REVIEW OF FARMER-MANAGED IRRIGATION IN NEPAL

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1 Introduction

In most places in the hills of Nepal, and to a somewhat lesser extent in the Terai, wherever there is a reasonable potential of developing irrigation, the farmers have already made some effort to irrigate part of the potential command area. Recent estimates suggest that farmer-operated irrigation systems provide 93% of the irrigation in the hills and 74% in the terai (Water and Energy Commission (WEC). 1981. Irrigation Sector Review. Report No. 3/2/190981/1/1. Ministry of Water Resources, Kathmandu).

Some irrigation systems were built hundreds of years ago under the direction of petty rajas. Other systems, including some built in recent years, have been developed entirely by local initiative and resources.¹

The size of farmer-managed irrigation systems is normally determined by the hydraulic boundaries of an individual diversion and canal. The observed size of systems in the hills varies from several to about 50 hectares. The size is constrained largely by the topography in the hills. In the Terai, farmer-managed systems of more than 5000 hectares have been reported (WEC, 1981).

¹ We have chosen to use the term farmer-managed rather than community-managed in referring to irrigation systems operated by the irrigators with little or no input from the government or other outside agencies. The reason for the choice of this term is that the word community is ambiguous.
2 Organization

Wherever there is some existing irrigation, there is also an organization to carry out the primary tasks of an irrigation system. These tasks include construction of the civil works to capture and convey water to their fields, allocation of entitlements to water among the members, distribution of the water to the farms, maintenance of the system, and managing of conflicts arising among members. In order to carry out most of these tasks, the organization must have a means of mobilizing both human and financial resources.

The organization may be very informal, or it may exhibit a high degree of formality with scheduled meetings, elected functionaries, written rules, accounts, list of members and their water allocation, and members attendance at work. The amount of organization required and the formality of the organization is, to a large degree, a function of how much labor must be mobilized to maintain the system to capture and deliver the available supply of water as needed. If little labor is required, the organization tends to be much less formal and vice versa.

Even though there are frequently a series of canals from the same source which may even cross each other in the command area, each has a separate organization for its operation. A given plot of land usually has water allocated to it from only one canal. All farm operators receiving water from a given canal are usually considered members of the organization.
that operated that canal system. A farmer is a member of several organizations if the different plots of land he cultivates receive water from more than one canal.

Nearly all of the irrigation organizations have some recognized functionaries. They are usually selected at a meeting of all the members. Typically one functionary is responsible for organizing and supervising work on the system, and another keeps the accounts, minutes of the organization's meetings, and a record of members' attendance at work. Depending on the nature of the system other functionaries may be appointed (c.f. Chherlung case study Appendix I). In larger systems there may be several tiers or levels of organization with officers selected to represent different levels (c.f. Chhatia Mauja case study Appendix II). The performance of these functionaries is usually reviewed annually, and they may continue or be replaced depending on members' satisfaction with their performance. While functionaries may be appointed for specific tasks, major decisions are only made at meetings of all the members.

A broad diversity of organizations and means of carrying out the primary tasks of an irrigation system have been observed among farmer-operated systems in Nepal. What follows is a summary of observations of farmer-managed irrigation in the Central, Western, and Far Western Development Regions.
3 Irrigation Tasks

3.1 Construction

Groups of farmers have worked hard to develop their water resources. Some have constructed long canals through jungle, hard rock, and along the face of cliffs. Often they have hired other villagers who are skilled in cutting canals and tunnels through hard rock. Until very recently all materials used were from the local community. Now cement and steel or plastic pipe brought from outside have also become quite common. Flows in excess of 300 litres per second have been measured in canals constructed by farmers in the hills, and flows of several cubic meters per second have been observed in the Terai.

3.2 Water Allocation

An irrigation system must somehow allocate entitlement or rights to the water among the farmers. Two basic principles by which this is done have been observed. The most common principle used is to divide the water in proportion to the area of land irrigated by each farmer in the command area. Thus, if a farmer has one-twentieth of the irrigated land area, he is entitled to one-twentieth of the water in the system.

Another principle of allocating water is by selling shares in the system to the members. In one system the total water supply is divided into 60 shares, and the 105 members own from one-eighth of a share to four shares
(c.f. Chherlung case study Appendix I). If one farmer has more water than he needs for his land and another has less than needed, the one can sell water to the other. One year, ten additional shares were added to the system and sold for a total of Rs. 28,000. The money was used to make improvements in the canal so that more water could be delivered to serve a larger area. It is also important to note that there is no relationship between land ownership and water ownership in this method of water allocation. This principle of water allocation by purchased shares offers both an incentive for efficient use of water and a mechanism for expanding the area irrigated.

3.3 System Operation

3.3.1 Water Distribution

In a well-functioning irrigation system, water is distributed to each farmer’s fields in the amount entitled by the allocation. Three methods of distributing the water for monsoon rice cultivation have been observed.

One method is through the use of saachos. A saacho is a horizontal weir made from a log with two or more notches of equal depth but varying widths cut into the top. It is installed in the canal so that all the water flows through the notches, causing the flow to be divided in the same proportions as the ratio of the widths of the notches. The ratio of the water allocation of the land served by the distributary canals below the saacho is the same as the ratio of the widths of the notches. These saachos may be used only to divert a portion of the flow from the main into secondary canals, or they may be used right down to the individual field level.
Another common method for distributing the water according to the allocation is by a timed rotation. Each farmer takes water from the canal for a specified length of time. The length of each farmer’s turn is calculated to provide him the proportion of the flow to which he is entitled by the allocation. In many systems of the Far West intermediate storage tanks are used to collect very small flows. The tank is then emptied by discharging periodically at high flow rate to individual plots on a rotation basis.

The third method of distribution observed is by contract where the members of the organization pay one or more persons to deliver the water to all the fields. The contractors adjust the flow throughout the command area so that all fields are covered as adequately as possible. This method of distribution is especially suitable when the fields are a long distance from the village where most of the farmers live.

Water distribution for wheat and maize tends to be much less precisely regulated. Usually the farmers decide among themselves when each will irrigate his fields, and then each farmer will be allowed to take water until his fields are fully irrigated. Since water is relatively scarce at the time of maize planting, an appointed functionary of the organization may be in charge of distributing water so that all members are able to plant at least some of their maize at the optimal time.

3.3.2 Maintenance

The critical period for maintenance of most farmer-managed irrigation systems is prior to and during the monsoon season. Most organizations have a
meeting of the members in May where plans are made for the major annual maintenance which is done prior to land preparation for rice planting.

Generally the maintenance is done by the members, and they contribute labor in proportion to the benefits they receive from irrigation. Some organizations give a contract to one or more members for this work, and all the members contribute money to pay the contractor. Money may also be raised in this way to purchase tools and cement.

An important element in the operation of an irrigation system is a method for early detection of any problems at the intake, landslides that block the canal, and leaks in the canal. During the monsoon usually two people patrol the canal every day. The members may do this turn by turn, or two people may be hired to do this on contract. The persons patrolling the canal do minor repairs and alert the rest of the members if more labor is required.

If they report an emergency, the leader will call all members, regardless of access to benefits, to report immediately for work. Work may be carried out continuously night and day until water flows again.

3.3.3 Conflict Management

An irrigation organization which must distribute a limited amount of water to many members and which requires the cooperation of the members for operation and maintenance will inevitably experience conflict. Some members may try to steal more than their allotted share of the water. Members, from time to time, will fail to contribute their required share of the labor and
cash to maintain the system. To function well, irrigation organizations must have an effective way of managing conflicts when they arise.

Persons who are caught stealing water are usually fined, may be physically punished, and frequently are denied water in their next turn. One organization exacted a public confession from a member caught stealing water, and the signed confession was recorded in the organization’s minute book. Most organizations levy cash fines against members who are absent from work. Since the enforcement of sanctions is in the hands of the members who benefit from the proper adherence to the rules and who control the distribution of water, there are both the incentives and the means to enforce the rules.

3.4 Extension and Improvement

All of the farmer-managed irrigation systems we have observed have, over time, improved the canals and expanded the area and number of farmers served. Most improvements in the systems have been done by raising resources from the members. Money has been raised to give contracts to persons especially skilled at cutting canals and tunnels through rock and to purchase cement. Recently irrigation organizations have been turning more to the government as a source of resources for the improvement of systems. Over half of the observed systems have received some assistance from the government. Sources of government assistance have been the Irrigation Department, Ministry of Panchayat and Local Development, and the district panchayets. When applying for and receiving government assistance, the local irrigation organization gives up some control over what work is done and how it is carried out. In some cases it appears that the organization’s efforts
are beginning to be more focused on pursuing external resources at the expense of the initiative and effort required for operation and maintenance of the system with local resources. "Grantsmanship" is becoming the mode of operation instead of "self-help".

3.5 Resource Mobilization

An irrigation organization must be able to mobilize resources, both labour and material, to accomplish the irrigation system tasks described above. The ability to mobilize resources in a timely fashion is the major factor distinguishing a well-operating irrigation system from an ineffective one. In farmer-managed irrigation systems, these resources are contributed by the members in proportion to the benefits they receive from the system.

In systems where water is allocated in proportion to the area irrigated, members are usually required to contribute labour and cash according to their land area which is served. For instance, in one system a person with 0.5 hectare of irrigated land is required to provide one labourer every day that ordinary maintenance work is done. A person with only 0.25 hectare has to supply one labourer every other day. In another system, cash was raised at the rate of Rs. 160 per hectare to pay a contractor to do the maintenance.

Farmer irrigation organizations which allocate water in proportion to purchased shares of water also mobilize labour and cash contributions on this basis. One labourer must be provided each day of ordinary maintenance for each share of water owned. This year, one organization with 105 members irrigating 34 hectares, raised cash at the rate of Rs. 250 per share for a
total of Rs. 15,000 from sixty shares to improve their canal. This cash was in addition to their regular ration expense.

Another basis for resource mobilization is in proportion to the productivity of the irrigated land. Each member’s irrigated land is rated by measuring the yield of rice, i.e., number of dhan muri, (about 49 kg of paddy) and both labour and cash are contributed in proportion to the number of dhan muri each person’s land yields.

When emergency maintenance is necessary, most organizations require all members to work irrespective of the number of shares owned or the size of the land holding irrigated. At times work will continue at night by the light of kerosene lanterns and torches.

The amount of resources farmer irrigation organizations mobilize is considerable. Several systems with command areas of 30 to 50 hectares regularly mobilize more than 2,000 man-days of labour in a year. One organization with 55 members raised Rs. 70,000 in one month’s time to install a pipe to cross a major river.

In order to mobilize these large amounts of resources, an irrigation organization must have means of enforcing its rules and assessments. Most organizations keep written records of members’ attendance at work and people are fined if they do not work as required. Fines are set at about the same level as the local daily wage rate. If a person refuses to work or pay the fine, the organization can deny that person water. Several organizations have reported that when a member has refused to pay, a group of the members has gone to that person’s house, taken his pots and pans and threatened to
sell them. The person then paid the fine, and all the members saw how serious the organization was about enforcing the rules.

4 Evaluation of Performance

As we have seen farmer irrigation organizations have successfully mobilized large amounts of resources to construct and operate their systems. This in itself is a major accomplishment. However, evaluation of farmer-managed systems should ultimately be based on the agricultural productivity achieved by the irrigation.

In most of the systems observed, triple-cropping is practiced with cropping intensities of nearly 300%. Average yields from sample crop cuts in four mid-hill systems have ranged from 3.0 to 3.5 metric tonnes per hectare for paddy and 2.0 to 2.5 tonnes for wheat. Estimates for maize yields are similar to those for wheat but results from measurements are not yet available. Given the low level of use of management-responsive varieties and fertilizer, these figures demonstrate the effectiveness of water management in these systems.

5 Lessons from Farmer-Managed Irrigation Systems

Several important learnings emerge from the study of farmer-managed irrigation systems and from the review of Nepal’s experience in irrigation development. These points, which have important implications for the
approach to be used in irrigation development, are summarized below:

1) In most locations where there is irrigation potential, farmers have already developed the water and land resources to some extent. This means there is existing local experience with water management and irrigated agriculture. This farmer knowledge and experience should be tapped in planning new irrigation development in the area. Wherever farmers must work together to bring water to their fields some degree of organization has developed. This existing organization and infrastructure should provide the starting point or basis for a users group.

2) Farmer-managed irrigation systems are effective in managing the water resources to achieve improved agricultural production. The organizations are capable of: a) timely delivery of water, b) allocation and distribution of the water, c) labor mobilization for maintenance of the system, d) raising cash to pay for materials and operation, e) supervising and carrying out construction, f) identifying the most serious problems in the physical structure and setting priorities concerning what should be improved first.

3) Farmers use an incremental approach in irrigation development. This allows the accumulated knowledge and experience of each undertaking to be utilized in the next improvement or expansion. By undertaking one segment at a time there is a minimum disturbance of the existing irrigation, and work can be fitted to slack periods in the cropping cycle when labor is available.

4) The principle of water allocation has important implications for the
efficiency of water management and the expansion of the area irrigated. Water allocation by purchased shares provides financial incentives for efficient water management and for expanding the land area served. In contrast, allocation in proportion to area irrigated contains no incentive for efficient management nor a mechanism for expanding the area irrigated as the supply is increased.

5) "Ownership" of the system greatly affects farmers' attitudes and behavior. The users "own" the farmer-managed systems, and they take full responsibility for its operation. The performance of the system is a direct result of their efforts, and they provide the resources - labor and cash - to operate it effectively. The farmers in these systems have both the incentives and means to enforce compliance with the rules formulated for efficient and equitable operation of the system.