PUBLIC INTERVENTION IN FARMER-MANAGED IRRIGATION SYSTEMS IN NEPAL

S.B. Upadhyay*

INTRODUCTION

Nepal is a rectangularly shaped, land-locked country stretching in an east-west direction for approximately 800 kilometers (km) and varying in width from 140-220 km. The country can be broadly divided into three regions: 1) the mountain and Himalayan zone, which exceeds 3,000 meters in altitude and accounts for 34 percent of the total area but only 5 percent of the total cultivated land; 2) the hill zone, with elevation from 300-3,000 meters, is subtropical and occupies 43 percent of the total land area and contains 30 percent of the cultivated land; and 3) the Tarai zone, lying below 300 meters, forms the southern belt extending along the Indian border and accounts for 23 percent of the total area and 65 percent of the cultivated land.

Agriculture and Food Balance

Agriculture is the mainstay of Nepal's economy, accounting for about 60 percent of the Gross Domestic Product, over 90 percent of all employment, and nearly 80 percent of export earnings. Food grain production is the most important component -- rice, maize, wheat, and millet account for over 90 percent of the total agricultural output. However, in the past five years production of food grains has not shown a significant increase.

Food balance projections up to the year 2000 show that to supply the minimum food and nutritional needs of the rapidly increasing population, cereal production must nearly double from the present level. In the next decade this requires an annual growth rate in food production of about 4 percent. Increased grain production can be attained by increasing the productivity of farmland. This can be done by improving irrigation infrastructure, agriculture extension, input supply, processing and storage, and marketing, and by implementing new irrigation systems.

Irrigation Development

The total cultivable land in Nepal is estimated at 3,000,000 hectares (ha). Much of this land could be irrigated by surface water sources. Portions of the Tarai zone also have potential for increasing the use of groundwater for irrigation.

Public sector irrigation development does not have a long history in Nepal. The Chandra Canal in Saptari District, built in 1923, was the first irrigation scheme built with standard engineering methods. In 1926 an agriculture council was set up to take care of Nepal's

*Executive Director, Water Resources Directorate, Water and Energy Commission Secretariat, Kathmandu, Nepal.

irrigation activities. The second modern irrigation system, Judha Canal in Rautahat District, began operation in 1945.

In 1951, the agriculture council was dissolved and the Irrigation Department established. The Irrigation Department has been reorganized into the Department of Irrigation, Hydrology, and Meteorology and undertakes all major irrigation schemes. Three other agencies -- the Ministry of Panchayat and Local Development, Farm Irrigation and Water Utilization Division of the Department of Agriculture, and the Agriculture Development Bank -- are also involved in irrigation development.

Although public sector irrigation development with respect to modern engineering techniques is relatively new, irrigation development in Nepal has been taking place for centuries. Farmers have built and operated systems on their own, some of which are as much as 400 years old. Of the estimated 690,000 ha of land that is presently irrigated, farmer-managed irrigation accounts for at least 400,000 ha. The percentage of the total irrigated land in the hills and in the Tarai under farmer-managed systems is about 90 and 70, respectively.

Farmers work together to divert water from rivers, and build main and branch canals, and the distribution system. They also maintain and operate the systems. To manage a system they form a *kulo samiti* (canal committee) and choose leaders. In many cases water is distributed on the basis of land holdings but in times of low supply a distribution schedule is used which may or may not be related to landholdings. Repair and maintenance of the diversion and main canal is done collectively, but field channels are maintained by those who use them. The organizational pattern used by those involved in repair and maintenance differs from one system to the other depending on the soil, climate, topography, and social structure of each location.

There are benefits that could be derived from greater involvement of farmers in the development of public sector systems. In the design phase, farmers can assist with information regarding soil conditions and topography; in the construction phase, they can provide labor; and, in the operation phase, they can participate in operation and maintenance (O&M). Similarly, public intervention in farmers' systems could help in several ways. At the macro level, rules and laws that recognize and protect the status and customary rights of the existing farmer-managed systems need to be formulated. At the micro level selective assistance is needed to: 1) strengthen weak user groups to enable them to exercise authority when necessary, 2) improve the physical systems by giving technical and material assistance, 3) improve accounting and administrative skills, and 4) improve water management skills.

PUBLIC INVOLVEMENT IN FARMER-SYSTEMS

Since 1985 the Water and Energy Commission Secretariat (WECS) has been conducting a water use inventory in the Tarai. The inventory has placed emphasis on identifying farmer-managed systems and obtaining information about how they function. The

irrigation status, as compiled from this study for both the private and public sectors, is given in Table 1. In the eight districts where studies have been completed, 836 farmer-managed systems were recorded.

Table 1. Relationship between cultivated and cultivable land area and public and private irrigation coverage (in '000 hectares)

District	Land				Gross Irrigated Area			
	Total area	Culti-vable	Culti-vated	Irrig-able	Farmer systems Season	Farmer systems Year	Public sector*	Total
Jhapa	156.9	136.5	113.5	124.0	66.4	3.0	5.0	74.4
Morang	184.7	142.6	107.3	120.6	25.6	21.1	54.0	100.8
Rauthat	103.7	88.0	58.4	81.3	1.7	6.7	6.0	14.3
Chitwan	219.4	114.1	46.8	87.6	11.1	9.3	5.5	25.8
Nawal Parasi	201.6	104.8	60.2	79.2	14.6	6.3	9.8	30.7
Rupendehi	141.5	114.6	90.4	108.7	10.4	32.7	10.9	53.9
Danddekhu	297.3	113.3	68.4	76.1	18.4	23.2	1.9	43.6
Kaiali	324.8	191.6	69.7	156.5	23.9	7.8	5.0	36.8
	1629.9	1005.5	614.6	833.9	172.0	110.0	98.1	380.2

*Government built systems.

Numerous problems have been observed in the farmer-managed systems. In low-flow periods, disputes and even fights over water sometimes disrupt irrigation activities. In systems that tap water from large rivers, there is no mechanism to control flood-water from depositing silt in the canal and destroying the canal and fields. In such cases there is frequent damage to crops. Many of the farmer-managed canals do not have sufficient control structures and appear to be poorly designed and of irregular size. At times farmers have changed the canal alignment when the original canal was filled with silt, making it difficult to repair. In the hills, farmers have used wooden structures to cross drains and even wooden aqueducts along rock cliffs. Such structures leak and the resulting erosion makes the span larger and more difficult to cross. Landslides frequently destroy canals and they cannot be repaired using local skills and materials. The diversion structures are a difficult problem for the farmers. They are constructed from boulders and brush or even earth and bamboo, but floods wash them away easily. In some systems the diversions must be rebuilt many times in one season. This increases the uncertainty of water delivery.

Public involvement in farmer-managed systems, if done in a way that preserves the organization and management strengths they exhibit, could enhance agricultural development. To evaluate and design better ways for public involvement in farmer-managed systems in the hills, WECS, in collaboration with the Ford Foundation and the

International Irrigation Management Institute (IIMI), have undertaken a study in the Sindhupalchowk District. The study's primary objective is to identify underlying problems of farmer-managed systems which limit their expansion and intensification.

Similarly in the Tarai, investigations should be made to see if there are effective ways to assist farmers in improving their systems. It is essential first to identify clearly the problems faced and the alternatives that could be undertaken. It may be possible in some cases to increase the irrigated area by improved management practices which reduce the consumption of water. In other cases, building semi-permanent diversions and other structures may enhance the performance of systems. Other benefits, such as reducing labor demands for repair and control of silt due to erosion and floods, would also be gained. Many of the farmer-managed systems were found to be seasonal. With improved technology some of these systems can be made perennial. Studies should be undertaken and research carried out to find ways that public intervention in farmer-managed systems can improve their performance and expand the irrigated area.