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**Design Issues in  
Farmer-Managed Irrigation Systems**

# **Design Issues in Farmer-Managed Irrigation Systems**

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# Some Experiences Encouraging Farmer Water Users' Participation in Irrigation System Operation and Maintenance

Jiang Ping<sup>†</sup>

## IRRIGATION DEVELOPMENT IN CHINA

IN ITS LONG history of agricultural production, irrigation has played an important role in the economic progress of China. Before the founding of the People's Republic of China in October 1949, the total irrigated area made up about 20 percent of the arable farmland.

Since the founding of the People's Republic of China irrigated area has expanded. Feudal customs have been abandoned, modern technology has been introduced, irrigation management has been organized based on agency/farmer joint management, and new water-utilization rules have been instituted. About 48 million hectares (ha) are presently irrigated, making up 46 percent of the farmland in the country. There are 137 major irrigation projects each with command areas of 20,000 ha comprising 16 percent of the country's irrigated land. Four hundred fifty-eight medium projects with command areas from 6,667 to 20,000 ha each cover about 10 percent of the overall irrigated area. Land covered by numerous minor projects (less than 6,667 ha each) amounts to 74 percent of the country's total irrigated area.

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<sup>†</sup> Jiang Ping is a Senior Research Fellow at the Farm Irrigation Research Institute, Ministry of Water Resources/Chinese Academy of Agricultural Sciences.

## RESOURCE MOBILIZATION FOR MEDIUM/MINOR IRRIGATION SYSTEMS

Huge investment has been put into irrigation construction. The total financial expenditure from the state for water-conservancy construction up to 1985 was US\$72 billion of which more than US\$30 billion were used for irrigation construction primarily of major and some medium-scale projects. Because of limited financial resources the government encourages farmers to construct and manage most of the medium and all of the numerous minor projects in the country. In China, this means that the farmers should be responsible for the construction of medium/minor irrigation projects and their management, including payment of agency staff salaries, costs of repairing, cleaning, and desilting canals, costs of fuel and electricity, and all operation and maintenance overhead costs.

Despite the policy of having the farmer water users support the costs of constructing, operating, and maintaining minor irrigation projects, it has been difficult to obtain the collaboration of the water users because of economic and institutional constraints. The farmers are mainly interested in the returns from their annual crop production and income and find it difficult to invest in construction that will provide them with a return over a long period. Also, in China all farmland is social property, and the farmer has the right to use his share of farmland only for as long as he is engaged in farming in the village. Every two or three years the area and location of the farmland cultivated by a farmer may be adjusted according to changes among the village households. Inequities in water distribution and labor and cash obligations among different water-user groups also cause the farmers to resist making long-term investments in irrigation projects.

### Labor and Cash Mobilization by Farmer Water Users

Three types of payments are usually collected from farmer water users: 1) payment of labor costs involved with system construction and maintenance, 2) payment of a water fee, and 3) payment of operating expenses.

*Payment of labor costs for system construction and maintenance.* Usually, the number of labor-days required to construct, repair, clean, and desilt the canal is estimated and the total divided into a quota per unit of area irrigated or unit of irrigation water consumed. Then each village is assigned to contribute to construction and maintenance costs in proportion to the area it irrigates or the volume of water it utilizes. The number of labor-days is converted into a cash sum required of each household in proportion to the area of land it irrigates or the volume of water it uses.

To complete the work, the village-management group organizes a work team from among the beneficiaries, or contracts a construction team. Farmers who contribute labor are paid a daily wage. Those who supply manual or animal-drawn carts are paid for these contributions.

*Payment of a water fee.* Irrigators are required to pay a water fee calculated on the basis of the water used. At present this fee is very low; the average price of irrigation water is reported to be

3 to 4 yuan (US\$1 = 3.6 yuan) per 100 cubic meters in north China. Although the water fee is supposed to cover overhead costs including salaries of agency staff, heavy repair, and depreciation of main structures the water fee seldom covers these costs. As a result, the development of diverse enterprises such as fisheries or nurseries in conjunction with water management is encouraged by the government.

The volume of irrigation water is usually measured at the water intake of the lateral canal. The lateral-canal supervisor then collects water fees from each household. The water fee may be calculated according to the amount of water used or according to both the area irrigated and the amount of water used. Water fees may be paid in cash or in kind, e.g., 15 kilograms of grain at the current price per hectare, annually.

(Although well irrigation is one of the major types of irrigation in north China making up 65 percent of the total irrigated area of the region many areas do not collect any water fee for agricultural use of groundwater resources. However, in a few areas, a water fee of approximately 30 yuan per ha per year is collected and used for operation, maintenance, and the development of conveyance and groundwater recharge systems.)

*Payment of operating costs.* Water fees are calculated to cover only the cost of water management. Beneficiaries are required to pay an additional fee to cover operating costs. Operation costs fall under two categories: 1) those associated with the operation and maintenance of the main and branch canals, usually managed by the government agency, and 2) costs for operating the lateral and sub-lateral canals and farm ditches, which are managed by the farmers.

The fee for operating costs is collected with the water fee calculated on the basis of cubic meters of water delivered or used. The portion of the fee corresponding to the agency-managed part of the irrigation system is administered by the system administration and is used for operation and maintenance of main and branch canals in the irrigation season. The operating fee corresponding to the farmer-managed part of the system is returned to each county water users' association and is combined with other county funds to pay for wages incurred for canal supervision and operation of the infrastructure at lateral-to-ditch levels during irrigation.

Farmers of the same sub-lateral canal elect several canal tenders who undertake canal supervision and irrigation management and they are paid by each farmer in proportion to his length of rotation during irrigation.

## RECOMMENDATIONS FOR MORE EFFECTIVE RESOURCE MOBILIZATION

In China, both farmland and irrigation facilities are public property. However, since the increase of irrigated crop production and more efficient use of irrigation is in the interest of the farmer water users, irrigation management in China consists of two partners: the agency and the farmers. The agency is responsible for irrigation performance, and irrigation performance is dependent upon the active participation and collaboration of the farmers. Therefore, with respect to more effectively mobilizing labor and cash resources, agency policy should strive for the following:

1. Water allocation among beneficiaries should be equitable.
2. The distribution of irrigation should be scheduled so that water can be delivered when it is needed, in the right amount, and in a manner that allows for optimal performance. Irrigation should be scheduled so that full flow is delivered to uplands and minor flow to the lowlands. Rotation should be organized among laterals to concentrate water flow for some laterals in each rotation to avoid dispersion of water supply.
3. Patrolling should be organized and allocation and distribution schedules enforced, with appropriate penalties.
4. A variable water-price policy should be developed to encourage the most efficient and maximum use of the water available.