

# Improvement of Irrigation Management and Enhancement of Economic Benefits by Contract Management

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## INTRODUCTION

THE WEST MAIN canal irrigation district is located in the Zhangye City of Gansu Province. It was built by the West Han dynasty 2,000 years ago and rebuilt in the 1960s. The irrigation water is mainly taken from the Heihe River by gravity. In addition to this, water is drawn from local wells. At present there are two standard main canals with a total length of 16.5 kilometers (km), 21 lateral canals with a total length of 92.72 km, 1,560 structures, 195 pumping wells, and 4 ponds. The value of the fixed assets is about 39.775 million Chinese yuan (US\$1 = ¥6). The annual total water use is about 200 million cubic meters (m<sup>3</sup>) for a command area of 11.7 thousand hectares (ha). The entire district comprises 3 townships, 39 villages, 312 production cooperation units and 23 office farms and forests. There are 3,200 farms with an total rural population of 46,800. The administration division has 112 staff members. Among them, 48 are public servants, 64 farmer irrigators and 28 farmer technicians.

The district is situated in a typical continental arid region in the northwest of China. The average annual precipitation is only 122 millimeters (mm) and the evaporation reaches 1972.5 mm per year. Therefore, agricultural development depends entirely on irrigation. The district has an elevation of 1,478 to 1,500 meters (m) above sea level with 123 days of frost-free season, an yearly average temperature of 8.1°C with 39.3°C as the maximum and -20.8°C as the minimum. The annual sunshine hours are about 2,277 and the soil is mainly sandy loam and suitable to cultivate wheat, corn, grain, rapeseed, beet, watermelon and sunflower. Local farmers are mainly engaged in crop production, but have livestock and poultry as well. The local industry and township enterprises are under-developed and the commercial economy is in a poor condition.

Since the founding of the People's Republic of China, the irrigation district has been reconstructed and expanded at a cost of ¥1.5 million of government investment and 9.0 million work-days of farmer labor. The district has obviously changed considerably, the actual irrigated area has been expanded gradually and the annual total food production has increased from 10 million kilograms (kg) in the 1960s to 37.9 million kg in 1987.

## MANAGEMENT SYSTEM PRIOR TO CONTRACT MANAGEMENT

The management reforms in the West Main Canal Irrigation District were tested prior to the introduction of contract management. The water charge was adjusted from the original ¥15 per ha to ¥37.5 per ha in 1984. The annual total water charge was increased from the original ¥115,000 to ¥400,000 in 1984. The annual operation cost can be covered by the collected water charges. Meanwhile, comprehensive management tools were developed and the annual net income was increased from zero to ¥7,000 in 1984.

However, generally, the reforms were quite incomplete. First of all, the water charge did not match the actual cost of water. The total water charge was less than half the cost of supplying water. The overhaul cost and depreciation cost could not be recovered by water charges and they could not be used for repairs, rehabilitation and improvement of old and damaged structures. According to the estimation made before the introduction of contract management, the canal system was only completed 41 percent, the structures 76 percent and the field conveyance system area was only 1,933.3 ha. Irrigation water efficiency was only 0.45 percent because of the uncompleted field conveyance system and unlined canals. In the period from April to June, serious droughts occurred frequently, which was a constraining factor in the development of agriculture in the district. A more serious problem was that the "big pot rice" administration system constrained the activities of the managers. The administration offices at different levels gave more attention to the comprehensive management of the district, while the district comprehensive management unit itself had no decision-making authority, such as in the eminent domains of personnel, assets, goods and even water. Leaders and major staff of the district administration division were directly assigned by the higher level administration office without considering the candidate's capacities. The district administration division had no power to choose and fire them. The water charge was unitedly collected and paid to the higher level authorities. The water charge was used by some

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leaders for other purposes without considering the actual requirements of the district. Farmer management organizations were imperfect and their responsibilities were unclear.

## **MEASURES AND PROCEDURES OF DISTRICT CONTRACT MANAGEMENT**

The contract management of the West Main Canal Irrigation District is essentially based on the rules of "the provisional regulations of contract management responsibility system for the national industry enterprises," which were issued by the state council. It is given below, according to the actual conditions of the district, and is in two stages.

### **Stage I**

The first level contract of the district is signed between the Water Conservancy Bureau of the Zhangye City and the water management division of the West Main Canal. The contract is based on the separating principle of ownership and management. Firstly, following the working conditions of the district, the basic principles of contract management are defined as follows: "the social benefit must be guaranteed, basic income is fixed, payment of expenditures is checked, extra income and pay savings are retained for usage, lower income and over pay cannot be reissued." Secondly, a contract management alternative is made through tender-base estimates. These include the estimate of the cost of water supply to determine the annual collected water charge and pay items, investigations of canal system, structures, and canal flow capacities to determine the system's completeness and water use efficiency, and determination of the actual irrigated area, yields and product values, irrigation quota and frequency according to the average value, as well as the irrigation experiment results of the past three years. Meanwhile, the indicators of reconstruction and ancillary structures, [softy] in production, science and technology extension and staff training should be carefully analyzed to determine the tender base. On this basis, the "thousand grade examining system" is made and the rights and duties of both parties and the praise and penalty measures for the contracted managers are specified. Finally the contract alternative is presented. Thirdly, the contract managers are selected and the contract is signed. The tender invitation is open to all staffs of the West Main Canal management division and the water conservancy systems in the provincial, prefectural and city levels by the Water Conservancy Bureau of the Zhangye City in order stimulate competition. The contract managers are selected in the procedure. The contract is signed by both parties and registered with a notary to give it a legal status.

### **Stage II**

The content and indicators in the first contract are distributed to every section and each township water management station and ultimately also to every working member to form the secondary [and third] contract. To do so, the comprehensive management system and institution within the district should be changed. The division director [responsibility system under the leadership of the representative assembly of the irrigation district] has to invite the participation of the township and village officers, as well as farmers. He also has to merge professional and farmer management and try to improve management efficiency. The representative assembly of the irrigation district consists of water management division staff, administration leaders and farmers representatives of the benefitting townships, villages and groups. They will meet periodically to make important decisions concerning the district.

The administration committee of the district is elected by the representative assembly of the irrigation district. It is the standing body of the representative assembly of the district and it is also the leading organization behind the water management of the entire irrigation district. It leads and controls the policies and comprehensive management strategies of district management. The chief member of the administration committee of the district is the director of the management division (general contractor), and the deputy chief members are the governors of the three benefitting townships. The management division of the district is a functional unit of water resources management of the entire district and is led by the administration committee of the district. It has sufficient power to decide on explicit management problems. The management division uses a system of director responsibility. The director supervises three township water management stations, one administration office and four sections, i.e., an irrigation section, an engineering section, a financial section and a management section.

The township water management station is the basic management organization which is under the double leadership of the management division of the district and the township government. The four sections and the one office are the inner institutions of the management division of the district. In order to complete and strengthen farmer management organizations, 13 lateral canal committees consisting of 74 members, 40 sub-lateral canal committees with 269 members, as well as 312 irrigation groups with 2,500 members are established under the township water management station. Each village appoints a village head as the water manager. The farmer management organization members are selected by the water users and their salaries should be paid by the farmers. They are

responsible for operation and maintenance of the irrigation works at the field level. The township water management station is managed through the contract system with the management division of the district. The four sections follow the management-by-goals principle. The tasks of the management division of the district are firstly divided into each section and office and then the responsibility documents are signed by the division director and the section heads. The tasks of each section are then distributed to every staff member by the section head. The system of personal responsibility is built up for carrying out the tasks. The staff redundancy system is practiced for the staff of the management division. The unemployed staffs are paid a basic living allowance during a specified period. If they are still unemployed after this period, the management divisions will make them redundant. Staff wages consist of a basic wage, a duties wage and a post-wage, and are determined by the work completed. Some comprehensive management items and a unique water system are contracted by the station and section as the third level contract or rent management.

Therefore, the "big pot rice" and "iron bowl" that existed for a long time have been broken and the activities of the staffs have become more exciting under the new comprehensive management system.

## CONTRACT MANAGEMENT RESULTS

The annual water charge collection has increased from ¥ 0.45 million to ¥0.89811 million since 1985 by contracting out management. The total collection of water charges does not yet cover the total cost of water supply, but it has created a necessary condition for rehabilitation of the systems in the district. About ¥ 1.7988 million of maintenance, repair and rehabilitation of the systems was paid by the collected water charges in the past five years. Forty percent of the total water charge of ¥4.4005 million is used for the rehabilitation of 14 lateral canals with a total length of 24.2 km, for the construction and rehabilitation of 114 lateral canal structures, for the distribution of 91 lateral canal lifts, as well as to complete 18,400 ha of field work area, to distribute 136 sub-lateral canal lifts, to maintain and repair 22 main and lateral canals with a total length of 32 km, to construct 22 gate houses and 500 meters of stone dam in the main canal head and to wash and repair 45 abandoned pumping wells. The "canal system completeness" of the whole district is increased from 41 percent before contract management to 82 percent in 1992. The structure completeness is raised from 76 percent to 93.8 percent. The irrigation water efficiency is enhanced from 0.45 percent to 0.58 percent. According to the studies, the actual irrigated area has reached 13,707 ha, which is 26 percent more than the designed command area (10,874 ha). The total food production has been gradually increased by the extension of the command area. The total food production was only 3.79 million kg in 1987 but became 4.768 million kg in 1990, 4.857 million kg in 1991 and 5.005 million kg in 1992. The yield and production value per unit cubic meter of water have increased, respectively, from 0.5 kg/m<sup>3</sup> and ¥ 0.4 /m<sup>3</sup> in 1987 to 0.92 kg/m<sup>3</sup> and ¥ 0.72 /m<sup>3</sup> in 1992. The average net income per head has increased from ¥ 567 in 1987 to ¥ 850 in 1992.

To guarantee social benefits, comprehensive management has been largely developed to increase the income of the water management members and to improve the living conditions of the staffs. Except for the original farms, forests and shops, a mill that yearly processes 0.5 million kg of wheat and a small "water facilities manufacturing plant" have been constructed. A service group for the installation of a low pressure pipe line and maintenance and repair of pumping wells has been established. A gasoline supply station has been constructed near the city highway. A combined selling contract of agriculture and side products has been signed with the Youth Canal Administration Bureau of Zhanjiang City of Guangdong Province [for the local products, such as wheat, corn, beans, jujube, buckwheat and fruits]. They have bought a large-scale bulldozer, two concrete mixers, 20 tons of steel [modular], an air compressor with a capacity of 9 m<sup>3</sup> and other well-washing devices, as well as 3 vehicles and 4 motor cycles. The net income of comprehensive management has increased from ¥ 7,000 in 1987 to ¥ 127,000 in 1992. The cumulative net income of comprehensive management in the past 5 years has reached ¥ 0.5192 million. The average staff salary was only ¥ 30 in 1987 but increased to ¥ 250 in 1988 and to ¥ 350 in 1992. The maximum salary for general staffs is ¥ 500, 700 yuan for a section head and ¥ 1,400 for the contractor (chief director). The houses and living conditions of staffs have been gradually improved. All houses of the management division were provided with central heating. A water tower, a public bathhouse of 45 m<sup>2</sup>, a reading room and an action room have been built. At the same time, they have bought 12 TV sets for the flow measurement points and built a residence building for the staff. Staff performance has greatly improved through the improvements of living and working conditions. The district was evaluated as a model unit of water and comprehensive management by the Ministry of Water Resources in 1991.

While developing the "material civilization," the water management division of the West Main Canal has paid more attention to developing the "spirit civilization." The quality of staff has been enhanced by education and training. Staff homes and youth fields have been opened in each township station and important canal sections in order to develop study and recreation, and sports activities. A technology training class will be opened during the winter and spring. Technical skills of the staff have obviously been enhanced by training. There are 20 staff members who have obtained grades of technician.