The Creation of Management System, Water Property Rights and Economic Results Research of the Small Irrigative Regions in China

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Abstract: At present, the management system falls behind, the system creation is not enough and the water property rights are indefinite, which result in low efficiency of water utilization in the irrigative regions of China. Indefinite property rights caused unreasonable installs of the resource, waste, abusing and the occurrence of low efficiency. Based on these problems, by the reaches and studies on Changgang Irrigative Region of Lanxi county of Heilongjiang Province of China, which changed the management mechanism of water expenditure. This paper builds up the economic analysis on the agriculture irrigation efficiency. It made the conclusion that economic results will greatly improved by building water market. At the same time, only management system continuously reformed can ensure the effective mechanism of the irrigative regions in good operation. [Nature and Science. 2004;2(4):39-48].

Key Words: system creation; water property rights; resources installs

Introduction

China is a large country in agriculture in the world, also is a large country in irrigation. In the gross amount of water resource, the agriculture irrigation takes a lion' part. In 2000, the national agriculture water consumption takes 80% in the gross amount. Among it, the irrigation takes 67%. On agriculture planting, China regards supplementary irrigation as the lord, the whole country demand supplementary irrigation 1.23 m^3, while producing 1 kg corns. But the dense population caused personal owning is extremely limited .The northern farmland area takes 3/5 of the national farmland area, but the water resource is only 1/5. On the contrary, the southern farmland area takes 2/5 while the water resource is 4/5. The southern farmland has water 28695 m^3/hectarn; while the northern has only 9465 m^3. There are 15 provinces (area) whose amount of water can't reach to 1500 m^3/hectarn. Among them, 13 are in the north. Especially the recent years, on the short of the water resources, the agriculture irrigation has suffered rigorous challenge. At the same time, owning to backward in management system, lots of irrigative regions faced up the problems: water fee can't hand in, water consumption can't get guaranteed, the peasants aren't positive, engineering is in aging and bad repair, the beneficial results drop. Therefore, solving is utmost urgency. Changgang Irrigation Region of Lanxi County, Heilongjiang Province of China changed the management mechanism of water consumption; explicated water property rights. In 3 years, the beneficial taking a favorable turn, and farmer's income level obviously increased.

1. The basic condition and problems of Changgang Irrigative Region

Changgang Irrigative Region of Lanxi country Heilongjiang Province set up in 1964.The designing irrigation area is 1,500 acre. The irrigative region management-station is a business unit, has 19 workers. Our country subsidizes 17 thousand yean annually. In 1980, bad management forced to ceasing irrigation. From 1989 to 1997, the irrigative region proceeded maintaining the operation while doing the patchable reform. But there's difficulty in collecting the fees, the management section is lots off debts, the equipments were aging the engineering was in bad repair and the management fell behind. So it ceased irritation again is 1998. Then the equipments in the pump-station were idle, the workers were unemployed. 1.8 thousand farmers of 647 households who relied on the irrigative region can't reach their wishes that growing the crops, living a life of reasonable comfort. They appealed many rimes for their extremely difficult lives. Like

this, the ten thousand acre irrigation area, which invested 5,000,000 yean, was sunk in paralytic.

The above problems suffered the Country party committee and the Country Government. To discard the irrigative region thoroughly or leave no stone unturned to get away from the predicaments, is not only the dilemma of the leaders at different levels, but also the disputed topic of all the people. Lanxi Country Party Committee, Country Government has the courage to renovate. They realized that, in nowadays, transforming the traditional water conservancy into resources water modern water conservancy, transforming the engineering water conservancy into resources water conservancy, it must solve the problem that the reformation of management system, productive relation in rural area can not adapt the market economy. It must solve the antinomy between the marketing of water merchandise and public welfare of irrigative management. It must solve the antinomy between the account of water fee and lasting development of the irrigation area. It must solve the antinomy between the engineering construction and the lack of the investment.

In November 1999, Lanxi County Conservancy Bureau asked for the upper supervisory section, and listened to the farmer's opinions, by investigating and studying over and again. They put forward the contracted reformation project about the Changgang Irrigation Area, which handed in and approved by the County Party Committee, County Government. They agreed in bid in the water conservancy interior. On April 1rt, 2000, Fan Chun comrade, a senior engineer of the County Water Conservancy Bureau wined in the bid, signing the contract with the supervisory section. Changgang Irrigation Area uncovered a new page heading to the new century finally.

What Changgang Irrigation Area practice is the zero price-contract, the contractor didn't hand in any fee to the Water Conservancy Bureau. And the contracted period is 25 years. During the period, the augmentative engineering and equipments by maintaining the building should give to the first party unconditionally. The contractor must employ the current workers. The contractor has the power to manage and use but can not realize the all properties. The funds of maintaining the equipments and the engineering are solved by the contractor himself. It must ensure to materialize standardization of the Irrigation Area and act. It provided definitely the both parties' power, responsibility, benefit in the contract.

After the contract, the operating nature of Irrigation Area changed, transforming government-owned into public-operation. A fresh and live blood infused into the muscle, which was on the verge of decadent. A series remarkable changes took place in the management of the Irrigation Area. The contractor raised funds 410,000 yean to repair the engineering, prepaid the electricity charge 2,050,000 yean, recovered thee irrigation, prevented leakage in the leaking channels, renovated the patchable engineering in the farmland, enlarged the irrigation areas. The stationmaster was appointed, although the old casts were employed, they have one chance to contest the post. Wage-reformation was practiced. The monthly wage of the station –master is 1,500 yean, and the senior clerk' is 1,200 and the manage personnel' is 800. Award and publish system on saving water practiced strictly. The enforcement of the reformation measures like a delight flowing water, moistening the workers and the farmers' hearts. The same year, the Irrigation Area recovered 333.3 hectares, and increased aqueous-merchandise' value. The water consumption per 1 acre from 1700 m^3 reduced to 1100 m^3. Owing to non-water-matter dispute, the farmers no longer sit in the ground to wait water, but were told "water comes" at the midnight by the workers. Never wished to hand in the water fee, then helped the workers to collect the water fee, cried to demand the water, then killed the pigs and goats to appreciate supplying water on time. Changgang Irrigation Area and the farmers who counting on it are all changed.

2. The system-economic analysis on the reason of low efficiency in agriculture irrigation

2.1 The water property rights is misty

That a property right is definite is the basic term of the market mechanism retaining normal operation. It's the precondition to exploit, exchange, keep, manage the resources and invest with resource, without exception of the water resources. Firstly, indefinite water rights result in weak exterior control of the water expenditure. The obtaining water quantity mainly under the yoke of the natural factors. Especially the upper reaches' exploitation is usually above plan, and the waste is serious .The widespread phenomenon of "pump water-contest" is existed. Secondly, indefinite water rights result in the low effectiveness of resources install. The property rights

indefinite, then the water is non-negotiable, and water resources can't be flown from low-value realm to costliness realm, which lowered the national gross beneficial result. In fact it's a distortion of resources install.

2.2 The price of water is low (Table 1)

For long times, the standard of water fee is low. The difference between water cost and the government subsidizes water price. On one hand, in people's opinion that water is a priceless resources and they make the habit of wasting water in production activity and livelihood. On the other hand, the investment to agriculture hydraulic engineering can't be recovered on compensation, then the national support is increased. The water-supply engineering is aging and hard to maintain. What make it worse, during the period of economic system reformation, the government subsidy decreased year by year? The funds of the Irrigation Area management unit operated difficultly.

2.3 The governors are pursuing political achievements in their tenure

The irrigation system's construction and management are invested by the government. The national wage and subsidy are the source of the operated governors, not the service quantity that provided to the farmers. The governors' tenure limit and the post promotion system make them preferred to keep good relations with superior and keep the short-term performance of the irrigation system. Once the governors' work was only for pleasing the superior but not satisfying the farmers' demand, they would not have enough motives to obtain the extensive and accurate information. The governors were encouraged by looking for funds to develop a new irrigation system, but didn't safeguard the original irrigation system carefully. Developing a new irrigation system is easier than safeguarding the original irrigation system on expressing themselves at the political achievement in their tenure. They would be appreciated by the superior and promoted the post easier. During the period of 1985-1995, the governors of Changgang Irrigation Area changed 5 times. Their short-term behaviors made serious loss to the collecting economy.

Table 1. The price of water, water cost, subsidy rate in different periods of Changgang Irrigation Area

Term	1990	1995	1997
The price of water (yuan/m^3)	0.020	0.022	0.025
Water-cost (yuan/m^3)	0.030	0.040	0.047
Subsidy rate (%)	18.0	8.0	0

2.4 The management system can't adapt to the objective request of reformation and development in the Irrigation Area

Like most small irrigation areas in current, Changgang Irrigation Area belongs to the nation, no change in 50 years. The County (municipal) Water Conservancy Bureau leaded the management-unit. The governors and the farmers, the County Government, and the Village Party Committee didn't handle matters at common benefits, which made the farmers have no enthusiasm too participate the management. On the water fee paying, especially in the droughts, they had conflicted motion. The Irrigation Area entrusted the County Government or the Village Party Committee to collect the water fee, which created chances for some officials' "attempt rent" behavior. The farmers contained lingering fear. Therefore, to encourage the farmers to participate in the water expenditure management and the development, It should be leaded by the market economy, to give full play to the governors, the farmers, the County Government, and the Village party Committee's enthusiasm and creativeness on the water expenditure management.

3. The economic analysis on the irrigative water expenditure efficiency

The improvement of the Changgang Irrigation Area' water expenditure efficiency, is attributed to the effective operation in practice and the guidance on

theory. Under the following 4 different kinds condition, we discuss the farmers' profit. Draw a conclusion: that by establishing water (although be prepared), according to m^3 to collect the fee, and the saved water resources be made over, do favor in saving water and bringing economic results into play (Figures 1-4). The following is the concrete analysis:

3.1 Supposes on the terms

(a) The farmer is an economic person, pursuing the profits-maximize. The farmer owns land area T. The land can't be made over, planting a certain kind crop.

(b) In the process of practice irrigation, the water loss is G (including the farmland evaporation, underground permeation, and the loss in the irrigation management). This part of loss is unavoidable, only can be reduced by taking some certain water saving measures. The water supplying ' loss is Go. While there's no water saving investment .The saved water is g when there has water saving investment. Water saving investment is I. I is the function of g's .

The $G=Go-g$

$I=I(g)$ $(I'>0, I''>0)$

(c) The water demand of the farmer is X .X=G+W. The W is the water demand of natural growing. Suppose this land has abundant water, the farmer can acquire the whole demand, and his water consumption won't exceed his allotted water Xo. Then the surplus water is Xo-X.

(d) This crop' output is Q. It's production function is Q.Q=Q (W, T), that is a kind function of variable factors, i.e. the devotion of water is variable. Suppose the devotion W and the output Q present the regulation that the income decreased gradually. This crop' unit yield is P.

(e) The farmer can't affect the water price, but can affect the profits by choosing the yield level.

3.2 Collecting the water fee is according to the land area. The water price of unit area is Po, and the water-trade is nonexistent (Figure 1).

In this circumstance, the farmer considered the price of 1 m^3 is zero. So he will not take any cost-means. The water expenditure balanced term that the farmer pursuing the profits-maximize is:

$\Pi 1=$ (sales income) – (the expense of water expenditure) – (the cost of water saving)

$=P*Q(W,T)-P_o*T-I(g)$

The water expenditure balanced term that the farmer pursuing the profits-maximize is:

$\Pi_{1w}=P*Q_w=0$

$\Pi_{1g}=I'=0$

i.e. when the farmers' profits reach maximize , water expenditure' limit performances is equal to water saving' limit cost , is zero. Water expenditure' limit performances is the change of the output which droved by increasing a unite water. Water saving' limit cost is the wasted cost for the farmer to save a unit water.

$\Pi 1=$ (sales income) –(the expense of water expenditure) –(the cost of water saving)

$=S_{oaw}-P*T$ (such as diagram (1) shows, the S means the area)

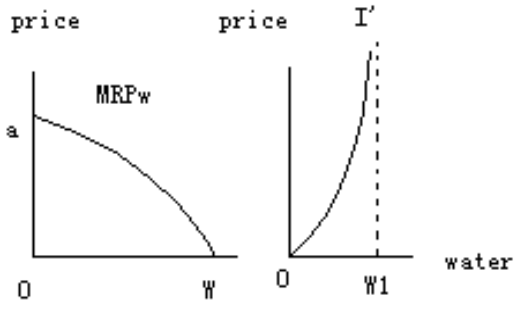

Figure 1. Collecting fees according to the area, water-trade market is nonexistent, the farmer' profit sketch map (1)

In diagram (1), the OW means the crop' water consumption, OW_1 means the loss G_o while taking no water saving measures. The water saving measures "g" is zero.

3.3 Collecting the water fee according to the land area. The water price of the unit area is Po. Water-trade market is existed. The water bargain price of 1 m^3 is Pa (Figure 2).

In the assumption, the farmer would like to sell a part or all part of his allotment to non-agriculture section. In this circumstance, the farmer will take some necessary measures to save water. Use the $\Pi 2$ to mean the farmer' profits in this circumstances.

$\Pi 2=$(sales income) +(income of selling water) –(the expense of water expenditure) –(the cost of water saving)

$=P*Q(W,T)+P_a*(X_o-W-G_o+g)-P_o*T-I(g)$

The water expenditure balanced term that the farmer pursuing the profits-maximize is:

$\Pi_{2w}=P*Q_w-P_a=0$

$\Pi_{2g}=P_a-I'=0$

i.e. water expenditure' limit performances =water saving' limit performances = the bargain price of water

Π_2=(sales income) +(income of selling water)–(the expense of water expenditure) –(the cost of water saving)

$=S_{oabw}+(S_{wbcw3}+S_{0dew2}+S_{w1fgx0})-S_{opabw}-S_{oew2}$ (such as diagram (2) shows)

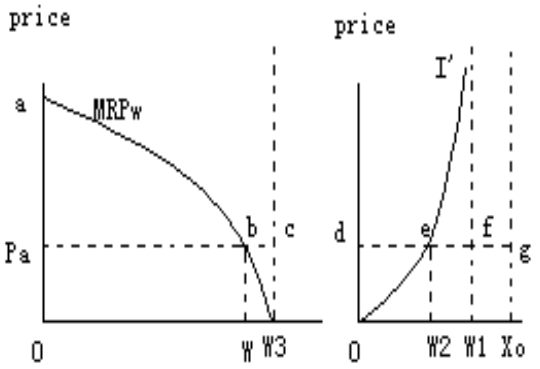

Figure 2. Collecting fees according to the area, water-trade market is existed, the farmer' profit sketch map (2)

In diagram (2), the OW means the crop actual water consumption. The WW_3 means the reduced water consumption .The W_1X_0 means surplus water even there is no water saving, i.e. X_0-G_0 .The OW_2 means the saved water "g" by taking water saving measures. The W_1W_2 means the loss G in actual irrigation process.

3.4 Collecting water fee P_w according to 1 m^3. Water-trade market is nonexistent (Figure 3).

In this circumstances, coming from the mental state that to decrease the planting cost, the farmer will adopt a certain water saving measures. Use the Π_3 means the farmer' profit in this circumstances.

Π_3=(sales income) –(the expense of water saving expenditure) –(the cost of water saving)

$=P*Q\ (W,t)-P_W*(W+G_o-g)-I(g)$

The water expenditure balanced term that the farmer pursuing the profits-maximize is:

$\Pi_{3w}=P*Q_w-P_w=0$

$\Pi_{3g}=P_w-I'=0$

The conclusion is, $P*Q_w=P_w=I'$, i.e. for the sake of production, the farmer' devoted in water saving, until the water' limit performances is equal to the limit expense of water saving.

Π_3=(sales income) –(the expense of water saving expenditure) –(the cost of water saving)

$=S_{oabw}-(S_{opwbw}+S_{efw1w2})-S_{oew2}$

Such as diagram (3) shows, the OW means the crop' water consumption. The WW_3 means the reduced water. The OW_2 means the saved water "g" by adopting the water saving measures. The W_1W_2 means the loss G in actual irrigative process.

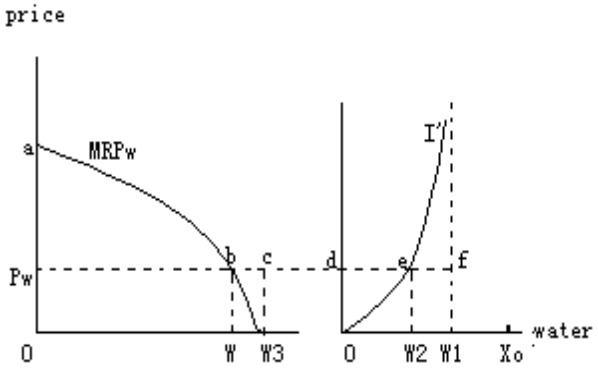

Figure 3. Collecting fees according to the area, water-trade market is existed, the farmer' profit sketch map (3)

3.5 Collecting water fee P_W according to 1 m^3. Water-trade market is existed. The bargain price is Pa per 1 m^3, and $P_a>P_w$ (Figure 4)

In the assumption, the farmer would like to sell a part or all part of his allotment to non-agriculture section. In this circumstance, the farmer will take some necessary measures to save water. Use the $\Pi 4$ to mean the farmer' profits in this circumstances.

Π_4 = (sales income) + (income of selling water) – (the expense of water expenditure) – (the cost of water saving).

$=P*Q\ (W,T)+P_a*(x)-W-G_o+g)-P_w(W+G_o)-I(g)$

The water expenditure balanced term that the farmer pursuing the profits-maximize is:

$\Pi_{4w}=P*Q_w-P_a-P_w=0$

$\Pi_{4g}= P_a -I'=0$

The farmer's choice on planting strategy is point b at water price Pa+Pw. The corresponding water consumption is W. But the farmer' actual cost on planting strategy is point g at the water price Po. The saved water was all used to trade.

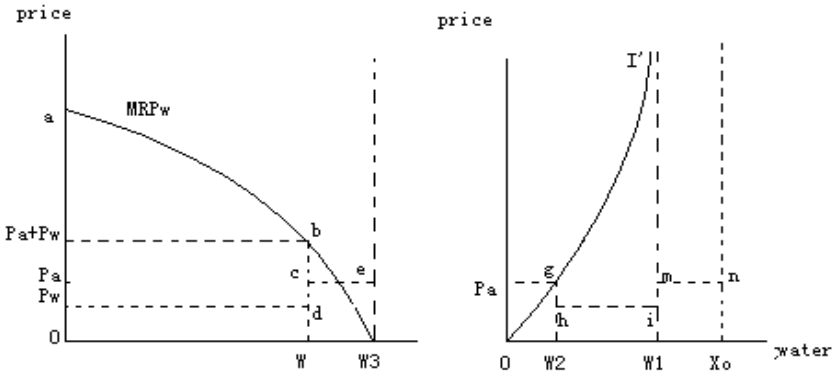

Figure 4. Collecting fees according to the area, water-trade market is existed, the farmer' profit sketch map (4)

$\Pi 4$=(sales income) +(income of selling water) –(the expense of water expenditure) –(the cost of water saving)

$=S_{oabw}+(S_{wcew3}+S_{opagw2}+S_{w1mnx0})-S_{opwdw}-S_{w2hiw1}-S_{ow2g}$

In diagram (4), the OW means the crop actual water consumption. The WW_3 means the reduced water consumption. The W_1X_0 means surplus water even there is no water saving, i.e. X_0-G_0 .The OW_2 means the saved water g by taking water saving measures. The W_1W_2 means the loss G in actual irrigation process.

We can get the conclusions from the above model analysis: $\Pi_1<\Pi_2, \Pi_3<\Pi_4$. By water property rights market, on one hand, along with the proceeding of the adjustment on agriculture industrial structure, the farmer will replant a new crop what in low coefficient on water expenditure or efficiently crop. Otherwise, its water resource limit performance will be lower than the price of the water resource that made over. The income from making over the water resource by water rights market, also can be used to complement the shortage of the infrastructure funds on farmland and irrigation, quicker the construction of water saving irrigative equipment, to form virtuous cycle of the work on agriculture water saving.

4. System creation on management of water expenditure in irrigation area

4.1 The establishment of the water rights

Are water rights problems existed or not in Changgang Irrigation Area? What advantages can bring in by defining and explicating the water rights? The governor of Changgang Irrigation Area just knew the concept of "water rights" at the end of 2001, and the farmer knew the proceeding on explicating "water rights" in the spring of 2002. The main "water rights" problems to solve were: how to handle the remained water? The handling can benefit the water saving and the farmer or not? To solve these problems, should it definite the power on profit and making over with the remained water or not?

In <<The water laws>> rules: "The water resources belong to the nation, i.e. owned by all the people". "All the ponds, the water in the reservoirs which owned by agriculture collective economy, belong to the collective." Water expenditure in irrigation from half-open exploitation to exercises of collective water rights, what is the basic direction of water rights vicissitudes. The basic meaning of water rights of irrigation area turned into collective water rights is: to give the more definite power on usage and profit, and the suitable power to make over is allowed. At the angle of management, the irrigation area water rights is the power to give the particular irrigation area a certain quantity and quality water resources which is decided by the public structure or public represents with form of organization and consultation, singing the agreement, on the irrigation area itself, water rights means the irrigation area which regarded as water expenditure group owning the power to acquire and consume a certain quantity and quality water resources in a certain resources valley or region. It decided by the factors of its population quantity, resources condition, and potential development act. At the same time, we should notice that, the water rights of irrigation area is owned by all the residents, and entrusted to the public structure to manage. The irrigation area should have a initial total water consumption, i.e. the initial water rights. The irrigation area has the power to benefit and make over with the remained water. Laws is the most common method to definite the property rights of nature resources,

without exception of the water resources. The intervention of the laws can reduce the bargain expenses by building the scaled economy that the property rights is defined.

To definite the water rights, the concrete ways of Changgang Irrigation Area:

Firstly, practiced the water-trade. Establishing the water supplied by water conservancy engineering belongs to the characteristic merchandise, building the business relations between the buyer and the seller. The management unit of the irrigation area supplied water according to the contract. The farmers consume the irrigative water by paid. In a questionnaire, almost all the farmers knew that water is merchandise. 2/3 can speak out the current water price and the price policy. All the farmers advanced a part of the water fee at the beginning of a year.

Secondly: the farmers participated in the management directly. The Water Expenditure Association request the farmers to participate the management what is all-directions, including the investment and the construction, maintenance and management on the farmland irrigation engineering in the magistracy of the Water Expenditure Association. Also, they participate in formulating the water expenditure plan supplying the water, supervising democracy with the association and the water-supplying section. An investment shows that, the mainly express that the farmers participate in the management lies in the formulation of water expenditure plan, democracy supervision positively. The Water Expenditure Association increased the openness of democracy decision. They let the farmers know the election to the association director, wage-paid and the management expenses share the water fee.

The farmers know that, the purpose of participating in the association positively is to make their opinions adopted. The wishes that increase their quality of themselves are enhanced continuously.

Thirdly, Water Expenditure Association and the development of agriculture economy have already displayed the positive interaction the establishment and maintenance of the channels, the timeliness of water supplying, democracy supervision, the relations between the association and the water conservancy section and act, these aspects are all increased. Thus, the water management section decreased the inappropriate interfere to the irrigation activities. The reasonable burdens of the farmers are alleviated. The property rights have a certain definition. The society bargain cost descended. And the development of the agriculture economy is speeded.

Finally, the benefits compensation mechanism is established. The core of the benefits compensation mechanism is to guarantee the farmer' benefits, especially the benefits of the poverty households and the injured person, to bring about the encouragement on water saving to the farmers. Water saving can compensate for a loss of less expenditure completely, and also for the cost by the increased water price. Comparing with the original much expenditure, the farmers can acquire more income. Then it can attain the dual purpose that building efficient consumption of water for agriculture and benefiting the farmers. With the support of the government, the encouraging measures to the Water Expenditure Association and the farmers on water saving is practiced. The channels compensating the benefits are: the public finances transferring paid, the income of water trade, and the national devotion and subsidy to the water conservancy equipments.

4.2 The mechanism of circulating and making over the water rights in the Irrigation Area is established.

The established core of the water tights market is setting up the market of making over the water rights, i.e. on the foundation of the government' authorization, the independently operating and making over the water rights is permitted, that the households engaged in specialized water expenditure who didn't own the water rights or the quota is insufficient can acquire the water expenditure in agriculture is permitted. That circulating and making over the water tights can increase the efficiency of resources allocation. Once there is no valid circulating mechanism, water rights will remain and solidify in the current owners for long times, if things go on like this, then the phenomenon that low-efficiency in water expenditure will take place. Circulating and making over the water tights can handle and utilized by the farmer who is good at operation and can use the water in high efficiency? It can guarantee the water resources in high efficiency allocation and valid utilization throughout. The circulation means it can sell water outwardly., also can make over among the farmers in the Irrigation area.

4.2.1 The exterior circulation of the water rights in the Irrigation Area

From the above narration, selling water outwardly can increase the farmers' economic benefits. However, the actual business of selling water cannot do by the scatter farmers, and is done by the households collective. For the sake of selling water, the prior condition is to request the approval if every member, insisting the consistency approval principle. Namely, all the farmers must have the request of selling water. Hence, it's necessary to establish the farmers' water Expenditure Association. Extensive farmers' participation and publish of extensive information can lower the bargain cost and the management expenses. In additional, the farmers' opinions on selling water influence the system of water fee collecting. The exterior circulation should notice the below problems:

① On the calculation method of collecting the water fee, the following calculating formula is suggested:

The water price per stere ={ (the development expenses on water conservancy the same year) + (the maintenance and management expenses on water conservancy equipments)+ (the waster of electricity and thermal energy expenses)} / (the total water consumption of the irrigation Area).

② Selling the water outwardly should sell and collect the fee natively. The members cannot operate the business alone.

③ The income of selling water is allotted by the contribution degree of the composition of each member in this area. Here, each member' contributed amount on water selling is equal to his decreased water consumption of crops. The income of selling water is regard as allotted reward. Each member' reward = (the selling water' price per stare) × (the contributed amount of water selling).

④ The irrigation area does Water selling unify. Each member (farmer) cannot buy internally at lower price, then sell outwardly at higher price.

⑤ The valley management organization has the power to practice the mechanism of supervision and management in the magistracy.

4.2.2 The internal circulation of the water rights in the Irrigation Area

The internal circulation is among the different farmers. In a same irrigation area, the owned water consumption of the farmers is stable and the position is fixed relatively. The consultation and designed management facing the lower bargain cost than the exterior circulation. The internal circulation only needs the relevant parties' consultation, and examined to pass by the Water Expenditure Association.

4.3 To establish an intact responsibility, power, benefits system that do favor the management in the irrigation area.

During the two years of the management system reformation Changgang Irrigation Area probed continuously. The system construction pursued creation at every step. Only in the 2 years, 12 terms responsibility systems, 26 terms management systems, 9 terms contract-manage regulations, and 3 terms statutes are established. The establishment of these standardized system, made the whole irrigation area always keep neat in management. The farmers participate in the irrigative management positively. It mobilizes everyone' positivistic and creativity fully.

5. The evaluation on economic results

5.1 The efficiency in water use is increased, and the results is remarkable

5.1.1 The consciousness on water saving of the farmers increased relatively. The farmers participated in the management on expenditure, what enhanced their economy consciousnesses. They voluntarily adjusted the industrial structure, neated the actions lowed the water expenditure quota, reduced the loss from digging the ditch and the expenditure quota per 0.067 lectern from 800 stere to 500 stere since the establishment of the Water Expenditure Association.

5.1.2 Obey the principle that occupying water rights " first in time, first in right". i.e. to guarantee the rights of the occupier whose expenditure time is the longest isn't seized by the new occupier, to avoid the occurrence of the "pump-water contest" (In 1970s, the water rights wasn't definite in Los Angeles U.S.A. The occupying principle on land dominated the ownership to the under-ground water. The adjacent households competed in pumping water, even excessively used and wasted.), especially in the internal well-irrigation areas. Once the water rights aren't definite, the entry isn't limited. The occupying

principle dominated the ownership of the storage. The pumper owned the exclusive rights with the under-ground water to the others. At a pumper, the others now would pump the water he doesn't pump, and he can't occupy the water in the future if he doesn't take actions. Hence, the anxiousness impairing the pumper' motive that to decrease pumping water for the future." Pump-water contest " occurred inevitably.

5.1.3 It avoided the phenomenon that the village officer' hitchhike and charge much more, reducing the farmers' supports. That individuality provided money to buy constructive material and fixed the engineering is appeared. After the establishment of association, with the supervision system, the charging is transparent, the finance is public and expenditure is public, what lowed the cost.

5.1.4 The coefficient of ditch water usage also increased consumedly. It enhanced the engineering management in the irrigation area, transforming " public product" to "preparative public product". The branch ditches are managed and maintained by the group, and several households manage the small ditches. Before the establishment of the association, the water conservancy engineering is developed by the national investment. Once it was broken or in bad, the management unit does the maintenance. Hence, the farmers were totally unconcerned the maintenance on engineering. And the technique measures on water saving can't put into practice. After the establishment of the association, the quantity of ditches increased obviously. The engineering management has the link with their interests. Divided-segment management is practiced, and the duty is implemented. The farmers are positive to participate the management. The coefficient of ditch water usage also increased consumedly.

5.1.5 It strengthened the democracy management and democracy decision of the farmers, and increased the openness of the water expenditure management. Nowadays, the affairs must be passed by democracy negotiation and democracy decision. The principle of fair, reasonableness, and efficiency is emphasized. All kinds of water matters disputation were declined. 95% persons reflected that, since the establishment of the Water Expenditure Association. The disputations between the villages, the farmers, the households and the irrigation station reduced. The phenomenon that breaking the ditches, taking the soil in confusion, and digging the opening disorderly was eradicated.

5.1.6 It saved the main physical labors of the families, and gave full play to the women. He results of water saving is remarkable. Before the establishment of the association, in general, the males engaged in the guarding and pouring water. In the process of the association, there is no need to contest. The water expenditure quota, irrigative methods and the orders determine the irrigation. It's equal and fair. The women and the elder can participate is irrigation, which increased the achievement of the inferiority community. at the same time, the women are patience and meticulous in guarding water. The results of water saving is more remarkable. According to an inquisition, the males of 18 households guarded water formerly. Since the women managed the farmland, the average rate of water saving is above 10%.

5.1.7 The farmers hand in the water fee initiatively. Once the association funds is missing, the prepaid is allowed, which can make up the shortage of the funds.

5.2 The problems in solution

5.2.1 The benefits of the farmers is loss. The established lands of the public equipments, not attend by the form of partnership, but compensated once for all at a low price. That's unfair to the farmers for their long-term usage rights on the farmland. To let the farmers get advantage and long-term income by modern construction, it must allow the farmers join the partnership by making over the lands and have long-term bonus.

5.2.2 The function scope of the Water Expenditure Association is too narrow. It should extend to other community management or important activity. Such as the collectively relief when heavy natural disaster, fix the disaster-reducing engineering collecting, an-drought etc. The Water Expenditure Association should expend its function. Especially the effective water matter activities, it should have a hand in it.

5.2.3 The positive of feminine farmland management should be transferred further. The practice has proved that, on the management of the

irrigation system, the feminine position seems to be more important. The women who engaged in the farmland management, at the consciousness and methods on water saving and the careful degree, have advantage compared with the man. Also, that the women participate in the management, embodied two sexes' equality. And the efficiency of water saving and water expenditure is increased consumedly.

5.2.4 Sometimes thee management of the Water Expenditure Association conflicted with the local government, what made the in dilemma. On one hand, the farmers' supports is still overweight .The government personnel are excessive. The small agriculture economy can't support the huge superstructure. On the other hand, the power of county government is excessive, especially on the land-controlled power, what can seep into the private things. It caused the dissymmetry between the excessive power and the narrow sources of the revenue. The relations between the farmers and the officers is the relation of bringing up and be driven bringing up, not the relations that be served and service.

5.2.5 In the property right system reformation of the irrigation area, it must lay stress the handle of three relations. One is the relation between the national property keeping the value and the transforming of property right. (To definite the ownership, to make over the operation right, to definite the mature disposition right on the invested property of the operation personnel, to definite the redistribution of the property benefits which invested by the nation) Anther is the relation between the renter pursuing profits and the farmers' supports. And the last is the interests' relations between the renter and the workers of the irrigation area.

6 Conclusions

At present, the water rights reformation in Changgang Irrigation Area is still placed in initial stage. Lots of problems are treating perfect and deepen .In a short period; making over short-term water rights can be for lord. The essential point is to cultivate the yearly circulation bargain in different farmers of the same irrigation area. For short-term bargain is simply and easily organized .The long-term circulation, especially the exterior circulation, directly the long-term invested on the water conservancy. Therefore, it's necessary to cultivate the operation company on water conservancy equipments.

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