

China's Water Management in Rural Areas

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Why Water Management in China?

In terms of total water resources, China boasts 2.8 trillion cubic meters of water, the sixth richest in the world. However, China's per capita volume is only about 2,300 cubic meters, barely one fourth of the world average. China is suffering water shortage. According to the current water demand, the annual shortage for the whole economy amounts to 30 billion to 40 billion cubic meters. Over 300 million rural people do not have access to qualified drinking water, adequate water, or convenient reach to water. Every year, about 10 million people suffer from temporary drinking water shortage because of drought. In recent years, about 33 million hectares of farmland is subject to drought every year. In the 10th Five-Year plan period, industrial loss due to water shortage registered 230 billion RMB yuan annually, 1.62% of the national GDP over the same period.

Furthermore, the distribution of water resources is uneven in time and space. 70% of rain precipitation is received in four months. Most of North China lacks water resources. Per capita volumes of water resources in the Haihe River, Yellow River, Huaihe, Liaohe river basin are only one seventh, one

third, one fifth, and one third of the country average.

Due to global climate change and human activities, in the past 20 years, water resources has been shrinking in North China, with the annual runoff of Haihe River Basin reduced by 41%, Yellow River 15%, Huaihe 15 % and Liaohe 9%. In some areas, water resources have been over exploited to the detriment of the ecological and environmental sustainability.

While China is suffering water shortage, water efficiency remains at low level. In average, the GDP output per unit cubic meter of water is about one fourth of the world advanced level. Water consumption per 10,000 RMB yuan of added value is five to ten times that of developed countries. Only 45% of agricultural irrigation water is actually used, a big gap to reach the developed countries.

Water pollution remains serious. With the persisting high sewage discharge, water quality of 39% of the river length under evaluation registers under category IV. Pollution in water bodies in North China is serious. Water shortage due to water quality is increasingly remarkable. Zones where underground water was excessively extracted increased to 164 from 56 of early 1980s, with the total area reaching 180,000 square meters from 87,000 square meters.

China also suffers flood disasters which caused 100 billion RMB yuan losses in the 10th Five-Year period, soil erosion prone area covering 37% of the landmass with 5 billion tons of soil eroded annually. The water facilities and infrastructure are very hard to maintain, with some left dilapidated.

These are the major challenges that China is faced up with in water resources management. China has been trying hard to meet the challenges. China has formulated the 11th Five-Year Plan of water resources, with special attention paying to saving and conservation of water resources,

governance reform, overall coordination and water resources allocation. At the top of the list of priorities, is water management in rural areas.

The Place of Rural Areas in China's Water Management Strategy

China's water management in rural areas is of vital importance to China's development in many aspects. Firstly, water access and drinking water safety concern their well being of the rural people. With the rural people accounting for the majority of the Chinese population, water access and safety in rural areas are relevant to China's undertaking of building a moderately prosperous society. Secondly, water is a precious resource to China. Rural areas play a significant role in water conservation and water saving. On the one hand, China suffers a lot from serious floods. People have realized that water and land conservation in the upper reaches of the river basins concerns the safety of life and property in lower reaches. By giving up farm land for forest and grass land, the people in the upper reaches have contributed to water and soil conservation to the benefit of whole environmental system of China. On the other, agriculture is the biggest water consumer in China. However, China's irrigation system is outmoded in that it wastes a lot of water. Water saving in irrigation is the most important component of China's water saving strategy. Thirdly, the backward water using method in rural areas has adverse impacts on grain yields. To stabilize food production, China has to carry out better water management in rural areas.

The present paper will focus on two urgent issues for China's water management in rural areas, namely the water safety initiative and water saving initiative that the Chinese

Government is now engaged with. These two issues are related to water access and water use.

Water Access in Rural Areas

The Chinese government has basically settled the problem of water access in rural areas. In the 10th Five-Year Plan period, over 67 million rural people are relieved from drinking water difficulties. In fact by 2004, China had basically extinguished the problem of water access in rural areas. In total 22.3 billion RMB yuan was invested in this historic achievement with 11.7 billion RMB yuan invested by the Central Government in terms of domestic bonds.

However, access to safe water is still a mountain to overcome. Based on a survey covering 70 counties, 431 sample villages, 259 representative water quality reports, and 2089 farmer households, the National Development and Reform Commission, the Ministry of Water resources, and the Ministry of Health released the report on the current drinking water situation in the rural areas of the whole country. It was found out that out of the 937,450,000 rural people (not including those of Shanghai, Hong Kong, Macau, and Chinese Taipei), 615,450,000 people have access to safe or basically safe water, accounting for 65.7%, while the drinking water of 34.3% of the rural people is not safe one way or another.

Figure 1: Population Distribution of Water Safety Problems

Source: Li Jing, et al. Research Report on Present Situation of Rural Drinking Water Safety and the Countermeasures

Water safety is of two categories. Category I concerns water quality. 70% of the afflicted rural people are drinking water of Category I. In terms of the number of the afflicted, the list runs as follows, water with over-concentrated fluorine (53,700,000 people afflicted), seriously contaminated underground and surface water (90,800,000 people afflicted), brackish water (38,500,000 people afflicted), water with over-concentrated arsenic, and other quality problems (with over-concentrated iron and manganese) (44,100,000 people afflicted). Category II refers to water quantity, convenience of water fetching, and stability of water supply. 30% (96,000,000 people) of the afflicted rural people are subject to these problems. According to the statistics of the Ministry of Health, 20,000,000 people developed fluorotic teeth, 1,300,000 people suffer fluoride bone disease, 10,000 people are afflicted with arsenic poisoning, while over 800,000 people suffer Kashin Beck disease.

In terms of regional distribution, 77,800,000 people are from East China, 130,000,000 people are from the middle, 115,000,000 people are from the west. People drinking fluorine water are mainly in North China, North West, and East China; arsenic water drinkers are in Inner Mongolia, Shanxi,

Xinjiang, Ningxia, and Jilin. People in North China, North West, and East China north of the Yangtze River are likely subject to brackish water. While people in South China are likely to drink contaminated surface water, those in North China and Mid-West China are more likely to drink contaminated underground water. Some people are even vulnerable to water contaminated with typhoid and paratyphoid, cholera, and schistosoma.

China's Objectives vs. UN Millennium Development Goals

It is estimated that one out of every six people of the world does not have access to safe drinking water, while in developing countries, 80% of disease and death cases are related to water. The UN Millennium Development Goal on water is to halve the proportion of people without access to safe drinking water by the year 2015.

Development of China's agenda on safe drinking water is based on the accomplishment of water supply program.

The Chinese Government pays great attention to water safety. In August 2005, the State Council released the Notice on Strengthening the Work of Drinking Water Safety, with special focus on rural areas.

The formulation of "2005-2006 Program on Emergent Projects on Drinking Water Safety in Rural Areas" marks the initiation of the construction of safe water projects in rural areas. 7.79 billion yuan of funds was arranged for water safety projects for 21,200,000 people. By the end of 2006, 28,970,000 rural people had got access to safe drinking water.

The above mentioned survey on water safety in rural areas was also finished in 2005, which constitutes a solid basis

for the compilation of the 11th Five-Year Plan on Water Safety in Rural Areas which was approved by the National People's Congress in on August 30, 2006.

According to the Plan, the Chinese Government will settle the water safety problem for 160 million rural people in the eleventh Five-Year Plan period, and basically settle the water safety problem in all rural areas by 2015.

This is in fact the adjusted Five-Year Plan on water safety. The original goal in the 11th Five Year was to provide clean water to 100 million people and settle the problem in all rural areas by 2020 years. The amendment of the plan shows China's commitment to the scientific outlook of development. It also shows that with years of steady development, water safety is now affordable.

Means to Accomplish the Task

Financial Means. The Central Government, and local governments and the beneficiaries will bear the investment proportionally, with the Central Government paying the lump sum. It is reported that the Central Government will allocate 32 billion RMB yuan for water safety projects in rural areas. The local governments are required to furnish the counterpart funds for technical review, extension, training and project management. The local people shall invest in the projects in labor and cover the costs for pipes and equipment in the households.

The distribution of the financial support varies between regions. Special support will be lent to the middle and west regions, with priority to be laid on the minority ethnic groups and reservoir migrants. In less developed areas, the needed funds will be provided mainly by governments at various levels. In the developed areas, the local governments and

the beneficiaries will jointly cover the funds. In order to guarantee that the funds for water safety projects are not diverted for other purposes, special accounts will be opened at the county level to manage the funds collectively.

Legal Means Along with State Council "Notice on Strengthening the Work of Drinking Water Safety", the National Development and Reform Commission, Ministry of Water resources, and Ministry of Health jointly promulgated "the Notice on Going Further to Implement the Construction of Rural Water Safety Projects" and "Methods on the Management of the Construction of Rural Water Safety Projects". The Ministry of Water resources issued three regulations on technical standards of rural water safety projects, on standards of qualification of rural and township water suppliers, and criteria for staff positioning.

Institutional Arrangement The local governmental leaders will take main responsibility for carrying out rural water safety programs. The Central Government will provide guidance and capital support. The relevant departments at each level of government will carry out their responsibilities and cooperate with each other under the unified leadership of the government. The development and reform commissions take care of program compilation, project examination and ratification, and monitoring of project construction and management; the water resources departments and public health departments work together on the feasibility study and preliminary design of projects and the implementation thereof. Environmental protection and land resource departments shall be referred to in the course of ex ante feasibility study and designing. The educational departments are supposed to put forward proposals on the school water drinking projects in the related areas.

After the program for water safety projects are approved,

local governments at various levels shall split the program into items and allocate them among departments with responsibility pledges to be signed. The pledge signers will be responsible for the soundness of the projects for lifespan.

Technical Means The safe drinking water projects will be organized on the basis of thorough investigation and scientific verification. Persons drinking at the village project shall be registered and name list shall be released for public reference. Each and every project must go through planning and cannot be constructed without approval. The project will be constructed depending on water source, water demands, terrain, and distribution of residential points so as to be cost effective. Collective water supply is encouraged for the sake of standard water management, reliable supply and guaranteed water quality. In areas with small scale water resources and scattered residential points, water supply projects will be built in villages. In areas where safe drinking water production is costly, the collective water supply stations will provide different waters, with safe drinking water for drinking and cooking and unprocessed water for washing and stock breeding and other purposes.

Drinking water resources shall be kept from being polluted. In the drinking water protection zone, pollution enterprises are prohibited, and network aquaculture activities are forbidden. Unauthorized well drilling and mine opening activities are forbidden in case drinking water will be contaminated by fluorine and arsenic.

Water quality control is a central link in securing safe drinking water in the rural areas. Sterilization and purification measures will be taken to ensure that drinking water quality is up to standards. Water quality examination and monitoring will be conducted at the water source, water processing lot, and ends of the pipelines.

Extension, training and publicity measures will also be beefed up to promote water safety awareness in the rural communities.

Governance In the rural areas, as water safety projects are dispersed in large areas, it is difficult to deliver and manage the projects. To meet this challenge, the Chinese government has carried out a series of institutional reforms. The basic idea is to identify managers from the very beginning of a program for them to undertake the tasks of delivery and management. The water users are empowered in terms of knowledge, participation, and surveillance. The mechanisms for this purpose include program score board system, social demonstration system, collective procurement and public tendering and bidding system, reimbursement system, engineering supervision system, and management responsibility system. The water users are entitled to participate in the whole process. Water users' opinions shall be solicited upon planning, designing, and construction of a project. The beneficiaries will set up water users' cooperative on the basis of democratic consultation to carry out automatic management on small-scale projects. The responsible organizations, beneficiary villages and water users' cooperative form up a management committee to take care of the operation of the regional collective water supply projects. Water is priced and water supply will be charged for the running costs so as to safeguard sound operation of the projects.

Role of Rural Areas in the Water Saving Society Initiative

Why Save Water in Agriculture?

It is estimated that by 2030 China's population will reach the peak of 1.6 billion. Per capita water resources will be only 1750 cubic meters. Even if we use water very thriftily, the total consumption will be 700 to 800 billion cubic meters while China's usable water is only 800 to 900 billion cubic meters. As we are reaching the ceiling, it is difficult to exploit new water resources. However, as China uses water in an extensive way, we still have great potential to tap by saving water. In 2006, China used 273 cubic meters water to create 10,000 RMB yuan GDP. China used 144 cubic meters to create 10,000 RMB yuan industrial added value. Developed countries only use 50 cubic meters to create the same amount of added value. 60% of water for industrial use was reused in China. While the repetition proportion in developed countries is over 80%. China's effective use ratio of irrigation water is only 0.45, while it is 0.7-0.8 in developed countries. Water saving irrigation is applied only to 35% of irrigation farmland in China, while the figure in developed countries is 80%. In China the biggest water consumer is agriculture, which takes up about 65% of water used in China every year. While water saving is a national strategy covering all trades and sectors, water saving in agriculture is of the greatest importance.

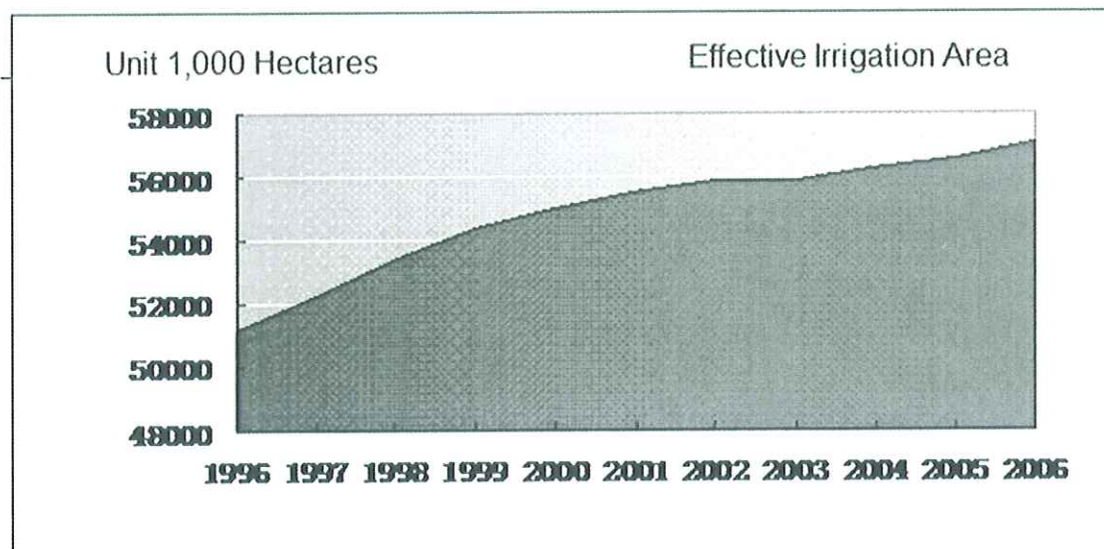
Water saving should be particularly applied to irrigation. China has about 400 big scale irrigation zones covering over 20,000 hectares each, and 5000 middle scale irrigation zones, covering 3600 to 20,000 hectares each. These irrigation zones consume 45% of water used annually in China. However,

surface irrigation accounts for 98% of the total irrigation system. 95% of the irrigation channels are earth channels. A lot of water was wasted through evaporation and seepage in the course of transmission.

Accomplishments and Goals

However, China still made great achievements in feeding its increasing population with the limited land and water. In 1950s, 1970s, and 1990s, China launched three farm land irrigation infrastructure building initiatives, and built over 400 large scale irrigation zones, 5000 middle scale zones, and millions of small scale irrigation projects. The irrigation system covers 56 million hectares of farm land, accounting for 45% of the total, producing 75% of national grain output and 90% of the economic crops. Among others, the big scale irrigation zones account for 11% of the national farmland, yielding 22% of the national general grain output. With per capita farm land accounting for only one third of the world average, China has successfully settled the problem of feeding 22% of the world population. Agricultural irrigation is of pivotal significance, as China's irrigated farmland is three times of the world average.

In the 10th Five-Year Plan period, the Central Government invested 9.27 billion RMB yuan and local government and beneficiary people invested 8.85 billion RMB yuan in the rehabilitation of 306 large scale irrigation zones and 99 middle scale irrigation zones for water saving, and over 1100 pilot water saving projects at the country level. In this period, water saving irrigation farmland increased by 5 million hectares to 21.3 million hectares with the averaged effective irrigation water use ratio reaching 0.45. It was estimated that 20 billion cubic meters water was thus saved annually, 25% of which was diverted for ecological maintenance, while about



15% for industry and urban use. Another side effect is that water saving irrigation has driven the development of water saving irrigation equipment industry. Since 1996, water saving irrigation equipment manufacturers has increased to over 200, with annual sales income registering 5 billion yuan. A new industry has emerged increasing employment opportunities in both cities and countryside.

According to the 11th Five-Year plan, China will increase farmland with water saving irrigation projects by 10 million hectares, increase water saving farmland by 2 million hectares, and lift the effective irrigation water use ratio to 0.5 from 0.45. The quota of irrigation water will remain 360 billion cubic meters. In regular years, irrigation water consumption per mu (667 square meters) will decrease to 410 cubic meters from 424 cubic meters.

If these goals are realized, grain production capacity will be increased by 25 billion kilograms so as to safeguard food supply of the whole economy. Annual water saved could reach 20 billion cubic meters, so that ecological maintenance water will be increased, over extraction of

underground water in the Yellow River-Huaihe River-Haihe River Alluvial Plains and the Fenhe River-Weihe River Alluvial Plains will be basically curbed, and the quality of farmland

irrigation will be ensured to increase farmers' income.

Now, water saving irrigation is a consensus between all stakeholders. To save water in irrigation, China work hard on two aspects. One is the rehabilitation of the irrigation systems for water saving purposes. The other is institutional building. The latter is especially noteworthy in the present paper.

China has carried out a Series of Viable Reforms on Agricultural Irrigation.

Water saving is a matter of agricultural development. China has reached a better understanding of "water saving in agriculture". It does not limit to saving water for the sake of saving water only. It also includes improving agricultural efficiency. Saving water in agriculture means less water for more output, and stable output. Farmers have realized that water saving is not only saving money, but also creating money. In the course irrigation promotion, farmers are mobilized to play an important role.

Water is not free anymore. The government has successfully introduced the water pricing and fee collecting system. Formerly, irrigation water was free of charge. Now, people are charged for using irrigation water. The price consists of the compensation for the costs incurred and a reasonable benefit. While water is saved in this way, the Irrigation water users shall cover the costs on a fair basis. There are series of irrigation water prices, including the double price system consisting of basic water price (users pay whether having used water or not) and gauged water price, extra-quota price, and season floating price. The introduction of the water pricing system is conducive to the optimal allocation of water resources. The Central Government has

also promulgated some regulations on irrigation water pricing in recent years. With introduction of water pricing policies, the "sunlight project" of transparent gauging, transparent pricing, and transparent fee collection has also been widely practiced, so that the relationship between water suppliers and users has been bettered.

Water quota and water right market have been established. General volume control and quota management have been applied to irrigation zones. The water quota for an irrigation zone is determined by the availability of water resources, the local social economic development scenario, and the actual needs for crops growing. This mechanism is included in the new Water Law approved in 2002. The water right transfer mechanism was also established. Water saved can be transferred to other industries for payment. At the same time, a compensation mechanism is also established for rural areas to get compensation for the use of irrigation water or irrigation facilities for other purposes such as industrial or urban development. By the way, this method is not only applied to farmers, but also to the various localities of river basins. That is the reason why the Yellow River, which used to get dry for several months every year in 1990s, has kept running for 7 years.

Reform on the title system has been carried out. Most provinces (autonomous regions and municipalities) have implemented reform on titles of small scale rural water projects. The titles of over 7,000,000 projects, accounting for one third of the small scale rural projects have been transferred through tendering, leasing and share-holding cooperatives.

A new Public Private Partnership has been promoted. In early 1990s, Association of Water Users (AWU) was first

introduced whereby farmers could take part in the management of irrigation water. With the introduction of AWUs, the farmers can take care of their own matters, so that the problem of manager default in farm land irrigation was settled. The governments, irrigation zone managements, and farmers are all winners. After years of promotion, the AWU mechanism has been widely accepted. In 2005, the State Council officially pledged to encourage and support the development AWUs and give them full play in project construction, utilization, maintenance, and water gauging and water fee collection. Now, there are about over 20,000 AWUs, with over 60 million participating farmers taking care of nearly 6,700,000 hectares of irrigation farm land.

The Chinese Government is also working on a Water Saving Law to incorporate the good practices and institutional reforms so as to promote the water saving initiative successfully.

Conclusion

Given big population and steady economic development, China's water problem remains big. The Chinese Government has realized that China's sustainable development relies to a great degree on the sustainable management of water resources. Besides the large scale water projects, like the South-to-North Water Diversion Project, the Chinese Government attached great importance to water management in rural areas, to tap the great potential of water saving in irrigation. In light of the "putting people first" principle of government and the UN Millennium Development Goals, the Chinese Government also gives a human touch to water management in rural areas by exerting tremendous efforts to provide clean water to all rural people.

Underlying these two endeavors is the idea that water projects in rural areas are basically public goods or quasi-public goods. The building and management of water projects in rural areas shall be supported and managed by the governments at various levels. Both the Central Government and local governments must guarantee steady increase of financial input in irrigation infrastructure. The capital funds are managed under special accounts. Rigid formalities are applied to payment and reimbursement.

A wide series of reforms have also taken place. The Chinese Government has made a lot of experiments in introducing good governance, market elements, and public-private partnership in water management in rural areas, which prove successful.

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