STRATEGIES FOR IRRIGATION DEVELOPMENT IN CHINA

Dr. Yuanhua LI
Deputy Director General
Dept. of Irrigation, Drainage and Rural Water Supply, Ministry of Water Resources, China
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Introduction
➢ China is feeding about 21% of the world population with about 6% of the freshwater and 9% of the farmlands in the world.
➢ In China, per capita fresh water availability is among the lowest in the world.
➢ Irrigation makes a major contribution to food security, producing about 75% of cereals and more than 90% of cash crops on about 49% of farmlands in China.
➢ In future, irrigation must play more important role, but it is not likely to get more water.

Irrigation Development
➢ The total irrigation area is 65.87 million ha by the end of 2016.
➢ Water use for agriculture is about 63% (more than 90% for irrigation) in recent years.
➢ Efficient Irrigation development is still the prior strategy in China, because:
  □ we need more food to feed the increasing population;
  □ farmers need better irrigation infrastructures;
  □ we have to save water from existed irrigation systems for industry and city.

Current Irrigation Systems
➢ There are around 456 large-sized irrigation systems with more than 20,000 ha of designed irrigation area for each.
➢ There are 7316 middle-sized irrigation systems with 667 – 20,000 ha of designed irrigation area for each.
➢ There are more than 400 thousand small-sized irrigation systems with 15 - 667 ha of designed irrigation area for each.
➢ Because of the development of irrigation, food production has kept pace with the population growth in recent decades.
The Du-Jiang-Yan Project has 2,270 years history, provides irrigation water for about 700,000 Ha of rice fields nowadays and is an example for sustainable use.

Roles of Irrigation

➢ In China, agriculture highly relies on irrigation.

Main Constraints for Further Development

➢ Water scarcity
  - The country-level data hide massive regional differences in water scarcity behind the average figures.

➢ Funds shortage for the rehabilitation and modernization of irrigation systems.
  - Most of the irrigation systems were constructed in the 1950’s and 1960’s, and low designed standard, aged structures and imperfect field works lead to low irrigation water use efficiency, poor irrigation service, low irrigation reliability.

➢ Farm size is small, and farmer’s income is quite low.

Uneven Distribution of Precipitation
Available Water Per Head In Different Regions

Farmlands, Grain Products and Water Resources

Every year, it may be found that many farmers get big reduction of yields in China!

Irrigation is getting less water!
Irrigation Development Becomes the Top Issue

➢ The ultimate goal for irrigation development is to guarantee food security of China without increasing irrigation water use.
➢ About $8 billion from central government for irrigation development every year.
➢ Farmers do not need to pay for the infrastructure of irrigation development.
➢ Increasing about 1.0 million ha irrigation area and improving about 1.2 million ha from traditional practice to drip or sprinkler irrigation per year.

How to achieve sustainable water and land use in future?

Systematic planning to cope with irrigation development and food production without increasing water use

➢ Program for the national food security.
➢ Planning for the utilization and protection of water resources.
➢ Program for the promotion of the grain production.
➢ A series of the planning for irrigation development.
   - From county level to national level.
➢ A series of the planning for the development of water saving irrigation.
➢ A series of the planning for the rehabilitation and modernization of the existed irrigation systems.
➢ A series of the planning for the improvement of the farmland.

Planning for an Individual System

We need to answer the questions:
--- How big should be the reservoir or other sources?
--- How much water can we take from a river?
--- How big should be the main canal, branches, laterals, ...?
--- How long should be the canals?
--- How high should be the water level in reservoir, main canal, branches, ...?
--- How should we save money and make more benefits?
--- How to protect the eco-environment in expected irrigation region?
--- What crops can be planted?
--- How to make the irrigation system to be operated friendly after the construction?
we need to answer the questions:

➢ How about the changing of the national population?
➢ How much food we need (At least)? And sometimes, we also need to know the distribution because the transportation is not easy (time & cost).
➢ How much water available? And how about the distributions both time and regions?
➢ Where are there arable lands?
➢ How to cope with water and land?
➢ How about the fund available?

Strategy 1: Research and Implementation of WSI

• In China, WSI refers to any measure leading to reducing irrigation water or increasing irrigation water productivity without distinct reduction in crop yields.

  – Reducing conveyance losses
  – Capturing return flow
  – AWDI for paddy
  – Non-full irrigation
  – Improving irrigation water management
  – Increasing application efficiency, etc.

Field Experiment

Improved Irrigation Practices
Four regional actions:

- Water saving and reducing groundwater use in North China Plain (IC card for tube-well pumping, remote control etc.)
- Water saving and increasing grain production in North-east China (increasing water sources, developing sprinkler and drip irrigation etc.)
- Water saving and increasing farmers income in North-west China (much more help from government, developing sprinkler and drip irrigation etc.)
- Water saving and reducing agricultural pollution in South of China (AWDI for paddy etc.)

Strategy 2: Modernization of Irrigation Systems

About $50 billion has been spent for the rehabilitation and modernization of the large & mid-sized irrigation systems recently, and this work has been almost finished.

➢ The large and mid-sized schemes claim top priority for the state investment.
   • The total irrigation area of large & mid-sized systems accounts for about 19% of total cultivated area in China, but the grain production from the area makes up more than 36% of national grain.
   • The large and mid-sized schemes use about 50% of the total water consumption in China.
➢ Hence, it is extremely important to improve the irrigation systems of large and mid-sized schemes both for water saving and food security.
Irrigation Water Used and Rice Product in Zhanghe Irrigation system

Strategy 3: Competing for the Investments
- The investment for irrigation development seems big, but it is still limited.
- Local governments have to compete the budget every year.
- The priority is given to those with bigger potential for increase of grain yields, wider adoption of WSI practices, more incentives for water savings, and better institutional management.

Strategy 4: Improving the Management
- To improve irrigation water management aiming to increasing irrigation efficiency, water productivity and income of farmers.
- To maximize the effects of irrigation systems and find incentives for farmers to protect the irrigation facilities and improve irrigation water management on-farm level.
- High-level policy support to provide incentives for research, dissemination of new technologies.

Development of WUA in China
- By now, over 83,000 WUAs were believed to exist in whole China, established under domestic programs.
- The WUAs involved over 60 million families, and are managing about 30% of the irrigation areas.
- The chairman of the WUA is elected by “one family, one vote,” monitors the agency’s work on behalf of farmers, organizes “collective action” for O&M of the on-farm irrigation systems and tanks.
- An irrigator appointed by the chairman measures the volume of “inflow” together with people from the agency and allocates water within the group.
- The water fee is paid directly to the irrigation agency and the farmers see what they pay and are happy to minimize water use.
Incentives for Farmers

- **Reducing water charge**
  - WUA provides an opportunity for wider water measurement and volumetric water charge, and farmers use water more carefully.
  - Demonstrations, training, and dissemination of the water-saving irrigation techniques become much easier within the organization of WUA.
  - Chairman of WUA organizes farmers to capture return flow, harvest rainfall water, control percolation losses.
  - Irrigation agency has more closed relationship with water users, water supply is based on water demand.

- **Increasing farmer’s income**
  - One WUA just needs one irrigator to take care all fields in the group. Then, farmers are able to work in cities or townships and get more benefits from other jobs.
  - Better irrigation service and increased investment from government and agency.
  - WUA ensures the equitable access to available supplies and reasonable water charge, and reduces water conflicts.

Summary

- In past 20 years, irrigation area increased by about 20%, the grain producing capacity increased by about 20%, without increasing irrigation water use.
- In past 20 years, about 25% of water savings from irrigation sector transferred to the eco-systems, and about 25% of those transferred to urban and industry.

Important issues remained:
- How to make policies, especially on investments, incentives of different aspects?
- How to cope with the food security and water scarcity?
- How to ensure the most cost-effective option of the tremendous investment?
Thanks!