Food and Agriculture Organization of the United Nations

Enhanced resilience of water drainage and irrigation system for disaster risk management in Shandong, China

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Summary

The rural land tenure became a family responsibility in Qilin township, with the need to renovate irrigation infrastructure becoming more urgent. This urgency was due to natural disasters such as water logging and drought which caused economic losses and threatened farmer's livelihoods. Major interventions as part of the Disaster Risk Management (DRM) plan for the township were undertaken, including the construction of a drainage culvert for improving the water logging situation.

The implementation of this practice helped to increase the community's resilience to floods, water logging and droughts by improving the community water drainage and irrigation infrastructures, as well as cleaning the canals. This improvement at the community level will reduce the economic losses of crop production, therefore contributing to sustainable livelihoods of farmers who engage in agriculture.

Description

The community-based irrigation and drainage infrastructures in the Qilin township were built in the period known as "collective", between 1956 and 1982. In 1982, the reform of rural land tenure changed from a collective production management system to a family responsibility. However, the existing infrastructures were not properly maintained or renovated, leaving field drainage canals, local bridges, culverts and gates, useless. Most branch canals and main field canals were not able to distribute water or draining out the logging and flooding waters during the rainy season due to blocks caused by sediment deposition that reduced the overall drainage capacity.

Damaged facilities and infrastructure in the irrigation systems have not been repaired in time due to insufficient funds, either from local governments or communities. Natural disasters such as water logging and drought often occur in the township, constraining the development of agriculture and causing economic losses when flood disasters happen, thus threatening farmer's livelihoods. To improve this situation, major interventions as part of the DRM plan for the township were undertaken, including

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the construction of a drainage culvert for improving the water logging situation in Liuxi and its neighbouring villages, and the dredging of irrigation and drainage canals in pilot villages.

1. Implementation of the technology

1.1 Construction of the drainage culvert and rehabilitation of drainage infrastructures

As an important component of Community-Based Disaster Risk Management (CBDRM), the Qilin township built a major drainage culvert of 1.5 m diameter and 100 m of length, and cleaned six field drainage canals (Figure 1) with a total length of 2 350 m, repairing six culverts and building four new culverts within the area. These activities were undertaken between May and July 2008. According to villagers, the improved water drainage system effectively worked in draining out rain water from fields in August 2008. There were no water loggings nor floods during the raining seasons of 2008 and 2009. The Qilin Township Government and County Agricultural Bureau and County Water Resource Bureau provided support for construction and rehabilitation activities.

1.2 The dredging of the irrigation and drainage canal in pilot villages

The village drainage canals built in the collective period were not well maintained due to a lack of collective funds since the rural land tenure reform in 1982. A baseline survey showed that most of village field canals were silted up with mud and grasses, dramatically reducing their water drainage capacity. In addition, individual farmers built check dams into field canals for transporting crops and straws from their field, completely blocking the canals.

To change this situation, villages dredged their field canals by hiring engineering machines and mobilizing the labours in farmer's cooperatives. The total length of the dredged irrigation and drainage canals in villages was about 9 500 m with a total soil volume of 18 530 m³. The field canal dredgings in Qianfengqiao, Liuxi and Nancao were completed in 2008. The increased drainage capacity of cleaned field canals significantly reduced the water logging time in the rainy seasons of 2008 and 2009. Village Committees and Farmer's Cooperatives (FC) in the villages played important roles in mobilizing labour inputs and individual contributions to clean the canals and repair the damaged field culverts and bridges.

2. Technical details

2.1 Field baseline survey

A water engineering specialist carried out field investigations on the existing irrigation system and drainage canals, identifying problems related to flood disasters and their causes. During the baseline survey, data and basic hydrologic information were gathered, which constituted the baseline data for designing and planning the activities in the field.

2.2 Designing and planning the drainage infrastructure construction projects

Based on findings during the survey on the irrigation and drainage infrastructures and lower resilience to the floods and water loggings, selected interventions were identified and prioritized through consultation with village leaders and villagers. The construction of the drainage culvert in the Liuying irrigation system and the improvement of drainage canals were identified as a top priority and implemented, followed by a technical

designing concept. The culvert drainage had a 1.5 m diameter, and the culvert length through dike was of 50 m with reinforced concrete. The culvert length in flooding plain of the Yunju River was of 50 m with strengthened concrete. The dredging parameters of the irrigation and drainage canal in the demonstration villages were designed according to the layout of the field canals and their sedimentation.

2.3 Construction and implementation of selected activities

The construction of the major drainage culvert was conducted by a selected construction team. Based on the design of the related water management projects, the team began the construction, and its quality was monitored and inspected by the water engineering specialist and the township water engineer.

2.4 Project management and maintenance

After the construction of the water infrastructure projects, all the irrigation and drainage facilities and infrastructures needed proper maintenance and management during the operating process. The appropriate operation and management of the drainage and irrigation canal system were the precondition for sustaining the drainage and irrigation functions. For the constructed drainage and irrigation system and dredged canals, systematic and regular maintenance and management mechanism and systematic operation will ensure long term contribution to reducing the losses of floods and water loggings.

3. Impacts and results

According to the Liuxi village leader and the Qinlin township governor, the culvert benefited about 6 000 mu of farmland for flood drainage, covering six villages (Liuxi, Liubei, Liunan, Mengdian, Dongyoufang and Xiyoufang), with a total population of 5 000.

The economic benefit of the culvert is significant, estimating 250 Yuan per mu (35 USD for every mu at the time of the project) of economic loss each year, for a total of 1.2 to 1.8 million Yuan for 6 000 mu.

4. Monitoring of the demonstration

The constructed water drainage projects and field canal cleaning projects were monitored and supervised by the water engineering specialist.

Monitoring the long-term impacts and benefits of these projects will be carried out by the county agricultural bureau and county water resource bureau.

5. Validation of the practice

This adaptation practice has been successfully tested in Juye in the context of the Strengthening Disaster Preparedness in the Agricultural Sector (TCP/CPR/3105).

6. Further reading

- Office of Technical Aid Project for Building Disaster Prevention and Control Capacity in Agriculture (OTAP for BDPCA). 2008. Summarizing Report on Water Conservancy Projects in Juye County, 2008.12.
- OTAP for BDPCA. Control of Waterlog and Drought and Restoration of Water Conservancy Projects in Qilin Town, Juye County. 2008.12.
- OTAP for BDPCA. Dredging of the Irrigation and drainage canals in Demonstration Villages. 2008.12.
- OTAP for BDPCA. Training material for irrigation management and canal system protection. 2008.12.

6.1 e-Resources

- Irrigation and Drainage Engineering.
- Plan and layout of the irrigation and drainage canal system.
- Technical guideline on Reparation and reconstruction of the irrigation and drainage projects in the flooding and water logging area. Link.

7. Agro-ecological zones

- Tropics, warm

8. Objectives fulfilled by the project

8.1 Pro-poor technology

Repairing and renovating irrigation infrastructure strengthen communities resilience to natural disasters and reduces their loss.