

# Primary Study on the Development of High Efficient Water-saving Irrigation in Farmland Irrigation Engineering

Yingjie Zhou

Faculty of Modern Agricultural Engineering, Kunming University of Science and Technology, Kunming 650500, China

**Abstract:** As an important infrastructure of agricultural production, farmland water conservancy projects play a vital role in improving crop yield, reducing agricultural production costs and promoting farmers' income. Under the background of increasingly scarce water resources, efficient water-saving irrigation is the inevitable trend of current farmland water conservancy projects, and it is also an important measure to ensure agricultural development and farmers get rich. Based on this, this paper first analyzes the types of efficient water-saving irrigation technologies of farmland water conservancy projects, and then discusses the development ideas of efficient water-saving irrigation of farmland water conservancy projects in combination with the actual development of China's agriculture, in order to provide reference for the development of related work.

**Key words:** farmland water conservancy project; High-efficiency water-saving irrigation; Development ideas

The traditional extensive irrigation method not only wastes a lot of water resources, but also causes problems such as soil salinization and groundwater level rise. In view of these problems, relevant technicians need to integrate high-efficiency water-saving irrigation as a core content into every link of farmland water conservancy projects, so as to make more reasonable use of water resources through precise control of irrigation water volume, and provide a solid foundation for sustainable agricultural development.

## I. Types of efficient water-saving irrigation technology for farmland water conservancy projects

### 1. Sprinkler irrigation technology

Sprinkler irrigation technology uses specially designed sprinkler heads to evenly spray irrigation water into the air, forming tiny water droplets that evenly moisten farmland like spring rain. This type of irrigation, in which water is sprayed into the field by the sprinkler head, has multiple application advantages. First, it has a remarkable water-saving effect. Sprinkler irrigation technology evenly sprays water into the field through the sprinkler head, which can accurately irrigation according to the needs of crops, avoid water loss and evaporation, and effectively save water resources. Secondly, it can improve crop yield. Sprinkler irrigation technology can provide uniform water supply for crops, promote the growth and development of crops, and improve crop yield and quality. Third, it is easy to operate. Sprinkler irrigation technology adopts automatic control, easy operation, can greatly improve the efficiency of irrigation. Fourth, strong adaptability. Sprinkler irrigation technology is suitable for farmland under various terrain and climate conditions, and can adapt to the growth needs of different crops. In agricultural development, sprinkler irrigation technology can be applied to various scenarios such as orchard irrigation, vegetable planting, cotton and other cash crops planting. Among them, the orchard planting area is large, and it needs sufficient water supply. Sprinkler irrigation technology can provide even water for the orchard, promote the growth and development of fruit trees, and improve the yield and quality of the orchard. Vegetables are more sensitive to water demand, and sprinkler irrigation technology can provide even water supply for vegetables, promote the growth and development of vegetables, and improve the yield and quality of vegetables. Cotton and other cash crops also have a large demand for water, and sprinkler irrigation technology can provide sufficient water supply for these crops and improve the yield and quality of crops.

### 2. Drip irrigation technology

Drip irrigation technology is a precision irrigation method that slowly and evenly drops water into the roots of crops so that they can better absorb water and nutrients, thereby improving crop yield and quality. Compared with the traditional irrigation method, drip irrigation technology has the advantages of water saving, energy saving, environmental protection and high efficiency, which can significantly reduce the cost of farmland irrigation, and also reduce water waste and land salinization and other problems. The investment cost is relatively low, and it is suitable for popularization and application in vast rural areas. In the irrigation and water conservancy project, the original channels, rivers and other water resources can be transformed, the drip irrigation system can be built, and the local climate conditions, soil types, crop types and other factors can be combined to formulate a reasonable irrigation scheme. By accurately controlling the amount and frequency of drip irrigation, it can provide the best growing environment for crops, achieve the goals of water saving, high yield and high quality, and promote the rational utilization of water resources and sustainable agricultural development.

### 3. Micro-irrigation technology

Micro-irrigation is a precise method of irrigation that ensures that crops receive the right amount of water throughout their growth cycle by delivering water directly to the roots of the crops. This technique utilizes different irrigation methods, such as drip irrigation and sprinkler irrigation, to achieve the best irrigation results with the smallest amount of water. In the field water conservancy project, the introduction of micro-irrigation technology has brought a series of advantages. First, it improves the efficiency of water utilization. By transporting water directly to the roots of the crops, it avoids evaporation and waste of water, making the efficiency of water use greatly improved. Secondly, micro-irrigation technology helps to maintain the structure of the soil. Traditional irrigation methods may lead to the destruction of soil structure, but micro-irrigation technology avoids this situation by controlling the amount of irrigation accurately. Finally, micro-irrigation

technology provides more adequate nutrients for crops. Because water is delivered directly to the roots of the crops, nutrients can be absorbed more efficiently, increasing the yield and quality of the crops.

#### 4. Water-saving technology for information-based irrigation

Information-based irrigation water-saving technology uses information technologies such as the Internet of Things, big data and cloud computing to realize real-time monitoring and control of the whole process of farmland irrigation. By arranging sensors in the field, relevant technicians can collect real-time soil moisture, weather and other information, and combine artificial intelligence algorithms to accurately regulate the irrigation water amount, achieve on-demand irrigation and timely irrigation, maximize irrigation efficiency and reduce water waste. Compared with traditional irrigation methods, information-based irrigation water-saving technology has the following advantages. First, it improves the efficiency of irrigation. Through the precise regulation of irrigation water, the waste of water resources in traditional irrigation is avoided, and the irrigation efficiency is improved. Secondly, the operation cost is reduced. Through the real-time monitoring and control of the whole process of irrigation, the manpower input is reduced and the operating cost is reduced. Thirdly, it improves crop yield. Through real-time monitoring of soil moisture, weather and other information, it provides the best environmental conditions for crop growth and improves crop yield. Finally, it promotes the modernization of agriculture. The application of information irrigation water-saving technology has provided a strong support for agricultural modernization and promoted the intelligent and refined development of agricultural production.

## II. The development of efficient water-saving irrigation of farmland water conservancy projects

### 1. Increase the popularization of water-saving irrigation technology

As the global water resources are increasingly stressed, how to use water resources efficiently and rationally has become a top priority. In this global water resources challenge, water-saving irrigation technology came into being. With its unique advantages, it has gradually become an important tool for agricultural production. However, in order to make this technology really effective, a series of measures need to be taken to increase the promotion. First, we need to strengthen policy guidance. The government, as the manager of the society, should actively play its guiding role by introducing relevant policies to encourage agricultural producers to adopt water-saving irrigation technology. For example, provide certain subsidies to farmers who use water-saving irrigation technology, or give preferential tax policies to stimulate their enthusiasm. Secondly, popular science education should be carried out. For example, through various channels, such as radio, television and Internet, the importance and advantages of water-saving irrigation technology should be popularized to the public, so that farmers can understand the operation mode of this technology, the application effect and how it will help them improve production efficiency; Organize relevant training courses and let technical personnel guide them on site to ensure that farmers can use water-saving irrigation technology correctly and effectively. Finally, we should attach importance to cooperative promotion. The government, enterprises, scientific research institutions and other multi-party cooperation, jointly promote water-saving irrigation technology. Among them, the government needs to provide policy support, enterprises are responsible for technology research and development and production, and scientific research institutions carry out technical research and experiments, forming a complete industrial chain. Through such cooperative promotion, resources can be shared, research duplication avoided and promotion efficiency improved.

### 2. Strengthening the application of modern science and technology

With the help of modern science and technology, limited water resources can be better managed and utilized, irrigation efficiency can be improved and sustainable agricultural development can be achieved. In today's era of increasingly tight water resources, efficient water-saving irrigation has become an important development direction of farmland water conservancy projects. Firstly, intelligent irrigation system should be actively introduced. The intelligent irrigation system automatically adjusts the irrigation amount according to the needs of plants and environmental changes to achieve the purpose of saving water. It can collect information such as soil moisture and meteorological data through sensors, and combine artificial intelligence algorithms to develop personalized irrigation schemes for each crop. Using such an irrigation method not only reduces the waste of water resources, but also improves the yield and quality of crops. Secondly, attention should be paid to the application of Internet of Things technology. The Internet of Things technology can connect farmland water conservancy projects to the Internet to achieve remote monitoring and management. Managers can keep abreast of the operation of irrigation systems through mobile phones or computers, and take immediate measures once they find anomalies; The automatic management of irrigation and water conservancy projects can be realized through the Internet of Things technology to further improve irrigation efficiency. Finally, it is necessary to strengthen the application of water-saving irrigation equipment. Water-saving irrigation equipment is an important tool to achieve efficient water-saving irrigation, such as drip irrigation, sprinkler irrigation and other equipment, which can spray irrigation water evenly on crops in the form of drops or water mist, thereby reducing the evaporation and loss of water. Using these advanced equipment can not only reduce the cost of irrigation, but also effectively save water resources.

### 3. Strengthen irrigation district planning

Along with the growth of population and the development of economy, the demand of water resources is increasing day by day, and its shortage has become the important restricting factor of China's economic development. In order to solve this problem, a series of measures should be taken to strengthen the planning of irrigation areas and promote the development of efficient water-saving irrigation of farmland water conservancy projects. Irrigation area planning is an important part of irrigation and water conservancy projects, its reasonableness or not directly affects the efficiency and water-saving effect of irrigation and water conservancy projects. In the planning of irrigation area, the relevant personnel should start from the distribution of water resources, the determination of water rights, the selection of irrigation

methods, etc., in order to achieve efficient water-saving irrigation as the goal. First of all, water resources should be distributed reasonably. For example, water resources should be rationally allocated according to the water needs of different crops and different growth stages to maximize the use of water resources. On the basis of considering the factors such as climate, terrain and soil in the irrigation area, the irrigation method should be adapted to local conditions. Secondly, water rights should be determined. In the planning of irrigation district, the water right of each water user should be clearly defined, including the amount of water, the quality of water, the time of water use, etc., through the restriction of water right, the rational utilization of water resources should be realized. Finally, we should choose the right irrigation method. Under the premise of ensuring the growth of crops, irrigation methods with good water-saving effect should be selected as far as possible, such as spray irrigation, drip irrigation and so on. At the same time, we should pay attention to the supporting construction of irrigation projects, lay the foundation for the application of advanced irrigation technology, and promote the further improvement of irrigation efficiency.

#### 4. Strengthening construction of demonstration projects

In the broad blueprint for agricultural development, farmland and water conservancy projects have always played a pivotal role. It bears the heavy responsibility of nourishing thousands of acres of fertile land, ensuring food security and promoting sustainable agricultural development. In this context, it is particularly important to strengthen the construction of demonstration projects and promote the development of efficient water-saving irrigation technology. Demonstration project, that is, through the successful practice in a specific area, the high-efficiency water-saving irrigation technology will be extended to a wider range of farmland. In terms of efficient water-saving irrigation technology, its core concept is to make full use of every drop of water resources to avoid waste, which includes the use of advanced irrigation equipment such as drip irrigation and spray irrigation, as well as the implementation of intelligent water resources management system for precision irrigation. Such projects can not only improve the efficiency of farmland water conservancy projects, but also reduce water resources consumption, protect the ecological environment, and provide farmers with better irrigation services. In the process of promoting the development of efficient and water-saving irrigation of farmland water conservancy projects, the construction of demonstration projects should be strengthened through the following measures. First, strengthen technical training and guidance, and enhance the water-saving consciousness and design ability of designers. Second, increase investment to encourage and guide social capital to participate in the construction of demonstration projects. Third, establish a sound operation and management mechanism to ensure the long-term and stable operation of the demonstration projects. Fourth, strengthen publicity and popularization, so that more farmers can understand and accept efficient water-saving irrigation technology.

## Epilogue

Efficient water-saving irrigation technology can maximize the utilization rate of irrigation water and reduce waste, which is of great significance to ensure sustainable development of agriculture in our country. Facing the double challenges of water resource shortage and agricultural modernization, developing and popularizing efficient water-saving irrigation technology has become the top priority of current farmland water conservancy projects. Relevant personnel should work together to increase the popularization of water-saving irrigation technology, strengthen the application of modern science and technology, irrigation area planning and demonstration project construction, in order to promote the development of high-efficiency water-saving irrigation of farmland water conservancy projects, and contribute to the sustainable development of agriculture in our country.

## References:

- [1] Di Wu. Application of high-efficiency water-saving irrigation technology in farmland water conservancy project in Mudan District, Heze, Shandong Province [J]. *Journal of Agricultural Engineering Technology*, 202, 42(35): 38+40.
- [2] Shaojie Feng. Analysis on the key points of design of high-efficiency water-saving irrigation engineering of farmland water conservancy [J]. *Control of Huai River*, 2022, (09): 90-91. (in Chinese)
- [3] Peng Han, Zhiyuan Zhang. Discussion on the development of efficient water-saving irrigation in farmland water conservancy project [J]. *Guide to Intelligent Agriculture*, 2022, 2(12): 83-85.
- [4] Qiang Pan. Research on construction and benefit of high-efficiency water-saving irrigation project of farmland water conservancy [J]. *Rural Science and Technology*, 2022, 13(07): 156-158. (in Chinese)