Research on Application Effect of Construction Technology in Agricultural Water Conservancy Project

Zhou Huan¹ *, Li Meng²

¹Guangxi Vocational College of Water Resources and Electric Power, GuangXi, NanNing, 530023, China
²XiJing University, Xi’an, 710123, China

*Corresponding author Email: zhou_huan@gxsdxy.cn

Abstract. In recent years, with the improvement of Chinese social productivity and the continuous development of science and technology, Chinese agricultural technology is constantly being reformed and developed. In this process, people are paying more and more attention to the development of agricultural science and technology. Development. Government departments have also invested a lot of talents, funds, technology and other aspects in agriculture, especially in the construction technology of farmland water conservancy projects, which has laid down a better and faster development for Chinese agriculture. Therefore, this article mainly analyses and discusses the construction technology of farmland water conservancy projects.

Key words. Agricultural water conservancy engineering, diversion technology, automatic irrigation technology, anti-seepage technology, water conservancy engineering construction.

1. Introduction

With the continuous economic development, Chinese farmland water conservancy engineering construction projects continue to increase and the scale continues to expand, especially in recent years, China has increased its investment in farmland water conservancy engineering construction, effectively promoting the development of the rural economy. Farmland water conservancy projects generally include drinking water projects, irrigation projects, reservoirs, drought relief projects, etc. Generally speaking, these farmland water conservancy projects effectively support agricultural production and development. The following is a specific analysis of the characteristics of farmland water conservancy projects: (1) The construction of farmland water conservancy projects is relatively small compared to large-scale water conservancy projects, but the area of construction design is relatively large, and the lines of construction projects are complicated. Because water conservancy projects serve agricultural production, they are the requirements for the construction period are relatively strict. Generally, the construction period is relatively short. (2) Farmland water conservancy projects have relatively high requirements for material storage during the construction process. Construction materials are required to be placed in an orderly manner to ensure smooth road traffic in the construction area of water conservancy projects, and cannot affect the normal traffic operation in rural areas. (3) During the construction of farmland water conservancy projects, certain land
ownership issues will be involved. Therefore, before the construction of farmland water conservancy projects starts, the corresponding demolition work and land rights issues must be done to effectively protect farmland [1]. The construction of water conservancy projects is proceeding smoothly.

2. **Diversion technology**
   In the construction of agricultural water conservancy projects, if we want to ensure the normal development of agricultural water conservancy projects, we must solve the two problems of water flow interception and diversion. Only when these two problems are properly resolved, will it not affect the main construction progress of agricultural water conservancy projects, and will even avoid serious safety accidents. In agricultural water conservancy projects, the diversion construction technology can be applied to solve the two problems of river closure and diversion [2]. First, the diversion construction technology not only has the characteristics of simple construction, but also has high feasibility and reliability. In the actual construction process of agricultural water conservancy projects, in order to ensure dry land construction, cofferdams will be constructed on the project site. At the same time, in order to ensure effective reduction of adverse effects on dry land construction, the diversion construction technology will ensure that the water flow in the cofferdam is effectively reduced. This technology greatly guarantees the smooth implementation of agricultural water conservancy projects.

2.1. **Cofferdam method**
   Cofferdam is the most common measure of diversion construction technology. Preparing rigorous and detailed plans and methods before the project starts, and at the same time using the construction of cofferdams for diversion construction, which not only effectively promotes the dredging and guidance of river water, but also provides for the smooth and orderly implementation of agricultural water projects. Of course, although the introduction of diversion projects can promote the progress of the project, safe operation is the primary issue that needs to be considered in the implementation of agricultural water conservancy projects. Therefore, the relevant construction planning must be perfected before the operation of the diversion project [3]. The construction of agricultural water conservancy projects must be strengthened during the dry season. Of course, we must also pay attention to the development of earthwork and concrete engineering. It is necessary to promote the smooth completion of dykes and diversion projects before the flood season, and to ensure that the construction management can be organized in an orderly manner. To provide guarantee for the smooth development of water conservancy projects.

2.2. **Open channel diversion technology**
   Open channel diversion measures are usually construction measures in the upstream and downstream of the operation foundation pit of agricultural water conservancy projects. The construction of cofferdam projects intercepts the water flow and directs the original river water downstream through the open channel. Diversion through open channels during the construction of water conservancy projects can reduce the blockage of upstream and downstream and promote the smooth flow of water.
   Open channel diversion is mostly suitable for areas where the terrain on both sides of the river is relatively flat or there are shallow shoals and drainage channels near the engineering site, which are conducive to the layout of open channels [4]. However, due to the large amount of diversion and drainage in open channels, it is necessary to adopt favourable factors such as corresponding drainage channels or superior terrain conditions during project operation to reduce the difficulty of operation.

2.3. **Culvert diversion technology**
   The culvert diversion measure is a diversion measure in the water conservancy project, through the construction of the upstream and downstream of the construction foundation pit, and the setting of water-retaining cofferdams to promote the previous river water to pass through the culvert and divert it. Most of these measures are used in the construction of smaller-scale stone dam projects, sluice
projects and other engineering projects. Compared with tunnel diversion, culverts involve a larger scope, are progressing faster, and are relatively easy to adjust. Similar to tunnel diversion, culvert diversion should be arranged as straight as possible, which will promote the smooth flow of water, avoid the appearance of silt, and reduce leakage.

3. **Automated irrigation technology**

The thesis combines advanced optimization scheduling decision-making software technology, irrigation area automation integrated data collection, database, geographic information system, network and communication, computer and control technology to form a highly reliable scientific management system.

3.1. **Basic functions**

Measure the important water levels in the canal system, the opening of the head gates of the main and branch canals, calculate the flow and count the water supply. Open and close the gate or start the pump-to-pump water according to the operation scheduling instruction. Statistics and generate real-time reports, daily reports, monthly reports, annual reports and fault reports. Create an irrigation area information database, which mainly includes a building database, a drainage river database, a canal database, an irrigation management database, and a management personnel database. It has the functions of querying, counting, and printing database related information, and can add, delete and modify related records in the database [5]. The creation of the geographic information system, combined with the database, displays the information of the irrigation area in vector graphics. The multimedia presentation explains the basic situation of the irrigation area. Use special application software irrigation experts to make decisions and optimize the scheduling system, generate irrigation system decision plans, and complete the irrigation process by the automatic measurement and control system.

3.2. **Design principle**

The automatic management of irrigation areas must first realize the informatization of the irrigation area. The informatization of the irrigation area is based on the database, the geographic information system is the information carrier, the optimal decision-making scheduling of the irrigation area is used as the means, and the automated measurement and control system is the tool to achieve scientific and informatized irrigation area scheduling. And the purpose of automation. The information collection and processing and application structure of the irrigation area are shown in Figure 1.

![Figure 1. Structure composition of automation information in irrigation area](image-url)
3.3. Principles of System Structure

The hardware composition of the irrigation area automation system: the management office LAN, which is composed of several central servers that control the operator terminal, the irrigation area leader management terminal, the office terminal, the multimedia demonstration terminal, and the external service terminal. The control centre machine uses an industrial control computer, which is the command centre of the automatic control system. The communication system is a combination of wired communication and wireless communication. It is convenient to lay cables in a short distance and adopt a wired method, while those in a longer distance adopt wireless communication [6]. The on-site measurement and control device of the gate or pumping station receives operation commands from the control centre to complete the action process of the gate or pumping station. The collected field data (water level, gate level, rainfall, flow and other irrigation operation data) are sent to the irrigation server of the irrigation area, which is the irrigation area Provide support and service for irrigation optimization scheduling decision. Various types of signal sensors. The system structure principle is shown in Figure 2.

![Figure 2. Structure diagram of automatic control system in irrigation area](image)

4. Ecological anti-seepage construction technology

Canal seepage prevention is one of the key measures to make full use of water resources to expand the irrigation area. Canal seepage prevention can reduce canal leakage loss by 50%-90% and increase canal water utilization coefficient by 0.2-0.4. Actively promoting canal seepage prevention is the main technical measure to reduce the loss of water delivery, and it is still the main direction for the development of water-saving irrigation in the construction of irrigation district reconstruction projects in the future [7]. At the same time, channels are an important part of the ecosystem of the irrigation
area. With the increasingly prominent water environment problems, the ecological role of channels in the prevention and control of water pollution and biodiversity protection has begun to attract attention. This paper mainly analyses the leakage effects of these 4 types of channels by measuring the flow velocity and the cross-section water area of the upstream and downstream sections of 4 different types of channels. The measured data of each channel section is shown in Table 1.

Table 1. Cross-section measurement data of various types of channels

| Channel type | I   | II  | III | IV  |
|--------------|-----|-----|-----|-----|
| Upstream flow rate/(m·s⁻¹) | 0.226 | 0.354 | 0.491 | 0.114 |
| Upstream cross-sectional area/m² | 3.026 | 3.826 | 1.466 | 2.415 |
| Downstream flow rate/(m·s⁻¹) | 0.217 | 0.342 | 0.425 | 0.171 |
| Downstream cross-sectional area/m² | 2.955 | 3.756 | 1.212 | 1.32 |
| Distance between upstream and downstream/m | 88 | 117 | 149 | 233 |
| Flow loss per unit length/(m³·s⁻¹)·km⁻¹ | 0.485 | 0.5097 | 1.374 | 0.213 |

Note: I represents the ecological channel with geomembrane anti-seepage at the bottom of the canal + dry block retaining wall; II represents the ecological channel with the canal bottom geomembrane anti-seepage + concrete combined with interlocking block slope protection; III represents the soil canal; IV represents the concrete channel.

It can be seen from the table that the maximum flow loss per unit length of earth canal (III) is 1.374 (m³/s)/km; the minimum flow loss per unit length of concrete canal (IV) is 0.213 (m³/s)/km; The flow loss per unit length of the two kinds of ecological anti-seepage channels, namely, the anti-seepage of the bottom geomembrane + dry block retaining wall (I) and the anti-seepage of the canal bottom + concrete combined with interlocking block slope protection (II), are 0.485 (m³/s)/km and 0.597 (m³/s)/km, which reduce the loss by 64.7% and 56.6% respectively compared with the earth canal.

Channels are the habitats of many animals and plants, especially after pesticides are applied in farmland, many creatures will inhabit the channels, such as frogs, toads, and insects. Therefore, the structure and form of a channel are particularly important to channel biodiversity [8]. In this paper, through regular investigation and identification of the types and distribution characteristics of the animals and plants per unit length inhabiting each channel, and comparing the types and numbers of species in each channel, the relationship between the channel seepage prevention form and the biodiversity in the channel is analysed. See Table 2 for the species and quantity of animals and plants per kilometre length of various types of channels.

Table 2. Biodiversity table of various types of channels per kilometre length

| Channel type | I   | II  | III | IV  |
|--------------|-----|-----|-----|-----|
| Plant species and quantity on channel slope | 5 | 8 | 24 | 0 |
| Type and quantity of small animals in the channel | 1 | 2 | 80 | 4 |

It can be seen from Table 2 that the types and numbers of plants per unit length of the soil canal (III) and the types and numbers of small animals are ranked first, mainly because the leakage of the soil canal is relatively large, so the vegetation on the slope of the canal grows It is relatively luxuriant, and there are also many types. Because it is an earthen canal, many plants grow in the canal, which attracts many small animals to inhabit and breed in the earthen canal. Concrete channel (IV) Because the slope and the bottom of the channel are all concrete anti-seepage, although the anti-seepage effect is very good, the slope has no plants; at the same time, there are few small animals in the channel, and the environment in the channel is not conducive to the habitat of small animals. And reproduction. Canal
bottom geomembrane anti-seepage + dry block retaining wall (I) and canal bottom geomembrane anti-seepage + concrete combined with interlocking block slope protection (II) Although there are not as many types of plants on the slope of the ecological anti-seepage channel as the soil canal, but it has grown a lot, and there are more small animals in the channel than in the concrete channel.

5. Conclusion
In summary, the construction of farmland water conservancy projects can provide a basic guarantee for the production and development of agriculture and the improvement of the rural economy. Therefore, it is of great practical significance to strengthen investment in the construction of farmland water conservancy projects. In the construction of farmland water conservancy projects in the future, it is necessary to scientifically carry out the construction technology management of farmland water conservancy projects, ensure the construction quality and construction period of farmland water conservancy projects, and continuously improve the construction management of farmland water conservancy projects to make farmland water conservancy projects better Rural economic development services. In addition, the relevant management personnel of farmland water conservancy projects should continue to strengthen their own management ability and level, strengthen their own business quality, improve their own management capabilities and management level, so as to better carry out the construction technology of farmland water conservancy projects Management work to improve the construction quality of farmland water conservancy projects.

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