

A General Survey of Qianjin Weir

Lingzhi Guo

Fuzhou Water Conservancy Bureau, Fuzhou 344000, Jiangxi, China

Abstract: *Qianjin Weir is located on the outskirts of Fuzhou City, Jiangxi Province. It is an ancient water conservancy project at the diversion junction of the Fu River and Ganggan River. Operating in coordination with the Zhongzhou Embankment Irrigation and Drainage Project, it forms a complete ancient water conservancy irrigation system and is known as “the Dujiangyan of Linchuan”. Having undergone construction and maintenance across the Tang, Song, Yuan, Ming dynasties and the Republic of China period, the existing weir structure remains from the large-scale renovation in the 4th year of the Tianqi reign of the Ming Dynasty (1624). Built with dry-stone masonry techniques, it still plays an important role after hundreds of years of vicissitudes. This paper systematically reviews Qianjin Weir from three perspectives: historical evolution, scientific and technological connotation and cultural inheritance, and explores its historical value, scientific and technological achievements as well as cultural significance as an ancient water conservancy project.*

Keywords: Qianjin Weir, Irrigation project, Water conservancy project, World Heritage Irrigation Structure, Fuzhou.

1. Overview of Qianjin Weir

On the outskirts of Fuzhou City, Jiangxi Province, known as the Hometown of Scholars, stands the ancient water conservancy project Qianjin Weir at the diversion confluence of the Fu River and Ganggan River. Centered on Qianjin Weir and supported by the Zhongzhou Embankment irrigation and drainage project, it forms a complete ancient water conservancy irrigation system, reputed as “the Dujiangyan of Linchuan”. The existing Qianjin Weir dates back to its last large-scale renovation in the 1620s. With a total length of 1.1 kilometers, a height of 6 to 7 meters and a top width ranging from 9 to 12 meters, it is constructed by dry-stone masonry technology. Having stood the test of hundreds of years, it still effectively regulates the river regime of the Fu River. The Zhongzhou Embankment irrigation and drainage project consists of embankments and culverts, internal irrigation-drainage canal systems, control facilities as well as regulating ponds and lakes. Encircled by the Fu River and Ganggan River, the Zhongzhou area serves as the core water diversion and irrigation zone of Qianjin Weir. Currently, the total length of the embankment reaches 30.4 kilometers with a top width of 6 to 8 meters and a height of 5 to 6 meters. The irrigated area within the embankment covers 24.14 square kilometers, among which the effective irrigation area is up to 22,000 mu.

The coordinated operation of Qianjin Weir and Zhongzhou Embankment has greatly boosted the sustained agricultural development in Fuzhou, and laid a solid water conservancy foundation for the prosperity of local society, economy and culture. To this day, the main relics of Qianjin Weir and the profound wisdom of ancient water conservancy embodied in it are well preserved. It continues to exert important values in history and culture, ecological landscape and water conservancy popular science, and was successfully inscribed on the list of World Heritage Irrigation Structures in 2019. This paper makes a systematic overview of Qianjin Weir from three aspects including historical evolution, scientific and technological connotation and cultural inheritance, so as to fully explore the profound heritage of this ancient water conservancy project.

2. Historical Evolution of Qianjin Weir

The history of Qianjin Weir dates back to the mid-Tang

Dynasty. At that time, local authorities repeatedly attempted to build water conservancy projects on the main stream of the Fu River. However, affected by the surging flood in spring and low water level in summer, coupled with inadequate maintenance, those projects were repeatedly constructed and destroyed.

Historical records show that Qianjin Weir was originally named Huapi Weir and first constructed in the Shangyuan reign period of Emperor Suzong of Tang (760 AD). Later, Yan Zhenqing, then magistrate of Fuzhou, continued its construction and renamed it Tucheng Weir. When Dai Shulun served as the prefectural governor of Fuzhou, he rebuilt it and changed its name to Lengquan Weir. In the ninth year of the Xiantong reign of Emperor Yizong of Tang (868 AD), Governor Li of Bohai rebuilt the project and officially named it Qianjin Weir [1].

According to *Records on the Newly-built Qianjin Weir* written by Bai Qianran in the Tang Dynasty, in 868 AD, Governor Li dug new water channels on the original site of Lengquan Weir to connect the waterway of the Fu River, stretching more than 970 zhang from Wenchang Bridge to the upper reach of Nanzhoupu. Meanwhile, he dredged farmland ditches, built over 20 branch canals and set up 5 weir sluices, establishing the irrigation and drainage system of Zhongzhou Embankment, which marked the initial formation of the complete water conservancy system of Qianjin Weir [1].

During the Song and Yuan dynasties, local officials and people renovated Qianjin Weir five times, and no records of Fu River embankment breaches were found in this period, proving sound daily maintenance. Nevertheless, from the late Yuan Dynasty to the early Ming Dynasty, due to insufficient official attention and poor maintenance, only two severe breaches and one minor breach were officially recorded, and the weir failed to get timely and effective reconstruction. The breach formed in the early Yuan Dynasty was not repaired until the Jiajing reign of the mid-Ming Dynasty, leading to the river course diversion of the Fu River for nearly 250 years. During this period, Ganggan River once became the main waterway of the Fu River, supporting local agricultural irrigation and water transportation.

As recorded in *Records on Reconstructing Qianjin Weir* by

Zhao Yizhe of the Song Dynasty: "The river surged eastward for years, and local people mainly used water wheels for irrigation; once the weir was damaged, people lost such water conservancy benefits." It indicates that water wheels were the major irrigation facility along Ganggan River at that time. Flowing past Yaohu and Kongjiadu, Ganggan River joins Dongxiang River at Xiaogongdu and finally flows west into the main course of the Fu River. Gradually, Kongjiadu, impacted by the eastward current of the Fu River, developed into an important local ferry and wharf.

The Ming Dynasty witnessed the finalized layout and structure of Qianjin Weir. In the fifth year of the Wanli reign (1577 AD), Prefect Gu Zhixian abandoned the perishable bamboo cage construction method and adopted red stone dry masonry to build the weir, laying the initial foundation of the stone-structured weir. In the fourth year of the Tianqi reign of the Ming Dynasty (1624 AD), Prefect Zhu Dadian drew on previous construction experience. He first drove pine wood foundation frames into the quicksand stratum for consolidation, then built the weir layer by layer with standardized tuff stones in an interlocking masonry method, extending the total length of the weir to over one thousand meters. The whole project took more than one year to finish, and the existing main relics of Qianjin Weir are exactly the remains of this large-scale renovation.

In the Republic of China period, preliminary regulation was carried out on Zhongzhou Embankment. In 1935, the Water Conservancy Committee of Linchuan County organized river embankment renovation works with a total length of 125 kilometers, benefiting about 200,000 mu of farmland indirectly, including 3.1 kilometers of Qianjin Weir embankment and nearly 30 kilometers of Zhongzhou Embankment. In 1958, the Jinlin Canal Irrigation District Project was officially launched, diverting water from Huwan Town of Jinxi County. Since then, Ganggan River was reconstructed into a main irrigation canal. Though Qianjin Weir no longer undertakes irrigation functions, it still plays an irreplaceable role in regulating river flow and stabilizing riverbed.

3. Scientific and Technological Connotation of Qianjin Weir

Qianjin Weir is the longest and largest gravity-structured ancient river regulation project in China, occupying a prominent position in the history of ancient hydraulic architecture. Constructed on the main stream of the Fu River right at flood-prone reaches with soft foundations, it posed enormous construction difficulties. The project once stretched up to three to five li in ancient times. The existing weir is 1.1 kilometers long, 9 to 12 meters wide and 6 to 7 meters high. It adopted timber-bound boulders in the Tang Dynasty, bamboo cage stone filling in the early Ming Dynasty, and was finally rebuilt into the present dry-laid stone structure in the late Ming Dynasty. Pine timber foundation frames were applied at the base of the existing weir to alleviate uneven settlement of the gravity dam body and ensure operational safety. Standardized tuff stones were used as masonry materials and laid in alternate header and stretcher bond to enhance the overall integrity and structural stability. Pine piles were arranged in a triangular layout at the weir toe to dissipate flow

energy, resist scouring and protect river banks and beaches. Water discharge notches were reserved on the weir to divert part of floodwater into Ganggan River during flood seasons.

Its flow diversion operation principle was summarized as restraining branch flow and rectifying main current as early as the 13th century. The branch flow refers to Ganggan River, a distributary formed by river course diversion, while the main current stands for the original mainstream of the Fu River. The weir guides the Fu River back to its original channel, ensuring normal water intake at water inlets on both banks in dry seasons to meet domestic water demand, agricultural irrigation and water transportation needs. In flood seasons, river water splits into two courses flowing through the main river and Ganggan River simultaneously, enabling the weir to perform flood diversion and safeguard Fuzhou city. In terms of structural design and operational mechanism, it shares great similarities with Dujiangyan Irrigation System, and was compared to the fish mouth dyke and golden dike of Dujiangyan in the Ming and Qing dynasties.

Similar to coastal seawalls, Qianjin Weir in the Ming Dynasty was built in strict accordance with ancient construction standards in terms of shape, materials and masonry techniques. The adopted tuff features high hardness and excellent anti-scouring performance. Quarried from Wushi Mountain, each standard stone was processed to specifications of 2-3 meters in length, 0.5 meters in width and 0.4 meters in thickness, weighing up to 300 kilograms apiece. In the 19th century, it was classified as a large-scale water conservancy project on a par with seawalls and Sangyuan Embankment.

The construction and sustainable operation of Zhongzhou Embankment benefited from official attention and joint management by government and local people. In ancient times, Qianjin Weir, Xiaoyi Port and main embankments were official projects funded and maintained by local governments, while branch canals and regulating ponds were managed autonomously by water users under official supervision. During his tenure in Fuzhou in the Tang Dynasty, Dai Shulun formulated water distribution regulations to standardize irrigation order and greatly promoted the development of irrigated agriculture. The whole management system realized the integration of rights, obligations and interests among all beneficiaries of public water conservancy projects. Project funds mainly came from private donations and government surplus fiscal revenue. In terms of labor recruitment, laborers were conscripted by authorities before the Wanli reign of the Ming Dynasty. During the Tianqi reign, prefect Zhu Dadian and county magistrate Zeng Lin contributed personal funds and adopted hired labor system with daily wages, which greatly improved construction efficiency.

4. Cultural Inheritance of Qianjin Weir

The irrigation project system consisting of Qianjin Weir and Zhongzhou Embankment is not merely a water conservancy facility, but also a vital carrier of regional culture. It is mainly embodied in water deity worship, a cultural bond uniting officials and common people. Shuihu Temple beside Qianjin Weir in the Ming Dynasty once served as a venue where local officials and civilians jointly offered sacrifices to water gods in ancient Fuzhou. Up to now, Kanggong Temple inside

Zhongzhou Embankment remains a sacrificial site. The annual parade ceremony of Lord Kanggong held on the 23rd day of the seventh lunar month has inherited people's admiration for Xie Lingyun, an ancient pioneer in water conservancy construction.

Records of Qianjin Embankment, officially compiled in the Ming Dynasty, is the earliest special local chronicle dedicated to farmland irrigation projects. Its compilation style and management system were referenced by later works such as *Records of Sangyuan Embankment* in the Qing Dynasty. Thirty genealogies of clans in Zhongzhou area, including *Genealogy of Ren Branch of Northern Zhou Clan* and *Genealogy of Xincun in Linghu*, have recorded in detail the development history of Qianjin Weir and the irrigated Zhongzhou area. In addition, place names such as Doumen Village and Linghu Xincun, together with the stone inscription stele dated to the 4th year of Tianqi reign in the Ming Dynasty, have jointly formed the local cultural landmarks.

The water transportation function of the project system boosted local economic and cultural prosperity. Convenient water traffic accelerated cultural enlightenment. Before the Tang Dynasty, due to inconvenient transportation, Fuzhou had no renowned figures and none of the 65 jinshi scholars in Jiangxi Province came from here. After the Song and Ming dynasties, with the construction of water conservancy projects including Qianjin Weir, Fuzhou grew into a prosperous region thriving in economy and culture, nurturing numerous celebrated figures such as Yan Shu, Wang Anshi, Zeng Gong, Lu Jiuyuan and Tang Xianzu. As stated in *Record of Reconstructing Qianjin Weir* written by Zhang Guangyue in the Ming Dynasty, before the completion of the stone weir, local literary talents were scarce; after its construction, scholars emerged in large numbers and successive generations achieved imperial examination success, fully reflecting the positive role of water conservancy development in promoting cultural progress.

5. Conclusion

As an ancient water conservancy project standing firm for over a thousand years, Qianjin Weir has witnessed the tortuous development and persistent efforts in water conservancy construction in Fuzhou across the Tang, Song, Yuan, Ming dynasties and the Republic of China era. Its scientific and technological connotations fully demonstrate the outstanding wisdom of ancient working people in hydraulic engineering. The structural evolution from timber-bound boulders to bamboo cage stone works and further to dry-laid stone masonry, as well as the flow regulation principle of restraining branch flow and rectifying main current and the joint official-civilian management system, all reflect the scientific rationality and practical value of ancient water conservancy technologies. Moreover, the water deity worship, clan memories and prosperous humanities carried by Qianjin Weir have elevated it beyond a mere functional project, turning it into an important symbol of regional cultural identity. Its inclusion in the World Heritage Irrigation Structure List in 2019 is not only international recognition of its profound historical value, but also brings new opportunities for its future protection, inheritance and

innovative development.

References

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