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Functions of Karez to Xinjiang Agriculture in the Qing Dynasty from the Perspective of Historical Documents

Danyang GONG

Department of Chinese Language and Literature, Northwest Minzu University, Lanzhou 730030, China

Abstract Desertification is increasingly serious in Xinjiang, and the construction of water conservancy is a precondition for the development of agriculture. The main project for the development of agriculture and water conservancy in Xinjiang is to build Karez, which played a vital role in the development of Xinjiang agriculture in the Qing Dynasty. It has been recorded many times in historical documents of the Qing Dynasty, such as *Lin Zexu's Diary*, *Tao Baolian's Diary*, *Xinjiang Atlas* and *Zuo Zongtang's Memorial to the Emperor*, etc., which recorded the situation and historical origin of Karez. Karez made a significant contribution to the development of agriculture in the Qing Dynasty. It increased the cultivated land in Xinjiang at that time, and increased the types and yields of crops. It is conducive to the stability and development of Xinjiang's economy. Until today, Karez is still an important water source for agricultural irrigation in Xinjiang.

Key words Karez, Historical documents in the Qing Dynasty, Xinjiang agriculture

1 Introduction

Xinjiang Uygur Autonomous Region is located at the intersection of Eastern and Western cultures, and has always been valued. According to records of historical documents, Xinjiang produced agricultural planting very early. However, due to Xinjiang's unique geographical environment, northern Xinjiang has always been dominated by animal husbandry. In the Han Dynasty, southern Xinjiang developed agriculture and animal husbandry, and it also maintained the agricultural tradition when it developed into the Qing Dynasty. From the perspective of geographical environment, Xinjiang is far away from the ocean, and has little precipitation and serious desertification. The Turpan area is also known as "Land of Fire" and "Bank of Wind". The climate is extremely dry, with an annual rainfall of only 16 mm and an evaporation of 3 000 mm. In such an environment, there is a demand for economic benefit analysis of irrigation. In different regions, Karez has different regional characteristics in terms of specific structure. However, in general, a complete Karez system includes four main components: shafts, underdrain (underground channels), open channels (surface channels) and dams (small storage tanks). Firstly, well heads are drilled on the ground from high to low to gather groundwater, then repair the underdrain at the bottom of the well, introduce the groundwater to the destination, and finally lead the water to the ground. This ensures that groundwater will not be evaporated or polluted by heat or sandstorms. The purpose of dam is to store water for human use.

2 Relevant records in historical documents in the Qing Dynasty

With the great construction of farmland water conservancy in the Qing Dynasty, the area of cultivated land increased significantly, which changed the original economic structure dominated by animal husbandry. During the construction of farmland water conservancy, Karez is the most characteristic water conservancy facili-

ty in Xinjiang. Lin Zexu of the Qing Dynasty was demoted to Yili during the Daoguang period of the Qing Dynasty. He wrote in his diary *He Ge Ji Cheng* on the way to Yili: he saw many earth pits along the way, asked the local people what they were called, and they replied "Kariz" with the function of drawing water for irrigation from south to north. The more water was drawn, the higher the water potential is, which was incredible! The land in this place was fertile and the cotton produced was very good. This was the function of "Kariz". The "Kariz" mentioned by Lin Zexu here is Karez. He not only briefly described Karez, but also praised his great role in irrigating crops.

When Tao Baolian, an officer in the Qing Dynasty passed through Turpan and Hami during the Guangxu period, when he saw Karez, he discussed the appearance and historical origin of Karez in his diary *Journey in the Year of Xinmou*: Looking far away on the way, there are all Karez, which are a long row of shafts dug by local people from the place where there is spring water on the mountain. Then the bottom layer between the shafts is dug into an underdrain, and the water flows out along the underdrain. There is a Karez a dozen steps away. He also said that at that time many people said that the Karez was Lin Zexu's pioneering work. He cited the records in the *Book of Han Dynasty* and *Wusun Biography*, indicating that it has been in the Western Regions for a long time.

At the end of the Qing Dynasty, there was a local chronicle book about Xinjiang, namely, *Xinjiang Atlas*, which described the Karez in a great detail. That is to say, at least during the Guangxu period of the Qing Dynasty, Karez in Xinjiang was very developed. Karez is mainly distributed in Barkol, Jimusa, Urumqi, Manas in northern Xinjiang, and Hami, Junshan, Turpan, Yuyue, Hotan, Shache, Shufu, Yingjisar, Pishan (Guma) and other places in southern Xinjiang. There are about 1 600 Karez in the four counties of Turpan, Junshan, Hami, and Toksun in the Turpan Basin. The annual water output is about 900 million m³, and the length of each Karez varies from less than 1 km to more than 5 km, usually 2 – 3 km. The longest Harabasman Canal is called the king of Karez. It is 75 km long and 2 m wide, and can irrigate up to 1 126 ha of farmland.

3 Functions of Karez to Xinjiang agriculture in the Qing Dynasty

3.1 Increasing the cultivated land in Xinjiang In the past, northern Xinjiang was dominated by animal husbandry, while southern Xinjiang had some oases, so it had developed agriculture and animal husbandry. In the Qing Dynasty, the government vigorously advocated and practiced farming, building water conservancy, turning barren land into fertile land, and the area of cultivated land increased significantly. This promoted the development of agricultural production and changed the original economic structure dominated by animal husbandry. To a certain extent, people's livelihood was stabilized, and at the same time, the fiscal revenue of the Qing government was increased.

The irrigation area of Karez is very large, especially the underdrain of Karez, the longest is more than 10 km, and the short is several kilometers. Only Karez in the Turpan Basin, according to the survey of geologists, has a total of more than 2 500 km of underdrain, which can effectively carry out agricultural irrigation and vigorously develop agriculture. Until now, Xinjiang mainly uses Karez for irrigation.

3.2 Increasing the variety and yield of crops According to the records in *Illustrations and Notes of Geography of the Western Regions*, there were ten kinds of food crops planted in the Uyghur area of southern Xinjiang in the early Qing Dynasty: grain, millet, sorghum, corn, wheat, barley, adzuki bean, mung bean, pea, flax, and perilla. Flax is an oil crop. In fact, there are only ten kinds of food crops. *Records of Xinjiang* stated that there were six kinds of "five grains" wheat, pea, millet, sorghum, barley, and rice in the Uyghur area of southern Xinjiang in the early Qing Dynasty. There are fewer types of crops. By the end of the Qing Dynasty, according to *Xinjiang Atlas*, the crop varieties included "millet, rice, beam, barley, wheat, highland barley, corn, buckwheat, potato, soybean, black bean, mung bean, broad bean, pea, lentil, hyacinth bean, etc. The variety of crops increased significantly. In addition, there are corn, flax, sesame and other oil crops, cotton, tea and so on.

There are also relevant records in the memorials to the emperor of the Qing Dynasty. For example, in the 22nd year of Qianlong's reign in the Qing Dynasty (1757), Huang Tinggui, governor of Shaanxi and Gansu, first proposed planting peas in northern Xinjiang, mainly considering that if livestock travelled long distances with a heavy load and did not feed on beans, they would start to get tired after a few stops. For another example, in the forty-seventh year of Qianlong's reign, General Mingliang of Yili gave a report to the emperor, saying that flax and rice had a good harvest, and flax was an oil crop.

According to the planting experience of the Qing Dynasty, the wheat planting at that time was based on the climate and land. It was located in places such as Kashi and Yarkand at the southern foot of Tianshan Mountain. The weather was warm and the land was fertile, which was suitable for planting autumn wheat. The snow at the northern foot of the Tianshan Mountains was thick and the weather was cold. The wheat planted in autumn would not grow in spring, so it was suitable for planting spring wheat. Therefore, Xinjiang is divided by the Tianshan Mountains. Most areas of the southern foot of the Tianshan Mountains are planted with cotton and autumn wheat, while the areas of northern foot of the Tianshan Mountains are planted with spring wheat, barley, sorghum, and peas. According to historical records, Turpan is loca-

ted at the southern foot of the Tianshan Mountains in Xinjiang, and it produces a large amount of cotton. If there was a good harvest, merchants in the Qing Dynasty would come to sell and buy. At that time, taxes had to be paid to the Qing government, and about two-thirds of the grain paid locally could be converted into cotton or cotton cloth for payment.

3.3 Being conducive to stabilizing and developing Xinjiang's economy Different from animal husbandry, the development of agriculture could rapidly stabilize the lives of people in Xinjiang in the Qing Dynasty. For example, in the middle and late Qing Dynasty, the invasion of southern Xinjiang by Kokand military officer Yaqub happened one after another. The war caused a large number of people to be displaced and the fields to be barren. After Xinjiang Province was established, the Qing government and local officials quickly organized manpower to recruit exiled people, restore agriculture, build water conservancy, and implement other rehabilitation works.

According to Zuo Zongtang's proposal in the Qing Dynasty, after Xinjiang was established as a province in 1884, 185 Karez and 657 km of water canals were newly built, which could irrigate 18 731 ha of farmland. The construction of these karez and canals quickly stabilized the war-torn Xinjiang and played a great role in restoring and developing production. This also promoted to another upsurge in the development of water conservancy in Xinjiang's multi-ethnic areas in Xinjiang at that time, which made the agricultural development and water conservancy in Xinjiang advance in giant strides during the Guangxu period of the Qing Dynasty.

To date, Karez is still an important water source for agricultural irrigation. In 2006, Karez Underground Water Conservancy Project was listed as a national key cultural relics protection unit by the State Council of China. In order to allow visitors to truly experience the historical changes and construction process of Karez, the Karez Museum in the Karez Folk Custom Park, located at No. 888, Ximen Village, Xincheng, Yaer Township, Turpan City, Xinjiang, was completed and opened in 2007. The museum is built on the basis of a Karez with a history of more than 800 years. Through a large number of pictures, physical objects and models, it shows the structure, distribution area, function and research findings of Karez to tourists in an easy-to-understand manner.

4 Conclusions

In summary, Karez, as the most characteristic water conservancy facility in Xinjiang, played a vital role in the development of Xinjiang agriculture in the Qing Dynasty. The situation of Karez has been recorded many times in historical documents of Qing Dynasty. To date, Karez is still an important source of water for agricultural irrigation in Xinjiang.

References

- [1] QI QS. Development of agricultural production in Xinjiang Uyghur area in Qing Dynasty[J]. Collections of Essays On Chinese Historical Geography, 1996(3): 174-193. (in Chinese).
- [2] QI QS. Development of agricultural productivity in Xinjiang in Qing Dynasty[J]. Journal of Northwestern Ethnic Studies, 1988(2): 261-275. (in Chinese).
- [3] LIU ZZ. Research on agricultural development of Xinjiang in Qing Dynasty[D]. Yangling: Northwest A&F University, 2016. (in Chinese).
- [4] HE YM. Ancient Chinese Agricultural Civilization[M]. Nanjing: Jiangsu People's Publishing House, 2018.09. (in Chinese).