The Qingyuan Mushroom Culture System as Agricultural Heritage

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Abstract: Qingyuan County, Zhejiang, China is recognized as a source of mushrooms around the world and as Mushroom City in China. Because of a favorable ecological environment and abundant forest resources, mushroom farmers in Qingyuan have engaged in mushroom production for 800 years and continued to form unique mushroom production systems where people and nature live in a harmonious way, and a rich and colorful mushroom culture. The Qingyuan Mushroom Culture System was named the Nationally Important Agricultural Heritage systems of China in 2014. Based on analysis of the importance of agricultural heritage and the necessity and urgency of protection, here we examine the agricultural heritage of the Qingyuan mushroom culture system as a research case study and comprehensively describe its heritage values, including supply materials and production, ecosystem services, cultural inheritance and multi-function agricultural development. These results provide reference values for agricultural heritage protection and inheritance of edible fungi in China, agricultural sustainable development and extension of agricultural function.

Key words: Qingyuan County; mushroom; value-analyzing; China-NIAHS

1 Introduction

Qingyuan County in Zhejiang Province, eastern China is one of the world’s earliest known places for the artificial cultivation of mushrooms. This county is known locally as The Origin of The World’s Mushrooms or Chinese Mushroom Town (Jiang and Huang 2002; Xie 2010). Some 800 years ago, Wu Sangong in Longyan Village in Qingyuan County invented the Mince Flower Method (also known as the Chop Flower Method) to grow mushrooms (Huang et al. 2014). Because of the favorable ecological environment and abundant forest resources, mushroom farmers in Qingyuan have engaged in mushroom production and continued to form unique mushroom production systems where people and nature live in harmony and have created a rich and colorful mushroom culture. In order to promote harmonious development between mushrooms and forests, Qingyuan County has protected the ecological environment and has been named the “county with the best ecological environment in China” (Zhu 2012).

With over-exploitation of forest resources and deterioration of ecological environments, traditional agricultural production modes have become important reference values (Zhou 2008). The Qingyuan Mushroom Culture System was named the Nationally Important Agricultural Heritage systems of China (China-NIAHS) in 2014. Heritage protection is an indicator of the civilization of a country and level of education, science and culture, and enhances its cultural identity and sense of pride, self-esteem and self-confidence (Liu 2011). With growing awareness of the importance of agricultural heritage values and protection domestically and internationally, understanding the agricultural heritage value of the Qingyuan mushroom cultural system is necessary in order for further development of the mushroom industry, effective protection of agricultural biodiversity and cultural diversity, sustainable development of the economy and society, and the construction of an ecological civilization in Qingyuan.

2 Overview of the site

The topography in Qingyuan County is middle mountain...
topography in southwestern Zhejiang, comprising valleys, basins, hills, low mountains, middle mountains and various geomorphologies; the terrain is tilted from the northeast to southwest. The climate is tropical monsoon, warm and humid, with four distinct seasons and mild winters, abundant rainfall and no extreme summer heat. A large temperature difference between day and night results in extremely favorable natural conditions for mushroom production. In the region’s vast forests, more than 2000 plant species grow, including 423 kinds of large-scale fungi resources and 360 kinds for edible (drug) use. Soil type in the area can be divided into four types, nine subgroups, 30 soil genus and 72 soil types. Soil at 800 meters above sea level and above is yellow soil and below this is red soil. Soil along the mountain ridges, slopes and flat alluvial lands of the middle and western low mountain plateau and other open areas is mostly paddy soil (Compiling Committee of Qingyuan County Annals 1996).

3 Heritage values and protection

3.1 The earliest example of mushroom cultivation

The site at Qingyuan is the world’s earliest known for the artificial cultivation of mushrooms. Wu Sangong (1130–1208), a Longyan villager in Bai Shanzu town in Qingyuan County, during the Southern Song Dynasty (1127–1279) invented the Mince Flower Method to cultivate mushrooms and this technique has been passed down through mushroom farmers over the last 800 years. The superiority of the Mince Flower Method is that it makes full use of ‘deadwood’ in remote mountains and forests, and has become a pioneer in making use of forest fungi products. In 1989, the chairman of the International Society of Tropical Fungus, Zhang Shuting, identified Qingyuan as the first region on earth to cultivate mushrooms and personally authored the Source of Mushroom plaque. Wu Sangong’s innovation is of global importance in the history of agricultural production both in China and internationally.

3.2 Livelihood

The mushroom industry became a source of livelihoods in Qingyuan 800 years ago, and mushroom farmers from the region have since traveled to over 200 cities and counties in 11 provinces across China (Qingyuan Tourism Bureau of Zhejiang Province 2008). The Qingyuan mushroom industry is widely recognized for its history, yield, market share and quality. In 2002, the Qingyuan mushroom gained “Products of Designations of Origin and Geographical Indications of the China” certification (Yao et al. 2011). Qingyuan sells to 20 large and medium cities and 200 counties in China, and exports have also increased significantly: 40% of Qingyuan mushrooms sold in the market are exported to over 60 countries including France, Japan, Germany and Southeast Asia (representing 60% of the transaction volume) (Ye and Wu 2006). Qingyuan is renowned as China’s Mushroom City and the industry has become a pillar of poverty alleviation in the area (Shen 1997).

3.3 The long history of mushroom culture

Mushroom farmers in Qingyuan have worked in the remote forest and mountains for generations, and have created a unique language and customs, a large number of mushroom-style ballads and proverbs, and stories of legendary figures to express the bitterness and joy of mushroom cultivation. These stories also reflect how mushroom farmers cultivate mushrooms, make a living and battle nature. It is clear that a unique mushroom agricultural culture exists here (Ji 2011) and spans art, ballads, play, language (mushroom mountain dialect), medical culture, legends, proverbs, couplets on the temples of the mushroom god, sports culture, marketing culture, incense standings, the temple fair of the mushroom god, food culture and religious culture. These elements also have a unique and brilliant role in broader Chinese culture.

3.4 The necessity and urgency to protect

The mushroom is at the root of Qingyuan culture. From the perspective of agricultural culture, the mushroom is not just a fungus crop, but has become a driver of culture, embodies or symbolizes the unique agricultural production systems in Qingyuan Mountain and communicates the full meaning of utilizing and transforming nature. From the perspective of livelihood security, the system provides local residents with mushrooms, bamboo shoots, mountainous vegetables and other products. The organic combination of different broad-leaved trees and coniferous trees in the system has formed a favorable forest ecosystem and maintained a relatively complete ecosystem structure with rich species diversity and habitat for animals.

Cultural inheritance is inseparable from its carrier, but due to competition in land use, changes in agriculture production and operation, forest resource conservation and rural labor immigration, the inheritance and protection of the Qingyuan mushroom cultural system faces several threats. Due to its difficulties and long processes, traditional mushroom agriculture techniques lack worthy successors. Influenced by loss of labor the number of mushroom farmers decreases each year and the resident population is aging. Younger generations do not want to live in remote mountainous areas and adopt heavy physical labor, meaning that traditional techniques are not very well-inherited. In addition, local traditional biological species are threatened by alien species, and agricultural biological genetic resources have suffered. The core point of agricultural heritage system protection is to protect the carrier and the corresponding culture and it is therefore urgent that we formulate and implement protection and development planning for the Qingyuan mushroom culture system.
4 Value-analyzing agricultural heritage

4.1 Substances and product production

4.1.1 Food and livelihood security

Qingyuan mushroom farmers make use of the biological principle that mushrooms coexist with forest under mutual benefits and have formed a series of edible mushrooms products without destroying forest resources. These products are the main sources of subsistence for mushroom farmers and important sources of income (Chen et al. 2008). The mushroom industry has played an important role for over 800 years, and mushroom production is an important source of rural household income; individual income resulting from mushrooms accounts for more than 50% of farmers’ annual net income. The mushroom industry has played an important role in the economic development of Qingyuan, and the industry associated with mushrooms totals nearly 2 billion CNY, more than half of the county’s GDP (Shen 1997).

4.1.2 The supply of raw materials

Mushrooms have become important raw materials for the pharmaceutical and healthcare industries. The main extract of mushroom is lentinan. The active polysaccharide gained from the active ingredient is extracted from the raw material of the mushroom fruit body by full extraction and concentration. It contains anti-tumor and reducing blood fat properties and is mainly used in medicine and health food. In recent years, scientists have discovered that a kind of β-glucosidase is contained in mushrooms and that this substance has a significant role in strengthening the human body against cancer (Yan 2013).

4.1.3 Human well-being

Qingyuan mushrooms have become precious delicacies because of their fresh, delicious, fragrant and unique flavor, and have become “the treasure dedicated to the Emperor”, “the king of dishes”, as well as a tribute to the palace since the Ming Dynasty Hongwu Period (1368-1398) (Jiang and Huang 2002). The natural environment in Qingyuan is especially suitable for growing mushrooms. Mushrooms growing north of Qingyuan are different from those in Qingyuan because the colder weather north makes the growth cycle longer and they grow much firmer, chewier and are less tasty. Mushrooms are rich in protein and contain a variety of sugars, minerals, vitamins and other substances beneficial to human health. Every 100 g of fresh mushrooms contain 12–14 g of protein, 59.3 g of carbohydrate, 124 mg of calcium, 415 mg of phosphorus, 25.3 mg of iron; mushrooms also contains polysaccharides, vitamin B1, vitamin B2 and vitamin C. Mushrooms are rich in dietary fiber, and regular consumption can reduce blood cholesterol and prevent atherosclerosis, stroke, heart disease, obesity and diabetes (Editorial Board of Jili Vegetables 2014). Mushrooms can also resist cold-like viruses as they contain an interferon inducer which induces the human body to produce interferon, interfering the synthesis of viral proteins, and means the virus is unable to reproduce (Lin 1997).

4.2 Ecosystem services

4.2.1 Genetic resources and biodiversity protection

Mushroom production systems where the mushroom and forest coexist harmoniously are the best sites to protect genetic resources and biodiversity (Yao et al. 1987). In the Qingyuan system there are 2005 kinds of seed plants, 1942 kinds of angiosperms, 236 kinds of ferns, 326 kinds of bryophytes, 423 kinds of macro fungi (360 kinds for medicinal use), 217 kinds of main crop varieties (including grass), and 39 kinds of livestock species.

4.2.2 Soil and water conservation

The Mince Flower Method adopts measures such as controlling the canopy density, maintaining weeds and twigs in the understory, and creating the necessary environment for mushrooms to grow. These measures help to prevent rainfall flushing through forest ecosystems and trap water. These measures increase soil humus and this aids soil and water conservation.

4.2.3 Climate regulation

Forests play an important role in carbon fixation, oxygen release and regulating climate. The shading effect of the forest canopy, as well as the transpiration effect when the forest grows is important in regulating the temperature, humidity, evaporation, transpiration and rainfall in the region. In addition, the forests maintained for mushroom production function in dust-retention and absorb exhaust gases.

4.2.4 Nutrient cycling

The Mince Flower Method requires that humidity be maintained at 70% to 90% by overshadowing. This increases the rate at which organic matter decays and is conducive to tree growth and accelerating biogeochemical cycles.

4.3 Cultural heritage

4.3.1 Social organization

In the first year of the Ming Dynasty, during the Hongwu Period (1368), Liu Bowen (Liu Ji) from Qingtian noted that there were less fields and more mountains, barren land and poor people in the Long, Qing and Jing counties. He pleaded with Emperor Zhu Yuanzhang to approve mushroom cultivation as a ‘patent’ for farmers in those counties, to which the Emperor agreed. After mushroom cultivation became an imperial patent, farmers gradually expanded mushroom production and the number of people cultivating mushrooms increased. In the Qianlong Period (1735–1796),...
during which the mushroom industry flourished, the number of mushroom farmers in Long, Qing and Jing counties rose to 150,000, with 90,000 in Qingyuan alone (Wu 2010). Mushroom farmers made a living in the remote mountains and forests in other provinces, and there were long distances between mushroom huts, remarkably decentralized. Since farmers were unfamiliar with their location, they faced many inconveniences during production, and gained little security in life and property. It was out of this situation that an organization protecting farmer interests evolved (Tian 2008).

The first mushroom farmer organization was the Zhejiang Mushroom Hall (also known as Zhejiang Hall) established in the 22nd year in Jian’ou County, Fujian Province in the Guangxu Period of the Qing Dynasty (1896). Mushroom farmers associations in Qing, Long and Jing counties were also established: Zhejiang Association, Zhejiang Hall, Mushroom Peasants Associations were established in Fujian, Jiangxi, Anhui and Guangxi, covering 100 counties (cities) and coordinating matters and protecting mushroom farmers’ rights (Huang et al. 2014). Mushroom peasants working in the remote forested mountains for generations have created unique technology, language and customs. Meanwhile, mushroom farmers working outside have made positive contributions to the development of the mushroom industry, as well as promoting economic prosperity and social progress in mushroom production regions.

4.3.2 Spiritual beliefs
Mushroom farmers in Qingyuan have made a living from mushroom cultivation since the Southern Song Dynasty, and have travelled to other provinces to cultivate mushrooms from every lunar October to March; this tradition has passed from one generation to another for thousands of years (Wu 2005). Mushroom farmers believed in the human-planted mushroom ancestor Wu Sangong and considered him the God of Mushrooms. Temples have been constructed in his honor and to give thanks to this mushroom ancestor. Where farmers gathered there were mushroom temples. The earliest Mushroom God Temple in Xiyang Village, Qingyuan County was the Spirit Displaying Temple (currently the Western Hall) built in the first year of the Xianchun Period (1265) in the Song Dynasty (960–1279). Mushroom peasants hold a temple fair to pay contribution to the Mushroom God from every lunar July sixteenth to nineteenth (Yu 1995), and during this period technical exchanges, contact with mushroom farmers, acting and playing, celebrating the harvest, martial arts and meeting relatives and friends have become indispensable activities in the temple fair (Tian 2008). The temple fair has not only reflected politics, business, culture and sports activities, but is an important symbol of formation and development of a variety of mushroom cultures. In 2007, the mushroom temple fair declared by Qingyuan County was listed in the second batch of intangible cultural heritage within Zhejiang Province.

4.3.3 Collective memory heritage
The local dialects in Qingyuan County belong to the Wu dialect system; only dialects in a few natural villages such as Jiang Gen belong to the sub-dialects system of northern Fujian Province. Mushroom peasants usually use a local dialect when in their hometown, but after going out to mushroom mountains they speak ‘mushroom mountain dialect’ (Gan 2012) in order to safeguard the interests of peers. The mushroom mountain dialect is commonly used among mushroom farmers between Longquan and Jingning County, by which they make mutual interactions and communication with each other. Mushroom mountain dialect is based on the local dialect, and the language, vocabulary and grammar are the same as the local dialect but with several differences. Main differences include changes in parts of speech and even the locals have difficulty in understanding this dialect. Nevertheless, the mushroom mountain dialect is not any branch of local dialect but belongs to the mushroom industry secret society. Given the difficulties of mushroom production and role of superstition in mushroom farmers’ lives, they always put bad and good harvests and their safety in the hands of gods, and therefore taboo exists in the dialect. Taking into account the security and confidentiality of mushroom production technology and the security of usual activities, they have created a relatively complete mushroom mountain dialect.

4.3.4 Social harmony
After the invention of a series of mushroom production and processing technologies such as the Mince Flower Method, Mushroom Technique and Baking Technique, mushrooms have initiated the history and benefited people (Liu and Hu 2011). The mushroom industry has become a traditional industry for Qingyuan people to survive and development. As Wu Kedian succeeded in researching human-planted mushroom techniques on exposed land, the mushroom industry was ushered into a new age (Wu and Chen 2002). At that time, Qingyuan established the country’s largest mushroom market and became the country’s largest mushroom collection and distribution center. The edible mushroom industrial chain in Qingyuan County has continued to extend, and displayed a regional system with stable annual output and is the primary market. The county has also formed edible mushroom processing enterprise clusters of certain scales and an industrial chain from low to high with multi-level product structure.

4.4 Development of multifunctional agriculture
4.4.1 Employment and income
The mushroom industry is a pillar industry in Qingyuan and has played an important role in employment, poverty alleviation and prosperity. Mushroom cultivation cannot rely on mechanization and the purchase, transport, sales and processing involved in mushroom cultivation provides
job opportunities for a rural surplus labor force. Currently, the number of people in Qingyuan County engaged in the edible mushroom and related industries is approximately 70,000, accounting for 54% of the total rural labor force (Hu 2011). The output value of edible mushrooms surpassed 100 million CNY in successive years, amounting to 460 million CNY in 2012; to some extent the edible mushroom industry has become an important part of the national economy (Wang 2014). The mushroom industry provides jobs and is also an important source of income, accounting for a large proportion of farmers’ income (Jiang and Huang 2002).

4.4.2 Leisure agriculture

Favorable ecological environments, a rich mushroom culture and healthy ecological agricultural products have enabled Qingyuan County to create a charming area and develop rural leisure agriculture through scientific planning and resource integration. For instance, the Huangtang Tourism and Leisure Resort currently under construction will occupy 5500 acres of the Huangtang modern agriculture base (water and dried fruit), be combined with nearby pleasant ecological environments, dense forests and three-level waterfall landscape in the Pan Longwan Region, and form a resort integrating picking, tasting, sightseeing, science education and leisure experiences (Wu 2010).

4.4.3 Ecological security

Qingyuan County is one of 17 key regions for biodiversity protection worldwide, and an important part of the mountainous area of the common boundary of Zhejiang, Fujian and Jiangxi provinces. The region is one of the key areas for the implementation of the China Biodiversity Conservation Action Plan, abundant in ecosystems with obvious vertical bands and natural succession series (Chen et al. 2009). One of the important functions of the Qingyuan mushroom culture system is the protection of the local ecological environment and traditional mushroom varieties, maintaining forest and agricultural biodiversity and protecting regional ecological security.

4.4.4 Scientific value

The Qingyuan mushroom production system is a natural laboratory. The Mince Flower Method is an important and unique mushroom production and operation mode, and has important research values in nutrition, medicine, ecology, botany, environmental science, forest resources and historical geography (Zhen 2011). Since the invention of human-planted mushrooms by Wu Sangong, generations have witnessed the development of technology of mushroom cultivation and the technology has become widely used and more mature. In 1979, Qingyuan County constructed a mushroom research center, specializing in mushroom-based domestication and artificial breeding, yielding cultivation, development of new resources, pest control, and research and promotion into deep-processing product technology. The center has successively undertaken a national research project, five National Level Spark Projects, 27 provincial-level research projects, winning a second prize National Scientific and Technological Progress Awards, seven second prize Provincial Science and Technology Progress Awards, four third prizes, eight first prizes at the city department level, and gained 15 scientific and technological achievements at a domestic advanced research level. The center has bred 241-4 independently, Qingyuan 9015, Qingke 20 and other mushrooms varieties.

4.5 Strategic significance

With the development of ecological civilization, the conflict that farmers have between depending on forests for food and ecological protection has become critical. Qingyuan County has always focused on harmonious development of mushrooms and forests, without curbing development of forests as mushroom cultivation areas and without relaxing restrictions on forest management. While the mushroom industry has rapidly developed, the ecological environment has had effective protection and development in Qingyuan County. In 2005, Qingyuan County was named “the county with the best ecological environment in China”, with forest cover of 86%.

As the most promising variety in Qingyuan County, mushrooms plays an important role in expanding the economic development of mountainous areas, fostering a “high-quality, efficient, ecological, safe” new industry to prosper the forestry and enrich farmers. The processing industry and leisure agriculture based on mushrooms have become a highlight of ecological civilization construction. Full use of the mushroom industry and related industries is important for mountain farmers’ economic growth (Chen et al. 2008), mountainous ecology, environmental protection and the economy and society.

Mushroom culture systems are also of great importance to sustainable agricultural development. Taking cultivation and processing industries of mushrooms and maitake as the leading industries and strengthening ecological protection and base construction can realize the comprehensive and sustainable development of the mushroom industry in Qingyuan. Measures to protect the Qingyuan mushrooms cultural system in a systematic way will protect the traditional Mince Flower Method and other techniques, form an excellent germplasm resource of mushrooms, promote the development of leisure agriculture and foster comprehensive development in a harmonious way.

5 Conclusion

The Qingyuan mushroom culture system is an agriculture heritage system comprising sustainable forest management, under-forest industry development, mushroom cultivation and process and utilization technology, mushroom culture and local traditions. Mushrooms were first cultivated in this region of eastern China 800 years ago and the industry is
deeply interconnected with agricultural culture based on mushroom production, social organization, the division of labor, and all levels of local society and culture. This system has important scientific value and practical significance for China’s agricultural and cultural heritage, the sustainable development of agriculture and agro-functional development.

References


Gan C F. 2012. All aspects of mushrooms. Mushroom Research Institute in Qingyuan County. (in Chinese)


