

# The Research into the World Heritage Value and Tourism Development of Dike-Pond Agriculture in the Pearl River Delta

Shenghui Guo

**Abstract** The Dike-Pond agriculture is a traditional agriculture model developing in the Pearl River Delta of China. 600 years ago, people in the Pearl River Delta dug the low-lying field into a pond, accumulated the clay around as its dike, raised fishes in the pond, and planted mulberry, fruits or vegetables on the bank, so a variety of farming models such as Mulberry, fruits or vegetables-dike-fish-pond came into being. Of these, the parts and function of Mulberry-Dike-Fish-Pond are the most special. Virtuous circles, with “Flourishing mulberry-Robust silkworm-Big fish-Fertilized field,” consist of raising fishes in the ponds, planting mulberry on the bank, raising silkworm with mulberry, feeding fishes with silkworm dropping, fertilizing the mulberry with pond clays, which made great contributions to the economical development of the Pearl River Delta and even the whole China and was called “Rare scenery in the world and the model of virtuous circles” by the United Nations Educational, Scientific, and Cultural Organization. With the change of economical system and update of agriculture, nowadays the Dike-Pond agriculture declines and is in the danger of disappearing. Several years ago, FAO and other international organizations set up the project of “Globally Important Agricultural Heritage Systems” to develop and protect traditional agriculture in new perspective. Referring to the explanation to the standard of the World Agricultural and Cultural Heritage Systems by FAO, the author finds the world heritage value of the Dike-Pond agriculture quite distinct: its rich diversity in production, biology and culture, the harmonious relationship between human and nature, the coordinated development of human and society, the common thought about Circular Economy and ecological civilization, promoting the local sustainable development. Tourism development is also an important way of transmitting and developing the agricultural culture of the Dike-Pond agriculture so it is necessary to develop agricultural culture tourism by building up museums, agriculture bases, synthetic ecotourism areas and taking other measures.

---

S. Guo (✉)  
Guangzhou Panyu Polytechnic, Guangzhou, China  
e-mail: guosh@gzpyp.edu.cn

**Keywords** Dike-pond agriculture • The world agricultural heritage • Tourism development • The Pearl River Delta • Mulberry-dike-fish-pond

## 1 Introduction

The Dike-pond agriculture is the most typical traditional agricultural production mode in Pearl River Delta region. With a long history and sound combined effect, it is the wonderful mode of the ancient ecological culture in our country (Zhong et al. 1987). In Ming Dynasty and Qing Dynasty, quite a few local documents introduced and recorded the Dike-pond agriculture, which appeared in Pearl River Delta and had been prevalent there for several hundred years. As it made great contribution to the economic boom and social progress of the local place, it is praised by the UNESCO as the “beautiful place and paragon of virtuous cycle rarely found on the earth.” In addition, it is promoted and applied internationally. Hence, it is praised by society widely and attracts widespread attention of the academic world (Ruddle and Zhong 1988; Korn 1996; Lu 2005; Wong 1999). The academic research on mulberry-dike-fish-pond started in the 1950s (Zhong 1958). In the 1980s, Guangzhou Institute of Geography researched the interaction between the dike-pond system as well as land and water systematically with locating and semi-locating observation methods (Zhong et al. 1993). This started the climax of research on the Dike-pond agriculture. Afterward, a large volume of writings researched the relations between ecological structure of the dike-pond agriculture on the one hand and material cycle, the process and causes of vicissitude, combined effect, and geological environment on the other hand as well as the promotion and application at home and abroad, etc. The writings were from the perspectives of geography, ecology, history, sociology, agriculture, etc. This provides theoretical guidance for the development of the Dike-pond agriculture and inheriting of the Dike-pond culture. However, since the beginning of twenty-first century, especially in recent years, with the decline of the dike-pond agriculture in Pearl River Delta as well as the transformation of social economy, corresponding academic research has been decreasing drastically. The existing research is mainly limited to such aspects as the current situation and treatment of dike-pond, reconstruction and regulation and control of ecology, spatial pattern and evolution (Zhang 1994; Yang 1995; Li et al. 2005). Many relevant new conditions and new issues, however, are not researched in time and in depth.

The dike-pond agriculture in Pearl River Delta is both a special production mode and the precious cultural heritage of mankind. In 2002, Food and Agriculture Organization and Global Environmental Facility and other international organizations launched and set up together the “Globally Important Agricultural Heritage Systems” program, which can also be called Global Agricultural Heritage. It has provided a new idea for development and protection of global traditional agricultural mode and has received positive response from many countries and regions (Jeffrey 2003; Karo et al. 2006; Min 2006). Currently,

more than 10 programs in the world, including the rice-fish farming system in Qingtian County, Zhejiang Province and terraced field system in Hani, Yunnan Province in our country, have successfully been declared global agricultural heritage (Su 1987). But as the excellent paragon of the traditional agricultural mode in our country, the dike-pond agriculture in Pearl River Delta, which has been praised highly by UNESCO, has not applied for recognition as a global agricultural heritage up to now. Achievements of research on the Dike-pond agriculture from the perspective of the cultural heritage are rare.

Some new disciplines such as tourism management have touched upon the research on heritage protection and tourism development of the Dike-pond agriculture (Han et al. 2008; Guo 2009), but most are superficial and only researchers put forward certain points or certain ideas without expanding the research. Some may just talk in generalities with less pertinence and practicality. Particularly, systematic research in depth on the value of agricultural heritage, and current situation of tourism development and solutions is lacked. Like many other things, lack of theoretical research will certainly confine the development of practice. At present, although the development practice of the Dike-pond agriculture tourism in Pearl River Delta region has made some progress and has gained some actual effects, there are still many difficulties and problems. With low level and small scale, the tourism development is still at the primary stage, which does not match its unique historical status and tourism value (Guo 2009). Research on related theories needs more efforts urgently.

Therefore, on the basis of summarizing and reviewing the development and evolution process of the Dike-pond agriculture in Pearl River Delta, this paper purports to analyze in details the global cultural heritage value, meanings of tourism development and current situation and problems of tourism development. Then the paper will put forward corresponding solutions and advice. It expects to offer scientific basis for the dike-pond agriculture in Pearl River Delta applying for recognition as world cultural heritage, inheriting of the Dike-pond ecological culture, and development of dike-pond agricultural and cultural tourism. This will push forward the scientific transformation and reasonable rebirth of the Dike-pond agriculture under new social and economic conditions.

## **2 Dike-Pond Agriculture in Pearl River Delta and Its Development and Evolution**

### ***2.1 Dike-Pond Agriculture in Pearl River Delta***

Pearl River Delta region is situated in the south part of Guangdong Province, China. It is formed by alleviation of three major rivers, Xijiang River, Beijiang River, and Dongjiang River. In the area, there is a dense river network. It has low and flat topography, having many places with elevation lower than 1 m. As a result, it has poor drainage and too much water frequently leads to flooding (Qu 1985). The region has tropical and subtropical monsoon climate with sufficient

rain in concentrated monsoon. And thunderstorm occurs frequently. In times of rainstorm, the flooding water in the river results in disasters, vast farmland being flooded. Additionally, the influence of the sea tide worsens the flood, which goes against agricultural production, especially the traditional cultivation mode of crops. Under the circumstances, after long period of exploration by people in Pearl River Delta, the low-lying land which frequently has flood is dug to form the pond. The mud is piled around the pond, forming the dike. People breed fish in the pond and cultivate fruit trees or other crops on the dike. Thus, the famous dike-pond agricultural production mode is created.

According to the varieties of the crops cultivated on the dike, the Dike-pond agriculture can be classified into many different types. If fruit trees are planted on the dike, then it is called fruit tree-dike-fish-pond. If vegetables are cultivated on the dike, then it is called vegetable-dike-fish-pond. If there are flowers on the dike, then it is called flower-dike-fish-pond. If mulberries are cultivated on the dike, then it is called mulberry-dike-fish-pond. Among different kinds of dike-fish-ponds above, the mulberry-dike-fish-pond has the largest scale in history, best combined benefits and highest popularity. Therefore, the mulberry-dike-fish-pond has been synonymous with the dike-pond agriculture in Pearl River Delta.

As with mulberry-dike-fish-pond, people plant mulberry on the dike and breed fish in the pond. The waste of fish and pond silt are the fertilizer for mulberries. The mulberry leaves are used to breed silkworm whose cocoon is collected to produce silk, while the waste of silkworm and waste silk water are poured into pond as fish feed. Thus, a virtuous cycle of “exuberating mulberry leaves—strong silkworm—fat fish, fertile pond silt—good growth of mulberries—high quality of cocoon” and the unique agricultural production mode which combines farming and breeding together comes into being (Fig. 1).

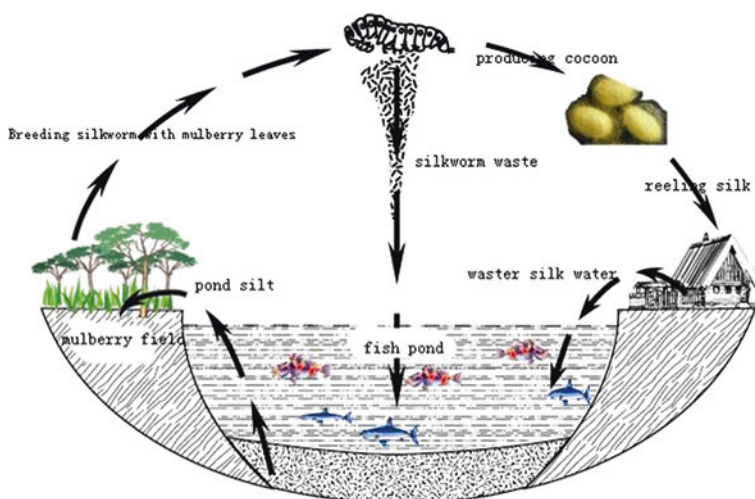


Fig. 1 Schematic diagram of the production cycle of mulberry-dike-fish-pond

## 2.2 *Development and Prime of Mulberry-Dike-Fish-Pond*

The earliest dike-pond in Pearl River Delta is fruit tree-dike-fish-pond, which appeared in Jiujiang in Nanhai, Gulao in Heshan, and Longjiang and Longshan in Shunde in about the middle or late period of fourteenth century. The fruit trees like longan and lychee were main crops on the dike. The reason was that the fruit trees could protect the dike, decrease the influence of flood, and generate more profits than rice. Therefore, in fifteenth century and sixteenth century, fruit tree-dike-fish-pond developed in large scale and expanded eastward to Chencun, etc. At that time, “most dikes and dams are covered with lychee and longan...” in Pearl River Delta. Now there are many place names such as “Longan Dike” and “Lychee Village,” etc. This proves the prosperity of the ancient fruit tree-dike-fish-pond in local place.

In the middle and late sixteenth century, with the rise of silk industry in Guangzhou and Foshan etc., people found that breeding silkworm could generate far more profits than cultivating fruit trees could. The mulberries grew fast, while the production cycle of the silkworm was short and within a year it could produce seven or eight times. Besides, planting mulberries and breeding silkworms together with breeding fish in pond could formulate a virtuous cycle and they could promote each other. Thus, people cut down the fruit trees and planted mulberries on the dike. Then the mulberry-dike-fish-pond replaced the fruit tree-dike-fish-pond and became the main mode of the Dike-pond agriculture in Pearl River Delta.

Afterward, with the development of the world commodity economy, the raw silk of Guangdong gradually had brick sales in the world market and the output and price increased continuously. So people had more enthusiasm for planting mulberries and breeding silkworms. The area of mulberry-dike-fish-pond expanded greatly. Jiujiang in Nanhai and Longjiang and Longshan in Shunde became the professional sericulture production base. In Shuiteng and Xingtang of Shunde, “half of the villagers planted mulberries” and the pomp that “all the women take sericulture as a profession” appeared (Qu 1985). The mulberry-dike-fish-pond in Pearl River Delta experienced three development climaxes.

After the First World War and before the world economic crisis in 1929, mulberry-dike-fish-pond entered its heyday of historical development. After the war, the price of raw silk increased every year. The profits of sericulture and fishery in pond were several times or even one dozen times of those generated by grains. Hence, the extreme phenomena of “stopping growing rice to plant mulberries” and “turning farmland to pond” appeared. The mulberry-dike-fish-pond gained unprecedented popularity. According to historical records, the total area of mulberry-dike-fish-pond in Pearl River Delta amounted to  $13.5 \times 10^4$  hm<sup>2</sup>, reaching the highest level in history (Zhong et al. 1987). Its range expanded from Shunde and Nanhai to surrounding areas. It started from Guangzhou-Sanshui railway in the north and reached Shiyi of Zhongshan. In the west, it covered the trunk stream of Xijiang River and included Panyu and Dongguan in the east. In southwest, the range extended to Jiangmen and Xinhui. A huge mulberry-dike-fish-pond distribution area with Shunde as its center was formed (Fig. 2) (Zhong et al. 1993).



Fig. 2 Regional distribution of mulberry-dike-fish-pond in Zhujiang Delta in heyday

### 2.3 Decline and Function Transition of Dike-Pond Agriculture

After the world economic crisis in 1929, the mulberry-dike-fish-pond in Pearl River Delta declined rapidly. Due to economic crisis, the international market demand for raw silk fell drastically and the raw silk encountered poor sales. The reeling mills closed down one after another. In 1926, there were 202 reeling mills in Pearl River Delta, while in 1931 the number was decreased to 111 and in 1934 only 37 mills existed. Consequently, the area of mulberry land decreased. In 1935, the land in Shunde and Nanhai decreased by 50 % and in Zhongshan more than 90 % (Huang 1989). After 1938, because of the invasion of Japanese troops, the mulberry-dike-fish-pond in Pearl River Delta suffered further destruction. By 1949, the existing total area was only  $1.2 \times 10^4$  hm<sup>2</sup>, less than 1/10 of that in 20 years before (Agricultural records 1976).

After New China was founded in 1949, the government adopted effective measures to enable the old production method to be restored and to develop to some degree. The area of mulberry-dike-fish-pond expanded once. The structure of dike-pond and the production technology were improved and the output increased for some time.

After the 1980s, the social economy developed and natural environment changed. On the one hand, the improved degree of industrialization and urbanization resulted in the added value of land and more labor costs. As a kind of labor intensive industry, cultivating the mulberries and breeding silkworms cost relatively more working hours. Compared with other new industries, the input-output profits of sericulture was comparatively lower. People were not so enthusiastic



about silkworm production. The cultivation of mulberries and breeding of fish were extensive and the dike collapsed and the pond was shallow. On the other hand, with the rise of chemical fiber industry, a large amount of chemical fiber production with fine quality and reasonable price replaced the silk. So people were less dependent on silk. In addition, the environment pollution got worse and the diseases of silkworms and mulberries were increasingly serious, which resulted in worse quality and decreased output. All these factors made the mulberry-dike-fish-pond give place for other industries. The mulberry land was used for other purposes and the mulberry-dike-fish-pond decreased day after day (Liu et al. 2008).

In the 1990s, especially in the new century, mulberry-dike-fish-pond in Pearl River Delta almost retreated from the economic field. As a kind of agricultural production mode, it almost disappeared. Only several hundred hm<sup>2</sup> of it in several scenic spots in Shunde and Nanhai is kept in the form of heritage and scientific technology education. What replace it are the new vegetable-dike-fish-pond and flower-dike-fish-pond as well as the modern hard dike-pond fish farming. The function and form of the Dike-pond agriculture especially the mulberry-dike-fish-pond change continuously. Its economic function weakens obviously, while its functions of cultural heritage, scientific technology education and tourism development etc. become increasingly conspicuous.

### **3 The World Heritage Value of Mulberry-Dike-Fish-Pond Agriculture in Pearl River Delta**

According to the interpretation of Food and Agriculture Organization, the world agricultural heritage is a type of new world heritage. It is equivalent to the world cultural heritage. It refers to the unique land application system and farming landscape formed through long-term co-evolution and dynamic adaptation of the country and the environment it has. This kind of system and landscape has rich biological diversity, being able to satisfy the needs of development of local social economy and culture and in favor of promoting the regional sustainable development (Guo 2007). The cultural heritage value of the dike-pond agriculture in Pearl River Delta is quite obvious, which is mainly demonstrated in the following aspects: biological diversity and cultural diversity, synergy with and adaptation to nature and social environment and the function to promote the regional sustainable development.

#### ***3.1 Rich Production Diversity, Biological Diversity, and Cultural Diversity***

For the dike-pond agriculture, especially the mulberry-dike-fish-pond in Pearl River Delta, the typical mode is cultivating mulberries on the dike, breeding fish in the pond, breeding silkworms with mulberry leaves, and feeding fish with dung

of silkworms. This realizes the organic combination of many production links, such as cultivation of mulberries, breeding silkworms and fish farming, forming the production chain with characteristics. This kind of farming mode, which integrates cultivation of mulberries and fish farming, breaks the separability and unicity of traditional agricultural crop farming and breeding industry. This mode demonstrates the obvious feature of production diversity. It not only increases the source and channel of income and promotes the stability of agricultural production, but also realizes the reciprocity and mutual benefit of all the production links and improves the use efficiency of resources. Besides, the dike-pond agriculture has some other production forms. For example, people interplant or intercrop napier grass, soybean, vegetables, flowers, and so on in the dike; raise chickens and rabbits among the mulberries; raise ducks in water or plant water lettuce, water hyacinth, *Alternanthera philoxeroides*, duckweed, and other aquatic plants; raise pigs with water lettuce, napier grass, etc. In this way, the three-dimensional production, which integrates farming, fishery and husbandry together, is realized (Qu 1985). If the production of biogas by using pig manure, fowl manure, and cocoon water as well as such product processing and market transactions as breeding silkworms, making cocoon, silk spinning, and dyeing are taken into consideration, the dike-pond system can be called the integrated multiform production mode with many links which combine farming, fishery, pasture husbandry, commerce, and trade together.

The dike-pond agriculture owns many living things, including mulberries, silkworms, fish, livestock, fowl, vegetables, fruit trees, and other plants and animals. So its biological diversity is outstanding. In terms of plants, there are all kinds of mulberries with Guangdong Jing mulberry as the major variety, including fruit trees like longan, lychee, banana, sugarcane, and citrus; flowers such as jasmine, rose, chrysanthemum, orchid, and citrus *oleocarpa* Tanaka; vegetables such as Chinese cabbage, lettuce, broccoli, flowering cabbage, zucchini, tomato, etc.; food crops such as soybean, corn, peanut, sweet potato, etc.; terricolous and aquatic plants such as napier grass and water lettuce. As to animals, apart from silkworms, there are four kinds of Chinese carp, represented by chub, bighead carp, grass carp, and pangolin. In the meantime, there are omnivory fishes, including carp, crucian carp, bream, and black carp; good quality aquatic species including shrimp, sea eel, terrapin, largemouth bass, etc.; farm animals such as chicken, duck, pig, etc. If the migratory bird, insect, and all varieties of plankton and micro-organism perching here are counted, the dike-pond system altogether owns as many as more than one hundred kinds. Its biological diversity is very typical.

The dike-pond agriculture also creates, inherits, and develops colorful cooking culture, dress culture, folk culture, architecture culture, and religion culture. Its biodiversity lays a rich material foundation for the diversity of cooking culture. Through orientational processing, people make various kinds of edible animals and plants into a variety of delicate food. The pond fish can be cooked into dozens of dishes (Tu 1982). "Food of Guangzhou and cooking of Fengcheng are best" (Fengcheng is the nickname for Daliang in Shunde) is the vivid description of the cooking culture in the Dike-pond agriculture region. The popularity and inheriting



of making technology of gambiered Canton silk (rust-colored variety of summer silk) demonstrate the unique and fashionable dress culture in the Dike-pond region. The bachelor girls deciding to never get married is the unique marriage custom and social phenomenon which occurs with the popularity of mulberry-dike-fish-pond. “Shunde Ancestral Temple” and “Nanhai Temple” are the temples which are constructed to worship the forefathers and to handle the family business and to consecrate the silkworm god, gnome, kitchen god, deity Zhen Wu, Goddess Matsu, and other gods. The temples are also built to hold such folk artistic and religious activities as dragon boat race, local opera, local opera on water, and autumn opera held to celebrate or pray for good harvests. The architecture culture such as the picturesque and natural village layout fully shows the unique and rich culture diversity in dike-pond agricultural region (Wu 1986).

### ***3.2 Demonstrating Good Adaptation to and Coordination with Special Natural Environment***

The dike-pond agriculture is the land utilization method explored by people in Pearl River Delta through long-term production practices. It adjusts measures to local conditions, makes best use of the advantages, and bypasses the disadvantages. It is the product of long-term adaptation to the local special natural environment and synergetic development with it. To great extent, it reflects the special natural landscape of the local place at that time and shows the co-evolution of the relationship between men and nature.

In ancient times, the Pearl River Delta, a place full of calamities, had “low-lying topography and frequent flood.” The river network was dense and the land was low. So the water could not be drained well. In spring and summer, rainstorm was frequent. The flood water of Xijiang River, Beijiang River, and Dongjiang River was discharged down. In Pearl River Delta, the water often overflowed the watercourse, causing disasters. In case of jacking of sea tide, the flood water could not recede in time. Thus, flood disaster in large scale was formed. The low-lying place was full of water, which seriously threatened agricultural production. In particular, this went against the cultivation of rice. In order to solve the contradiction between flood and production, people finally found the solution after a long period of exploration: dig the low-lying waterlogged land to form a pond for breeding fish; stack the mud into dike and plant mulberries on the dike. In this way, people invented the mulberry-dike-fish-pond mode (Wu 1986). Before the rise of mulberry-dike-fish-pond, there was once enclosing tideland for rice cultivation and fruit tree-dike-fish-pond. The two kinds of production modes were the relatively good adaptation to the natural environment at that time. Through practice, people found that the mulberry-dike-fish-pond could help prevent flood and eliminate disasters and was able to make full use of land and water resources to increase both production and income. This mode could realize the harmonious relationship between humankind and nature. So it developed in large scale (Lo 1996).

### ***3.3 Sound Social and Economic Effect and Realization of Synchronization and Joint Improvement***

The complex production links of the Dike-pond system bring many sources and channels of income. Cultivating mulberries, breeding silkworms, reeling silk, breeding fish, and interplanted and intercropped vegetables, peanuts, and corns, etc., will generate considerable economic benefits. Additionally, the virtuous internal cycle and mutual promotion render the quantity and quality of all varieties of production above higher and better respectively than other regions. The economic benefits of the Dike-pond agriculture are very obvious. Notes of Guangdong said that “1  $\mu$  land can produce 250 kg mulberry leaves and the silkworms can produce 2 kg of silk by feeding on these leaves; a family with 10  $\mu$  land for mulberries and silkworms can raise eight family members”; “breeding fish can generate much money”; “a boat full of raw silk is worth a boat full of silver.” A Brief History of Longjiang written in the period of Daoguang Emperor recounted that “the place Shunde has a good approach to getting enough food...this depends on cultivating mulberries, breeding silkworms, raising pigs and breeding fish”; “cultivating mulberries and breeding fish can produce far more benefits than cultivating crops can.” The descriptions in relevant documents prove the fact as well. The good profits brought by the Dike-pond agriculture render the Pearl River Delta wealthy gradually in the tide of commercial economy.

While creating much material wealth, the dike-pond agriculture could produce good social and cultural effects. With complex structure and finer division of labor, the mulberry-dike-fish-pond was able to absorb plenty of labor. Relevant research showed that mulberry field employed 2,000/hm<sup>2</sup> each year and that the fish pond employed 1,200/hm<sup>2</sup> each year (Zhong et al. 1987). If crop rotation, interplanting, intercropping, and silk reeling processing were taken into consideration, more labor would be needed. In addition, different kinds of work had different labor intensities. So, all the people could participate in it all year around. This solved properly the contradiction of dense population and shortage of cultivated land. Therefore, in the heyday of mulberry-dike-fish-pond, people in Pearl River Delta lived and worked in peace and contentment. Different people were engaged in different work and got what they wanted. The families and society were harmonious. Fights, social disturbances, unemployment, etc., rarely occurred (Guo 2010).

“Only when people have enough food can they behave in good manner.” People in Pearl River Delta became wealthy gradually by cultivating mulberries and breeding fish, valued culture and education very much. They built schools and academies of classical learning to boost education. The society had gathered many learned talents and piles of intelligent scholars. Shunde, Panyu, and Nanhai became the famous home to culture and art with Number One Scholars, successful candidates in the highest imperial examinations, literary giants, and artists emerging one after another. In Shunde only, there were 4 Number One Scholars, 429 successful candidates in the highest imperial examinations and 2,088 successful candidates in the imperial examinations at the provincial level (Office of Shunde

Chronicles 1993). This took a very important place in the structure of talents in Guangdong history.

In Ming Dynasty and Qing Dynasty, the population in Pearl River Delta was large while there was little land. And the clan forces were strong. The development of the Dike-pond agriculture took the advantage of these conditions and solved the social problems caused by them effectively, promoting the harmonious development of mankind and society. Take Shunde for example. In 1849, the population density was 1,277 persons/km<sup>2</sup>, which was dozens of times of the average number in the country. Large population, relatively little land and shortage of cultivated land became the most serious social problems of the region (Office of Shunde Chronicles 1993). If people only had cultivated rice on the land, there would not have been enough food to raise such a large population. Meanwhile, cultivating rice absorbed less employed population. Fortunately, since there was mulberry-dike-fish-pond which could produce “ten times more than the crops,” the profits created by land had increased and plenty of population had been employed in breeding fish, cultivating mulberries, breeding silkworms, reeling silk, and other links. This relieved the social contradiction caused by large population and comparatively little land, realizing the synchronization and joint improvement of mankind and society.

### ***3.4 Promotion of Sustainable Development by Circular Economy and Idea of Ecological Civilization***

As the integrated artificial ecosystem, mulberry-dike-fish-pond boasts unique structure and complex functions. The dike, mulberries and silkworms constitute the subsystem of mulberry dike. The pond, fish and plankton in water make up the subsystem of the pond. The two subsystems are connected organically by pond silt and dung of silkworms. The pond silt fertilizes the mulberries; the mulberry leaves breed the silkworms; the fish feeds on the dung of silkworms; the fish feces are manure in the pond. Every production process is closely connected with each other. The waste created by the former link is used fully by the next link (Tu 1982), forming the low-cost, low-input, and high cost-effective circular production. Therefore, it is honored by the UNESCO as the “beautiful place and paragon of virtuous cycle rarely found on the earth” (Deng 2003).

The dike-pond agriculture adjusts measures to local conditions and makes full use of soil fertility. Through the land–water interaction of dike and pond, it adjusts the moisture and nutrient automatically and relieves drought and flood disasters. It makes full use of solar energy and organic fertilizer and seldom uses farm chemical and chemical fertilizer, so it has low consumption, less pollution, and no waste. The scientificness, reasonability of mulberry-dike-fish-pond, and the virtuous cycle of “exuberant mulberries—strong silkworms—large fish—fertile soil” having been formed fully demonstrate the simple consciousness of ecological civilization that human should respect nature and make use of nature. On the other hand,

through the production mode of mulberry-dike-fish-pond, the nature keeps the ecological balance well and realizes water and water conservation. Thus the structure of the natural ecology is stable and the ecology functions well.

Due to cyclic utilization of internal substances and energy, the dike-pond system reduces the consumption of natural resources. Therefore, during several hundred years when mulberry-dike-fish-pond was prevalent, the total amount of such natural resources as land resources, water resources and light and heat resources in Pearl River Delta had basically been kept at certain level and been utilized sustainably. In the meantime, the reasonable match of mulberry field and fish pond and the interaction between the two in the Dike-pond agriculture region ensure certain green belt and wetland, reduce drought and flood disasters and maintain a good ecological environment. The sustainable use of the resources and good ecological environment fully demonstrate that dike-pond agriculture can promote the sustainable development in Pearl River Delta. After the rise of the Dike-pond agriculture, the Pearl River Delta has maintained relatively strong momentum for development. With prosperous economy and stable society, the region goes ahead of surrounding areas and other similar regions and becomes the economic center of Guangdong Province and the preeminent base of the maritime Silk Route (Guo 2010; Ye and Tan 1987).

## **4 Tourism Development of the Dike-Pond Agriculture in Pearl River Delta**

### ***4.1 Value and Meaning of Tourism Development***

The dike-pond agriculture is both a kind of old land utilization system and a special cultural landscape. It owns the tourism value in many aspects, especially for Pearl River Delta which is not rich in natural tourism resources and where residents often travel around, the tourism development meaning is more important. The huge demands of tourism market and development potential can satisfy the recreational and leisure needs of local people and can receive the sightseeing visitors.

The dike-pond, especially patches of mulberry-dike-fish-pond, is comprised of many mulberry dikes and fish ponds in different shapes. They have latticed distribution with green mulberry dikes and blue fish ponds. Overlooking from afar or looking down at the mulberry-dike-fish-pond, people can see a vast chessboard dotted with green and blue which forms very beautiful and special scenery. When people approach the mulberry-dike-fish-pond, the green mulberries embrace the clean water. The scenery changes with the change of visitors' position and with the progression of seasons. The mulberries on the dike-pond are scattered randomly. The mulberry leaves dance gracefully with the breeze. The various kinds of fish in the pond have different shapes. They swim in groups of three or five and jump out of the water surface now and then, evoking ripples. What a pleasant and dizzying scene!

Entering the mulberry-dike-fish-pond, people can own a pleasant sight and a delightful mood. Among the mulberry trees, people can have different recreational activities according to their own will. The lush mulberry leaves can be collected and played. The large mulberries can be picked and eaten by people. The thin and long mulberry twigs can be made into various fine handicrafts. Visitors may admire the wriggly body or easeful sleep of silkworms in silkworm house or silk mill. People can give them a mulberry leave to experience what is nibbling. They can also swing the silk vehicle to make cocoon and reel silk and to taste the joy and sorrow of women breeding silkworms. On the fish pond, people can boat. They can paddle, close their eyes and rest their mind, feed the fish or catch the fish. Besides, they can sit along the pond to throw the fishline into water to experience the delight of fish biting the bait. They can also stroll in the dike-pond amid the soft breeze, listening to the babbling water.

The ecological meaning and environment-protection role of mulberry-dike-fish-pond are second to none in our country and in the world. Its scientificness and the unique history and culture it contains attract many overseas visitors for scientific investigation or social experience. For the teenagers, mulberry-dike-fish-pond is the living teaching materials for them to learn the principles of ecological cycle and to strengthen the environmental awareness.

## ***4.2 Current Situation and Problems of Tourism Development***

Being a precious tourism resource, the dike-pond agriculture tourism in Pearl River Delta has been developed to some degree and it begins to take shape and has achieved initial success. In the whole region, there are about 200 hm<sup>2</sup> of mulberry-dike-fish-pond whose main function is tourism development. It is distributed in Shunde, Nanhai, Panyu, Zhongshan, Guangzhou, etc. The cultural relics and documents related to mulberry-dike-fish-pond are restored, collected and reorganized. Rural tourism, agricultural tourism, museum places, and former residences of celebrities with mulberry-dike-fish-pond being the theme are developed (Table 1). They attract more than ten million tourists every year (among them, more than 10 million are foreigners). They have achieved obvious economic effect of tourism.

However, it cannot be avoided that the dike-pond agriculture tourism development in Pearl River Delta is still in the initial stage and there are many problems. They are mainly showed in lacking of overall plan, comparatively small-scale, relatively little popularity, serious redundant buildings within a small area, unreasonable project design, under-exploitation of tourist souvenirs, unscientific landscape design, low re-travel rate, little market promotion, and some agricultural parks which are unworthy of the name or title even cheating the visitors (in the name of mulberry-dike-fish-pond development, running the real estate business).

**Table 1** Statistical table of dike-pond agricultural tourism development in Pearl River Delta

Type	Development content and features	Representative scenic spot
Dike-pond agricultural rural tourism	Use former producing area of mulberry-dike-fish-pond; renovate the dike-pond; dredge the river; repair the silkworm houses; maintain the natural and original scenery and rural culture in the region of dike-pond and rivers	Pengjian in Shunde, Dawen Village in Panyu, Minzhong in Zhongshan, iqiao in Nanhai
Dike-pond agricultural ecological park	Clear a patch of low-lying chaor and develop it by employing mulberry-dike-fish-pond and its idea as well as the modern ecological agriculture theory and technology to form a modern ecological agricultural farm combining production, sightseeing, leisure, recreation, food and drink and vocation. Run it commercially in such forms as tendering and rent	Changlu Farm, Jinhua Agricultural Ecological Park, Lixiaolong Fairyland, xinshiji Agricultural Park, Aidele Farm, Guangxin Ecological Agricultural Park, Baosang Park
Dike-pond agricultural museums	Build special museums to exhibit the real production tools, image-text and historical materials of mulberry-dike-fish-pond production. These are aided by modern acoustic, optical and electrical technologies and other electronic technologies as well as the mimical production scene	Shunde Exhibition Center, Nanguo Sidu Museum, Panyu Dawen Village Exhibition Center
Former residences of celebrities near mulberry-dike-fish-pond	Repair the former residences of influential people who have made great contribution to the mulberry dike fish pond production and collect and display relevant real objects and materials	Former Residence of Chen Qiyuan, Shunde Bingyu Residence

### ***4.3 Solutions to and Suggestions for Tourism Development***

Strengthen the efforts of government guidance and policy support. The dike-pond agriculture tourism development is the objective need of tourism development and is an important approach to overall development in urban and rural areas and the sustainable development of the Dike-pond agriculture. Government of different levels should highly value it, guide it positively and strengthen the efforts of policy



support. According to the goals and requirements relevant to modern agricultural parks and development of modern service industry in Outline of Reform and Development Plan for Pearl River Delta Region, the government should organize as soon as possible people to prepare and revise the land development and utilization plan of the whole region to ensure that the dike-pond agriculture, including the mulberry-dike-fish-pond will develop reasonably and proportionally.

Integrate the resources to form scale effect. The current development is mainly in the examples given above. Small-scale and redundant buildings within a small area, etc., are the problems existing ubiquitously. It is necessary to according to the market segmentation reorganize the resources and to choose one to two villages with favorable resource conditions as the emphasis of development to form scale effect. Build a large number of mulberry-dike-fish-ponds surrounding the villages to form the “all the residences are surrounded by the ponds.” In the village, build streets whose theme is the culture of mulberry-dike-fish-pond industry. Repair and restore the silkworm houses and exhibit the farming instruments. The arrangement of the streets should show the features of mulberry-dike-fish-pond and the poems of men of letters of different dynasties to eulogize the mulberry-dike-fish-pond as well as the popular science of silkworm and mulberry. The shops should sell the goods and folk crafts related to mulberry-dike-fish-pond.

Display the history and improve the culture taste. The mulberry-dike-fish-pond is not only a kind of land utilization mode, but also a kind of historical culture and ecological culture. It reflects the innovative spirit of people in Pearl River Delta of acting according to circumstances, drawing on advantages and avoiding disadvantages and developing the strong points and avoiding the weak points. As a kind of production mode, it has disappeared in Pearl River Delta. The mulberry-dike-fish-ponds developing at current stage are formed through restoration and reconstruction. When creating the scene of mulberry-dike-fish-pond, the similarity in “shape” should be pursued. More importantly, the similarities in “spirit” should be valued more. Interpret the mulberry-dike-fish-pond history and culture clearly with multiple means such as acoustic means, images, pictures, texts, and real tools so that people can understand its cultural connotation and the essence of its spirit. Therefore, the tourism development of mulberry-dike-fish-pond should not promote simply by digging some fish ponds and cultivating some patches of mulberry land. The development should be about exhibiting the splendid history of mulberry-dike-fish-pond, the production process, combined effect and its modern enlightenment through the scenes, real objects, and images as well as texts.

Strengthen the efforts of marketing and create the international brand. The traditional mulberry-dike-fish-pond agriculture production in Pearl River Delta is renowned overseas. In contrast, the tourism development of mulberry-dike-fish-pond is not so good. At present, among the scenic spots developed only the Shunde Changlu Farm is the national 4A-class scenic spot and has some comprehensive strength. Others have little popularity. So, more efforts should be spent on marketing and advertising. Make full use of TV, radio, newspaper, Internet, and other media to promote the mulberry-dike-fish-pond scenic spots especially in the provincial or international markets. Create the international brand and improve the influence and fame of the products (Guo 2009).

## 5 Conclusion and Discussion

The dike-pond agriculture in Pearl River Delta is not only a unique production mode, but also a beautiful scenic spot and the precious cultural heritage (Karo et al. 2006). With the change of social and economic conditions, the dike-pond agriculture which was prevalent in Pearl River Delta for several hundred years as the advanced production mode has begun to decline and is confronted with development crisis. The evaluation of this unique production mode cannot simply care for its ever decreasing economic benefits. Instead more attention should be paid to its obvious social and ecological effect. People should recognize fully its significant value of agricultural heritage and meanings of tourism development. With rich biological diversity and cultural diversity, the mulberry-dike-fish-pond not only satisfies the needs of social and economic development of local places, but also demonstrates the co-evolution of man and nature as well as man and society. It promotes the sustainable development in Pearl River Delta and is the precious cultural heritage in our country and in the world. It is quite necessary to protect and develop it by means of world agricultural heritage and relevant ideas. The paper suggests that relevant departments should highly value it and go into action actually to take the chance to apply in time for the recognition as a world agricultural heritage. Efforts should be made to plan it and develop the place into travel and leisure attractions and the base of popular science education. To inherit and develop the dike-pond agricultural culture, scientific protection and reasonable utilization of the Dike-pond agriculture can be reinforced through some measures and ideas, such as the construction of modern ecological agricultural parks and promotion in places outside the Pearl River Delta even some low-lying and pluvial places in foreign countries.

## References

- Agricultural Records of Zhujiang Delta Writing Group. (1976). *Agricultural Records of Zhujiang Delta* (Vol. 2). Foshan: Foshan District Revolutionary Committee.
- Deng, F. (2003). Mulberry-dike-fish-pond—Main agricultural characteristic of Pearl River Delta. *Agricultural Archaeology*, 23(3), 193–196.
- Guo, S. H. (2007). *Mulberry-dike-fish-pond in Shunde*. Beijing: People's Publishing House.
- Guo, S. H. (2009). Mulberry-dike-fish-pond and its tourism developing in Zhujiang Delta. *Guangzhou Panyu Polytechnic Academic Journal*, 6(4), 72–75.
- Guo, S. H. (2010). The value and utilization of mulberry-dike-fish-pond in the Pearl River Delta in perspective of the agricultural heritage. *Tropical Geography*, 30(4), 452–458.
- Han, X. L., Yu, K. J., & Li, D. H. (2008). Building the landscape security pattern of dike-pond system with urban functions. *Areal Research and Development*, 27(5), 107–110.
- Huang, W. Y. (1989). Technical investigation of deformed development of modern sericulture in Guangdong. *Agricultural History of China*, 4, 83–86.
- Jeffrey, B. (2003). Yemeni agriculture: Historical overview, policy lessons and prospects. *Research in Middle East Economics*, 5, 257–288.

- Karo, D. L., Katrina, R., & Brigitte, S. (2006). Agricultural as an upholder of cultural heritage? Conceptualizations and value judgments: A Norwegian perspective in international context. *Journal of Rural Studies*, 22, 67–81.
- Korn, M. (1996). The dike-pond concept: Sustainable agriculture and nutrient recycling in China. *Ambio*, 25(1), 6–13.
- Li, H. S., Luo, S. M., & Nie, C. R. (2005). Reconstruction and control of modern intensive dike-pond system in Shunde. *Chinese Journal of Ecology*, 24(1), 108–112.
- Liu, K., Wang, S. G., & Xie, L. (2008). Spatial evolution analysis of dike-pond systems in Foshan City. *Tropical Geography*, 28(6), 513–517.
- Lo, C. P. (1996). Environmental impact on the development of agricultural technology in China: The case of the dike-pond system of integrated agriculture-aquaculture in the Zhujiang Delta of China. *Agriculture, Ecosystems & Environment*, 60, 183–195.
- Lu, X. C. (2005). *Humble opinions on mulberry and silkworm farming in Yuezhong*. Shanghai: Shanghai Old Books Press.
- Min, Q. W. (2006). GIAHS: A new kind of world heritage. *Resources, Science*, 28(4), 206–208.
- Office of Shunde Chronicles. (1993). *Chronicles of Shunde County*. Guangzhou: Sun Yat-sen University Press.
- Qu, D. J. (1985). *Notes on Guangdong*. Beijing: Zhonghua Book Company.
- Ruddle, K., & Zhong, G. F. (1988). *Integrated agriculture-aquaculture in South China: The dike-pond system of the Zhu Jiang Delta*. Cambridge: Cambridge University Press.
- Su, Y. C. (1987). South China silk area—Local historical transformation and the world system theory. Zhengzhou, China: Ancient Books Press.
- Tu, S. S. (1982). Some characteristics of agriculture and handicraft distribution in ming dynasty in Duangdong. *Economic Geography*, 2(4), 278–282.
- Wong, C. Y. (1999). New developments in integrated dike-pond agriculture- aquaculture in the Zhujiang delta, China: Ecological implications. *Ambio*, 28(6), 529–533.
- Wu, H. S. (1986). Water balance of the dike-pond system in Pearl River Delta and its ecological function. *Tropical Geography*, 6(4), 299–308.
- Yang, Y. T. (1995). Problems of and solutions to the sustainable development of dike-pond agricultural ecology in Pearl River Delta. *Guangdong Agriculture Science*, 5, 14–16.
- Ye, X., & Tan, D. H. (1987). Agricultural commercialization and country fairs in Pearl River Delta during Ming Dynasty and Qing Dynasty. *Social Sciences In Guangdong*, 1(2), 73–94.
- Zhang, L. C. (1994). The characters of agricultural land use and its change tendency in the Pearl River Delta. *Tropical Geography*, 14(3), 204–209.
- Zhong, G. F., Deng, H. Z., & Wu, H. S. (1987). *Research on dike-pond system in the Pearl River Delta* (pp. 7–14). Beijing: Science Press.
- Zhong, G. F. (1958). Mulberry-dike-fish-pond and Sugarcane-dike-fish-pond in Pearl River Delta. *Acta Geographica Sinica*, 24(3), 257–259.
- Zhong, G. F., Deng, H. Z., & Wu, H. S. (1993). *Land-water interaction of dike-pond system*. Beijing: Science Press.