GIAHS Proposal

Globally Important Agricultural Heritage Systems (GIAHS) Initiative

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Xinghua Duotian Agrosystem

Location: Xinghua City, Jiangsu Province, China

The People's Government of Xinghua City, Jiangsu Province

March 2014

SUMMARY INFORMATION

Name/Title of the Agricultural Heritage System (local Name and Translation, if necessary):

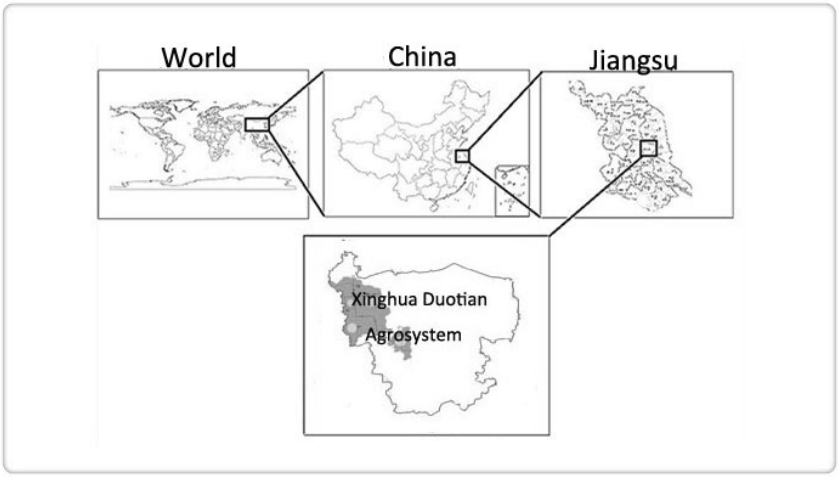
Xinghua Duotian Agrosystem
(Duotian is the local name for a kind of special raised field)

Recommending/applying organization:

People's Government of Xinghua City, Jiangsu Province, P. R. China

Country/location/Site:

This area is located at N32°56′00.46″-33°07′11.87″, E 119°43′04.72″-119°55′49.46″. It covers 5 townships, including Duotian Town, Ganggu Town, Lizhong Town, Xijiao Town and Zhoufen Town.



Accessibility of the site to capital city or major cities:

Xinghua city has convenient transportation over land or water, with waterways connecting Yangtze river in the South and the Grand Canal in the West, a train station on the Xinyi-Changxing Railway, the Ningtong-Jingjiang-Yancheng highway passing by and Beijing-Shanghai highway in the west.

Approximate Surface Area:

The total area is 312 Km^2, among which the central area is 40 Km^2, including 24 villages.

Agro-Ecological Zone: Low-lying wetland duotian ecological zone

Topographic features:

This area is located in low-lying and flat land, with higher land in the border and lower land in the middle. As one of the biggest wetland in Lixiahe area, it is covered with thousands of irregular duotian in different size, forming its special landscape. The average height of land is 2.5m.

Climate Type: Subtropical humid monsoon climate

Approximate Population: 170409

Main Source of Livelihoods: Vegetable farming and aquaculture

Ethnicity/Indigenous population: Han 170216（99.89%）; Minority ethnic group193（0.11%）, including Hui (86), Zhuang (60), Miao (21), Dong (13) and Li (13).

Summary Information of the Agricultural Heritage System:

Xinghua Duotian Agrosystem is a world-level wonder for its unique water-land utilization method in low-lying land and its splendid duotian landscape. Duotian is formed on the basis of wetlands, with different sizes and shapes. They are surrounded by water and they look like small islets drifting on the sea. Thus, people call Xinghua as "the city with thousand islets". The scenery is especially beautiful when rape flowers are in bloom during the Qingming festival. There are over 40 Km^2 duotian in Xinghua city, which is located in Duotian Town, Ganggu Town, Lizhong Town, Xijiao Town and Zhoufen Town, forming a unique landscape.

Xinghua area was located in low-lying land for centuries. As it was traversed by many lakes, Xinghua suffered a lot from floods in its history. In the past thousands of years, in order to fight against floods, the ancestors in Xinghua built wooden structure to support field, raised mud into small stacks, and formed the original duotian. They developed a unique way of water-land utilization and turned water area and wild land into cultivable land. As a special way of land cultivating, the duotian was a perfect model for utilizing nature, transforming natural habitat and living in harmony with nature for Xinghua people. It was also a masterpiece of flood prevention in the Lixiahe area. The Xinghua duotian landscape, having

gone through processes of utilizing nature, building wooden structures to support field and field rising, is of great scientific value for researchers to study the farming history of this water course network area in China.

The duotian is the most important living fossil in the Lixiahe area and is also a precious specimen for researching local eco-environmental changes and land use methods of transformation. As a result of the unique geomorphic features of duotian, modern farming method could barely be adopted here. For hundreds of years, the original geomorphic features have been kept in duotian area and farming activities could not be carried out without boats. With every household owning a boat and every farmer rowing their boats every day, a magnificent system is formed. Even today, people still adopt traditional farming methods in this area and use natural and ecological fertilizer to grow crops, especially vegetables. Longxiang taro, Xinghua chive and Xinghua oilseed rape are the most traditional agricultural products with higher economic value in this area.

Xinghua Duotian Agrosystem is a historic product of human beings living in harmony with land and water and also an outstanding model of water culture in Lixiahe area. It has not only provided unique water-land use method and landscape, but also cultivated unique planting culture, architecture, food and drinking culture, as well as folklore culture with duotian characteristics. However, the inheritance and conservation effort of Xinghua Duotian Agrosystem is facing great threat as a result of potential floods caused by lowering duotian, destruction brought by urbanization and construction, larger impact of modern agricultural technology, as well as inadequate personnel and financial support. Thus, it is of vital importance to list Xinghua Duotian Agrosystem as a GIAHS site in order to conduct dynamic conservation and adaptive management.

Content

1. System Characteristics

Xinghua, as a beautiful and productive plain and a famous agricultural city in Lixiahe area, has kept a great number of agricultural heritages over time, among which the Xinghua Duotian Agrosystem is a valuable treasure.

Xinghua Duotian Agrosystem is the historic outcome of pioneering and entrepreneurship of local ancestors, as well as their effort of raising field into stacks (named Duotian), and living in harmony with water. These special duotian are in different sizes and shapes,with the larger one of 2 or 3 Mu and smaller one of only several Fen or Li[1]. They are surrounded by water and notduotian connected with each other. In the endless plain, they look like many "islets", that is why people call Xinghua as "the City with Thousand Islets". During Qingming festival, the beautiful yellow oilseed rape flowers are blooming all over these "islets". At that time, you can enjoy the lovely scenery of "boats wandering in the water and people walking in the flower sea".

Figure 1 Spectacular Xinghua Duotian Landscape

According to the record of *Encyclopedia Britannica*: there are raised fields at the southeastern plain of China, particular case unavailable. It might be the earliest international record of Xinghua duotian. Today, there is only a small area of duotian landscape in Jiangyan district, adjacent to Xinghua city. There are over 40 Km^2 of duotian densely distributed in the central area of Xinghua Duotian Agrosystem, namely, Duotian Town, Ganggu Town, Lizhong Town, Xijiao Town and Zhoufen

[1] 1 Km^2=1500 Mu; 1 Mu=10 Fen=100 Li

Town. The duotian landscape cluster at such scale is a worldwide unique wonder not only for China, but also for the whole world. It has formed a unique cultural landscape and was highly appreciated by experts from home and abroad. This unique landscape has been recognized as one of the "Ten Discoveries of the Third Archaeological Survey in Jiangsu Province" and one of the "Most Important Discoveries of the Third Archaeological Survey in China". In December 2011, it was listed as one of the 7th Batch Provincial Level Culture Relic Protection Sites.

Xinghua Duotian Agrosystem is a typical wetland eco-agricultural system. Its unique water-land use method is a masterpiece showcasing Xinghua people's effort in utilizing nature, transforming nature and living in harmony with nature. As an ancient agricultural heritage system lasting for hundreds of years, Xinghua Duotian Agrosystem is of essential importance in the following aspects:

1.1 Food and livelihood security

The Lixiahe area where the Xinghua Duotian Agrosystem is located was covered with low-lying wetlands developed from ancient lagoons. The agriculture development was under threat because of the uncultivable nature of the land and frequent floods. The invention of duotian expanded the available land, especially cultivable land and solved the livelihood problem. The total area of the Xinghua Duotian Agrosystem is 312km^2, of which the cultivable land account for 42.1%, only next to water area, and the duotian is 40km^2, accounting for 30.4% of the total cultivable land.

Table 1 Land Use in Xinghua Duotian Agrosystem

Township	**Land Use Type and Area** （unit: km^2）						
	Farming land (including duotian)	Garden	Forest land	Grassland	Water	Construction land	Others
Duotian Town	21.956	0.01	0.05		27.90	8.474	0.16
Ganggu Town	19.034	0.19	0.24		26.15	2.149	0.36
Lizhong Town	29.303	0.004	0.84	0.03	43.32	4.272	1.65
Xijiao Town	32.983	0.23	0.06	0.06	26.88	4.696	1.63
Zhoufeng Town	28.093	0.13	0.93		26.15	2.868	1.03
Total	131.369	0.564	2.12	0.09	150.4	22.459	4.83
Percent	42.13%	0.18%	0.68%	0.03%	48.23%	7.20%	1.55%

Duotian is mainly used to grow vegetables. It was also used to plant crops or trees. Farmers could also breed fish, shrimp or raise ducks and gooses in the water. The duotian could not only provide food for the household, but also serve as a good platform of compound management of agriculture, forestry and aquaculture so as to increase farmers' income. Xinghua Duotian Agrosystem made it possible to develop high efficient eco-agriculture in the wetland, which is a good example for the similar area.

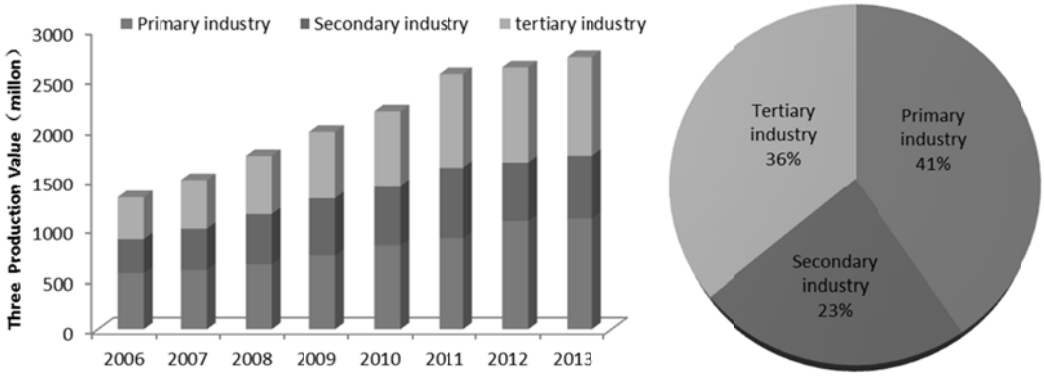


Figure 2 Three Industries Production Value from 2006 to 2013 and Three Industries Production Value Percentage of Xinghua Duotian Agrosystem in 2013

Table 2 Primary Industry Production Value Composition in Xinghua Duotian Agrosystem (%)

Agriculture	Forestry	Animal Husbandry	Fishery	Others
46.47	1.09	11.39	35.43	5.62

In recent years, the total production value of three industries of Xinghua Duotian Agrosystem has obviously increased. It is 2.7269 billion RMB of 2013, almost 100 million more than that of 2012. Since 2006, the tertiary industry's percentage has increased by 4%, while the primary industry maintaining its percentage around 40%, accounting for the biggest among all there industries. The primary industry was mainly occupied by agriculture and aquaculture, accounting for 81.9% of the total production value.

With the adjustment of planting structure and the drive of economic benefits, vegetable growing business has boasted rapidly in the past decades and become the main livelihood for local farmers. In 2013, there were over 4 km^2 land used for growing "Longxiang taro" with average output of 3.3×10^6 kg/km^2. The wholesale market price is 2.4 RMB/Kg, so farmers could earn over 7.9×10^6 RMB/km^2. Thus, growing Longxiang taro is quite beneficial. In terms of chive growing, famers could

grow 2-3 crops of chive annually. With high income of over 1.5×10^7 RMB/km^2, growing chive has become the major income source for farmers in Duotian town.

In recent years, Xinghua Duotian area vigorously developed tourism by taking advantage of the unique duotian landscape and Qiantao oilseed rape flower resources. Dongwang village, Ganggu town, Xinghua city is the core area of "Qiandao Oilseed Rape Flower Scenic Zone". In 2013, more than one million tourists have visited here during the Fifth Xinghua·China Qiandao Rape Flower Tourism Festival, which is increased by 6.7% compared to that of 2012, and also earn total revenue of 420 million RMB, with an increase of 7.7% compared to that of 2012. The tourism industry has greatly promoted local economic and social development. In addition, the tourism has created 300 new jobs for the local farmers (accounting for 85.7% of the total number of tourism workers). Tourism has become one of the main employment channels for surplus labor in this rural area.

1.1.1 The specialized agricultural products in Xinghua Duotian Agrosystem

Over 70% of the arable land in Xinghua Duotian Agrosystem is duotian surrounded by water and in different sizes and shapes. The soil of this system is developed from wetland soil, so it is highly suitable for growing vegetables. In addition, the local farmers have accumulated rich experience of vegetable growing from the long history. Therefore, it is a very famous area for producing vegetables with high quality and production. Longxiang taro, Xinghua chive and Xinghua oilseed rape and are the three most famous farm products here, which improved the agriculture effectiveness and increased the income for local farmers.

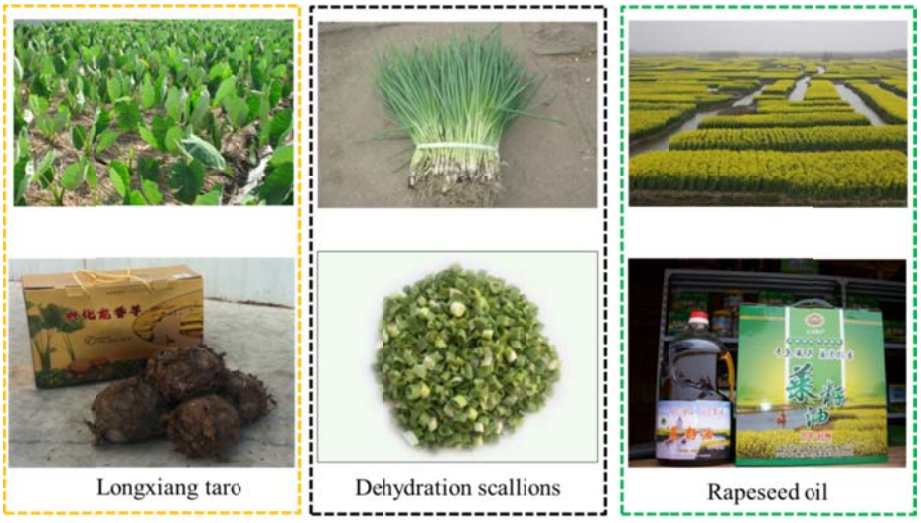


Figure 3 Longxiang taro, Xinghua chive and Xinghua oilseed rape

Longxiang taro, a variety of robust taro, is a high quality local product in Xinghua city. Historical records indicated that Longxiang taro has a history of more than 800 years and has long been a famous agricultural product in Xinghua city. Taro has been regarded as an important supplementary food for preventing hunger since ancient time. Nowadays, it is a common vegetable and is well-received by customers in Jiangsu, Zhejiang, Shanghai and Shandong provinces. As taro needs large amounts of water in its process of growth, the duotian, surrounded by water, could meet its water demand and produce high quality Longxiang taro. The plant height of Longxiang taro is 1.2～1.5m. The characteristics of the plant include deep green leaves, green and long leaf stalk, purple joints between leaves and stalks, spherosome mother taro with white pulp and powdery taste, less oval son taro with sticky pulp. Longxiang taro, as a local featured gourmet, was recorded in the 7th episode (Our Farm) in a very famous food program "A Bite of China" by CCTV-7. Longxiang taro, with soft texture, glutinous taste and rich nutrition of amylum, fat, protein, fiber, Vitamin B, C and mineral matters of Calcium and Iron, is good for people's stomach, intestine, liver, kidney and could nourish one's vitality. It also has auxiliary curative effect for constipation, glandula thyroidea, mastitis, arthritis and cancer. Cooking methods of Longxiang taro include braising, grilling, and stewing. It is popular among customers of all kinds, whether young or old. One can find them in the market of Suzhou, Wuxi, Changzhou, Beijing, etc. With its good reputation in the market, Longxiang taro has become the main vegetable variety in the restructuring of the local crop farming industry.

Figure 4 Harvesting Longxiang taro

Figure 5 Longxiang taro for cooking

Xinghua chive is one of the featured agricultural products in Xinghua Duotian Agrosystem. We can find records about chive in "*Geographic Record•Natural Products"* , the 2nd volume *of Xinghua City New Book* compiled in the 19th year of

Wanli's reign (1591AD), which indicated that Xinghua has the history of growing chive for at least 400 years. Its plant height can reach over 40cm. Xinghua chive boasts great fragrance and good quality. With a composition of Allylic Sulfides, it could whet one's appetite and prevent cardiovascular disease. It is also rich in Vitamin and mineral substance and could strengthen people's immune system as well as prevent respiratory disease. As an essential seasoning in the food industry of China, it is also one of the major exported seasoning vegetables. In 2006, General Administration of Quality Supervision has approved the geographical indication product protection of Xinghua chive. It is of great importance in protecting this essential agricultural product, developing the city's chive industry, increasing farmers' income and raising the reputation of Xinghua city. With years of development, the planting area of chive has been expanded gradually. In the 20.7 km^2 certified pollution-free agricultural producing area, there are 13.3 km^2 for planting chives. In 2011, Duotian town was officially recognized by the Ministry of Agricultural as the model township for "One Village One Product" for its excellent chive products.

Xinghua Duotian Agrosystem has only less than 100 years history for growing oilseed rape, which is the main winter crop. According to statistic recoreds in 1949, there was less than 6.7km^2 land for growing oilseed rape. It was increased to 10.4km^2 till 1957. On 30 June 1959, the Xinhua News Agency once released a special report that "the average output of oilseed rape for Zhangpi team, Duotian town, Xinghua city was 0.11Kg/km^2, with an increase by 29% compared to that of the last year." Therefore, Xinghua Duotian Agrosystem was also famous for producing the best oilseed rape in China. The Erucic acid content in rapeseed oil produced with traditional processing technique is lower than 3%. This oil is cholesterol-free and contains nutritional ingredients of unsaturated fatty acid such as linoleic acid as well as vitamin E. It can be absorbed efficiently by the human body. Known as the "healthiest oil", the rapeseed oil could soften blood vessels and delay senescence.

1.1.2 Dehydrated Vegetable Processing and Aquaculture

Xinghua Duotian Agrosystem is located in the middle of Lixiahe area between Yangtze River and Huai River. With its excellent ecological conditions and natural resources, Xinghua city was appointed as the second batch of National Ecological Demonstration Zone in 2001 and an Eco-agriculture City in 2007. In the Regional Planning for Competitive Agricultural Products by MoA, Xinghua city is listed as an

competitive region of high quality wheat region in the lower reaches of Yangtze River, crab breeding region in the middle and lower reaches of Yangtze River, and also the leading area for producing special wheat, rapeseed, high quality lean meat pig and local poultries.

Xinghua city has initially formed ten agricultural products industrial clusters: ecological river crab industry, dehydrated vegetable industry, high quality paddy rice industry, red-skinned wheat industry, malting barley industry, facility horticulture industry, aquatic product processing industry, high quality pig industry, high quality eggs industry, and feed processing industry.

The dehydrated vegetable industry is the characteristic industry in Xinghua city. The industrial base for dehydrated vegetable is located in Duotian town and Chengdong town, with the core base area of 8.89 km^2. This base was awarded by the Agricultural Committee of Jiangsu Province as Provincial Modern Characteristics Industrial Base and Duotian town has already become the largest vegetable dehydrating processing base and product distribution center in China. Currently, there are 91 vegetable dehydrating processing enterprises in Duotian town, accounting for 80% of the total number in China. Among all enterprises, over 50 are in large scale and over 40 are export-oriented. The annual amount of processed chive products in Duotian is over 10000 tons, with the total production value of one billion RMB; the dehydrated vegetable products, with “Xinghua chive” as the leading product, are sold very well in over 30 countries and regions, such as America, Japan, South Korea, Hongkong, Taiwan, etc. Therefore, Xinghua chive is world-known.

Figure 6 Growing Base of Xinghua Chive

Figure 7 Xinghua Chive

Figure 8 Dehydration Chive Processing Factory

Dehydrated vegetable processing is a kind of labor-intensive industry which needs a large number of workers in all procedures including planting, harvesting, transporting, processing, packaging and selling. More than 10 thousand job positions were created for this industry in Duotian town, which has effectively relieved the employment pressure for surplus labor in rural areas.

With rich water resources, the aquaculture industry in Xinghua Duotian Agrosystem also developed very well. The promotion of fish-shrimp-crab polyculture, especially shrimp-crab polyculture has expanded the aquaculture area to 235.88km^2, over 8.5 times of the real water surface area（27.9km^2）and greatly increased the utilization efficiency of water area. The total production value of aquaculture has reached to 1.8 billion RMB per year, with shrimp-crab production accounting for around 70%.

Table 3 Aquaculture in Xinghua Duotian Agrosystem

Township	Fish		Shrimp		Crab	
	Aquatic Breeding Area（km^2）	Production Value (1×10^4 RMB)	Aquatic Breeding Area（km^2）	Production Value (1×10^4 RMB)	Aquatic Breeding Area（km^2）	Production Value (1×10^4 RMB)
Duotian Town	13.69	10822.5	12.33	11838	15.73	3237
Ganggu Town	14.23	10530	15.67	13511	19.83	10892
Lizhong Town	17.14	23690	21.14	20406	21.14	14879
Xijiao Town	12.37	10825	15.05	10871	15.67	6160
Zhoufeng Town	12.97	9745	13.87	12864	15.04	11816
Total	70.40	65612.5	78.06	69490	87.42	46984

The aquaculture in Xinghua Duotian Agrosystem started in an earlier period, and has turned into a mature industry nowadays. Since 1983, the 8th Township-owned aqua-farm and the 10th Huxikou Village-owned aqua-farm have been established in Desheng Lake. Since 1991, the township government started to promote special aquaculture of freshwater shrimp, crab and soft-shelled turtle, encourage polyculture of fish-clam, fish-shrimp and fish-crab. This effort had greatly increased aquaculture benefits. Three major aqua-farms have been built in Desheng Lake, Qigan Lake and Laizi respectively in Duotian town until 2013, which formed the aquaculture system combining intensive breeding in ponds with extensive breeding in streams.

1.1.3 Safe Vegetables

Duotian town, as the traditional vegetable planting area, owns 20.67km^2 certified pollution-free vegetable planting area and has built Xinghua Chive National Agricultural Standardized Demonstration Area. Four vegetable products have been certified as pollution-free agricultural products and two as green food. In 2009, "Xinghua Export Vegetable Demonstration Area" was declared by Agricultural Committee and Entry-Exit Inspection and Quarantine Bureau of Jiangsu province as the first batch of provincial export agricultural product demonstration area.

As the core area for vegetable growing and processing in Xinghua city, Duotian town has conducted agricultural product quality control programs, built and enhanced agricultural product quality & safety supervision mechanism and evaluation network, and constructed an agricultural product quality & safety tracking system. Training sessions were arranged to promote the latest technology on using low toxicity and low residue pesticide so as to guarantee high quality and safety of vegetables. It is of vital importance to improve the safety level of dehydrated vegetable quality and further explore international and domestic markets.

1.2 Biodiversity and ecosystem function

1.2.1 Biodiversity

（1）Agricultural biodiversity

Xinghua Duotian Agrosystem is located in flat plain surrounded by water. With rich rainfall and mild climate, it is a fertile land. This region was famous for growing fruits and vegetables since ancient times and was named as the "Fruit Garden along

Rivers[2]" in the Ming Dynasty, which has been listed as one of the "Twelve Views in Shaoyang[3]". According to *Xinghua County Annals of Ming Dynasty*, many fruits, vegetables, grains, cotton and linen were grown here (Appendix II). In particular, a precious fruit called Luguo used to be grown here and was listed as tribute for the royal family. Unfortunately, this breed has already been lost.

Nowadays, the main crops in Xinghua Duotian Agrosystem include grains such as paddy rice, wheat, barley, and potato, commercial crops include oilseed rape, cotton, linen, mint, and herbal medicine. Taro, chive, ginger, Chinese cabbage, Chinese chives, edible amaranth, eggplant, pepper, carrot, tomato, melons, lotus, arrowhead and water chestnut are main vegetables and fruits in this area. Livestock and poultry include pigs, sheep, cows, rabbits, chicken, ducks and geese (Appendix II). Among all agricultural products, livestock and poultries, there are many high quality local varieties, which are of great importance in the protection of seed resources. For example, the famous Xinghua oilseed rape cultivated in Xinghua Duotian Agrosystem mainly traditional varieties, for example "qingyangertou", "piaoerbai" and "heitouda", which were selected by local people over a long period of time. The characteristics of those varieties include abundant branches, dense podding, dense seeds, strong frost-resistance power, and high and stable output.

Xinghua Duotian Agrosystem also has rich freshwater fishery resources. There are 56 varieties of fish, which belong to 10 orders, 28 families and 46 genera. Shrimp, crab, clam and wild poultry are also abundant. The main fish varieties include black carp, grass carp, silver carp, bighead carp, carp, crucian carp, bream fish, culter fish, mandarin fish, perch, mullet, ricefield eel, Eleotridae fish, Pseudorasbora parva, bitterling fish, whitebait, eel, etc (Appendix II).

（2）Related biodiversity

According to the survey result in 1996, there are over 160 species of wild animals in Xinghua city, among which 13 are beasts. The naturally inhabiting birds (including migrating birds) in Xinghua belong to 53 families, 68 genera and 125 species. There are 9 species of amphibians and 15 of reptiles. National primary and secondary protection animals include oriental white stork, red-crowned crane, swan, grey heron, Chinese merganser, the mandarin duck and all varieties in Falconiformes orders and

[2] Famous place for melons
[3] Shaoyang is the name of Xinghua City at ancient time

owls. Commonly seen wildlife animals are egrets, grey heron, pheasants, ducks, sparrows, frogs, toads, snakes and weasel. There are over 300 species of wild plants, including those in Phycophyta, Eumycota, bryophyte, Pteridophyta, and Spermatophyta. To Sum up, the vegetation is mostly occupied by aquatic and hygrophyte types, together with very small amount of xerophyte (Appendix II).

1.2.2 Ecosystem Services

(1) Biodiversity Maintenance

One of the most important functions of Xinghua Duotian Agrosystem is to protect biodiversity. According to statistics, the vegetation index of Xinghua Duotian Agrosystem is 31.41, and the biological richness index is 71.94. Those indicate that this system has good eco-environment and rich biodiversity.

(2) Water and Soil Conservation

The soil types of Xinghua Duotian Agrosystem are mainly Duotian soil. This kind of soil belongs to high productivity soil as it is rich in nutrients, organic matter and microelements, such as Calcium, Iron and Manganese. It is also good at curing and permeability as well as strong fertilizer preserving and providing ability (see Table 4). The accessible water resources are rich and are of high quality. Xinghua has Desheng Lake, Pingwang Lake, Dazong Lake, and Laizidang Lake. The great soil and water conditions have offered advantages for traditional vegetable farming in the Xinghua area.

Table 4. Soil Nutrient of Xinghua Duotian Agrosystem

Layer (cm)	pH	OM (g/kg)	oxidizable OM (g/kg)	total N (g/kg)	total P (g/kg)	Available N (g/kg)	Available P (mg/kg)	Available K (mg/kg)	$CaCO_3$ (g/kg)
0-21	7.70	15.4	8.4	1.02	1.09	64.5	6.4	146	7.18
21-83	7.55	15.8	11.7	1.18	1.19	83.5	10.8	157	8.18
83-154	7.35	15.6	5.5	0.29	1.25	-	-	-	-

According to survey, local farmers always raise canal mud besides duotian to grow taros, and they can also grow crops on the slopes around the duotian, thus, they could prevent collapse and erosion of duotian s and protect water and soil.

(3) Climate Adjustment

The farmers in Xinghua Duotian Agrosystem have accumulated a great deal of experience on how to adopt multi-level cultivation in space and multi-sequence

arrangement in time when utilizing this kind of wetland natural resources. The multi-level cultivation in space refers to the organic combination of forestry, agriculture and fishery so that they can make full use of the space on and below the ground. The multi-sequence arrangement in time means that they can make rational arrangement of the crops according to different seasons and make sure that the system gains higher profit on the basis of ensuring the sound growth of forest and crops. In order to make the most of the space resources, besides growing vegetables, farmers also conduct afforestation projects on the duotian. In the forest area of duotian, the radiation decreases by 45%-52% compared to the farmland, and the temperature is 0.8-1℃ lower, and the humidity is 3%-5% higher.

1.3 Knowledge systems and adapted technologies

Duotian was formed by digging up and stacking the sludge in the marshland to form ridges on which the local farmers can plant crops, vegetables, and so on. It's a unique pattern of water-land utilization and the result of adapting agricultural activities to the wetland area over many generations.

Modern farming methods cannot be applied in duotian, because of their special fragmented topographic features. As a result, the original landscapes are retained, as well as the traditional farming practices. These include using boats to move around in the fields instead of carts, collecting organic fertilizers by dredging up sludge, scraping sludge and gathering aqua-plants, etc.

1.3.1 Compound Agriculture-Forestry-Aquaculture Model

Xinghua Duotian Agrosystem presents a typical compound agriculture-forestry-aquaculture model. The moist zone formed by raised underground water level is a favorable habitat for humidity resistant trees, such as the pond cypress (*Taxodium ascendens*) and the dawn redwood (*Metasequoia glyptostroboides*). Therefore, it is conducive to develop forestry in duotian. Under the trees, vegetables are planted in the fertile soils. Compared with the conventional grain crops, vegetables produce higher economic yields. The farmers make full use of the water resources by fish farming in the ditches.

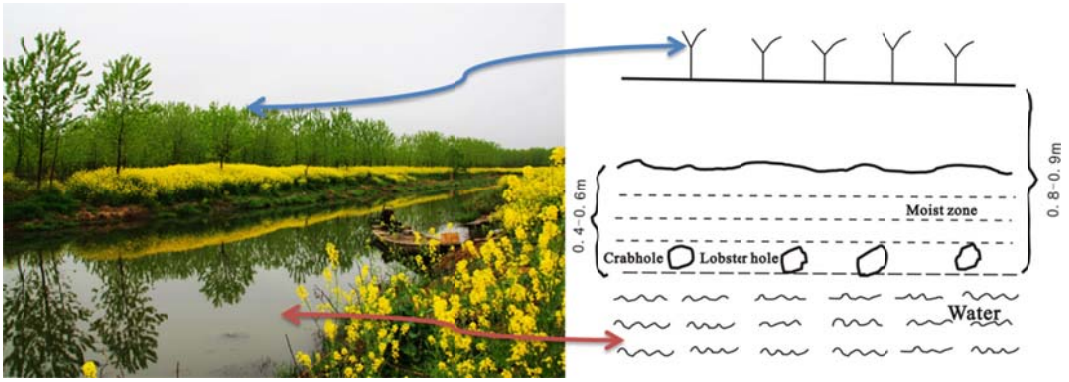


Figure 9 Compound Agriculture-Forestry-Aquaculture Model

This pattern combines forestry, agriculture and aquaculture: planting trees on the ridges, raising fishes in the ditches and growing grain crops or commercial crops under the trees. It takes full advantage of the space, and brings considerable economic benefits while securing long-term ecological benefits.

The local farmers extensively use the practices of intercropping and rotations of crops. There is sufficient rain and heat in this area with the annual rainfall of 1024.8mm, the relative humidity of 78%, the average temperature of 17.7 ℃, the annual sunshine time of 2305.6 hrs, and the frost-free period of 227 days. The crop growing season here is longer compared with most places in China, which increases the multiple cropping indexes of this area. For the majority part of Xinghua, the farmers plant two crops of rice and wheat (oilseed rape) in one year. They can grow at least two crops or even three crops of vegetables annually. By proper intercropping under the trees, the farmers have effectively enlarged farming area, and have thus effectively increased the ecological, economic and social benefits per unit of duotian.

1.3.2 Unique Seed-reserving Method-Shelving Seed

The local farmers apply some traditional seed reserving methods. For example, for melons, they select the fully ripened fruit in big size, spilt them right in the fields, and take out the seeds. Then they mix the seeds with plant ash, make them into mud cakes, and glue them on the walls with a sunny exposure to avoid rain flush. The seeds stay there until the following year, when it's time for seeding.

The local farmers have also invented a unique seed-reserving method for the selection and reservation of bulb seeds, known as "shelving seed". When the taros are ripe, the farmers select the higher-quality ones, expose them in the sun for two days and remove them onto indoor seed beds. A seed bed is made by bamboo or wood shelf

and covered by reed mat, which was put on the roof beams or just in the room. The seed taros stay on the seed beds for about half year, during which they are flipped at least twice, and the rotten ones are removed. When winter comes, a grass mat is laid on the taros to keep them warm. In the following spring, the farmers move the taros into the seedling beds where they would germinate. The seedling beds are rectangle shallow pits with around 1m wide and 30 cm deep. They are mostly located in places with a sunny exposure and sheltered from wind. When they were moved to the seedling beds, the farmers first put a layer of specially-made nutrient soil in the pit, plant the taros, and cover them with a thin layer of nutrient soil. The taros are watered daily, and are covered by grass mats during cool nights. In May, after the farmers harvest the rapeseed, the taro seedlings might have two to three leaves and ready to be transplanted to the fields. Compared with the seeds stored in the cellars, shelving seed for taros in this way has a higher bud ratio, stronger growth momentum, higher yields, and less vulnerable to diseases and pests.

1.3.3 Traditional Irrigation Method-Bailing Water

The arable land in the Xinghua Duotian Agrosystem mainly used to plant vegetables, for which water is indispensable. Bailing water is the major irrigation method and also the most important farming work for local farmers.

Water scoops are used for bailing water. A water scoop is made of two parts: the container and the handle. The container is a polyhedron made of galvanized iron sheet. It has a square posterior to contain water and a cupped, inclined blade that curves upward. The handle, usually made of bamboo, is about 3-4cm in diameter, and 2m long. The water scoop is a special implement. It’s light and functional. It can spread water more evenly and further.

Figure 10 Bailing Water

There are three key points for bailing water: sprinkle, sprinkle the water further and evenly. Because the ridges are relatively tall and wide, the farmers must spread the water further so that all the plants are watered. They need to sprinkle the water, so that the water would land on the young and delicate sprouts like small raindrops and would not harm them. For the same plot and the same plant, the water must be sprinkled evenly to avoid excessive water for some plants, or inadequate water for others. The farmers need decide the appropriate water amount according to the growth conditions of the plant, the soil humidity and the weather condition.

1.3.4 Traditional Organic Fertilizer Collection – Dredging up Sludge, Scraping Sludge, Gathering Aqua-Plants

Dredging up sludge is one of the traditional ways to collect organic fertilizer in Xinghua Duotian Agrosystem. The farmers use a special tool named “lanzi” to dredge up the sludge from the river bottom. The “lanzi” is made of a bamboo spar and “lanyi”, a net similar to a fish net made of hemp threads. The “lanyi” has very small meshes, which allow the water to flow out, but retain the sludge. When using the “lanzi”, the farmers lay the “lanyi” closely on the river bottom, which gathers the sludge when the boat moves forward. The farmers then pull the “lanyi” to the water surface, and then put them into the boat by using the lever principle.

Scraping sludge is another way to collect organic fertilizer. Even its tool is similar to “lanzi”, it is more like digging. Therefore, the sludge gathered by scraping is thicker and contains weed and snails, etc. Thus, it makes better fertilizer than the sludge gathered by dredging.

Gathering aqua-plants is another main method to collect organic fertilizer by local farmers. The tool used is called “zhanguan”. It’s made of two bamboo sticks. The farmers put zhanguan into the water where the aqua-plants abound. Just like children picking up noodles by chopsticks, the farmers uproot the aqua-plants and keep them in their cabins. The plants are later laid between the lines of vegetables where they provide shade, keep the soil humid and provide fertilizers.

Thanks to those organic fertilizers, duotian has favorable and fertile soils, which produce high quality vegetables.

Figure 11 Dredging up Sludge

Figure 12 Gathering Aqua-Plants

1.3.5 Traditional Fishing Methods

Xinghua Duotian Agrosystem has rich aquaculture resources. Traditional fishing methods are still used in this area, such as catching fish using tuck nets, hurdles, covers and nets.

Figure 13 Traditional Fishing Methods

Nowadays, large nets are often used in fishing. Each fishing net requires about a dozen of fishermen. What's worse, this method can easily stir the water and cause the release of toxic substance from the bottom, such as ammonia and nitrite, which will harm the environment of the rivers. The traditional fishing methods, on the other hand, would not harm the water environment, or the fishes. On the contrary, they will increase the survival rate of the fishes during the transportation, and thus improve the economic benefits to farmers.

1.4 Cultures, value systems and social organizations (Agri-Culture)

1.4.1 Intensive Farming Culture

Unlike the farmers in the other areas who use farm cattle and tractors to plow, plant, transplant and harvest, the local farmers in Duotian use leek knives, rakes, water scoops, shovels, forks and “lanzi” etc. They use boasts in the transportation of their harvest. The tools they use demand patience and efforts. They invest lots of work time in every stage of the cultivation.

Harvesting Taro **Planting** **Plowing**

Figure 14 Traditional Farming Work

1.4.2 The construction of rural cooperative economic organization

Vegetables in Xinghua Duotian Agrosystem are of different varieties, and produce large amounts with high harvest frequency. These vegetables are raw materials for processing companies, and provide food for local people. They are sold in both the local markets and the markets outside of Xinghua. This creates an occupation—vegetable agent. The vegetable agent is not new to Duotian people. They were called “Qinghuohang” (vegetable agent) and “Baxianhang” (seafood agent) in the history. The vegetable agent is a new type of rural economic organization that created based on this idea. Some agricultural cooperatives were also established. There are over 180 vegetable agents in the 42 villages of Duotian town. They are the important bridge among farmers, processing companies and markets. They play an important role in vegetable distribution and are increasingly relied on by the farmers. These cooperatives and agents will more and more become the cornerstones and backbones of the local agricultural economy with broadening of their information channels, increasing of market resources and improving of the economic power.

Figure 15 Vegetable Agents

1.4.3 Local Rules about the Protection of Duotian

Making village regulations for protecting duotian is the traditional habit retained in an effort to protect the agricultural heritage while developing economy. The village committee is entitled to stop and punish the person who violates the regulations.

Figure 16 Village Regulations

1.4.4 Water Culture of Xinghua Duotian Agrosystem

Xinghua Duotian Agrosystem is located in a highly populated region. Thus, imagination is required to supply sufficient food in an area with limited land. Duotian is the poetic results of local people's creativity. Adapting to the soil and water condition, Xinghua people have created duotian, a unique pattern of water-land utilization, and have grained abundant food resources as a result.

The topography of Duotian has shaped the lifestyle of the local people. They are known as the “people in duotian”. Not only are their living habits affected, but also their behavior, knowledge and philosophy. When we look into the past, we can see that this area, with its delicate water and farmland, has attracted many poets and literary men. Shi Nai’an was inspired by this place in his writing of the Outlaws of the Marsh. He was inspired by the Desheng Lake, the eight-diagram tactics, and the Shuihu Port, as well as the campaign to advocate for the Jin Dynasty and the revolt against the Yuan Dynasty. Zheng Banqiao, the most famous person of the Eight Eccentrics of Yangzhou, was born in Xinghua. The new calligraphy style he created, named “six and a half style”, was allegedly influenced by the landscapes of duotian. The talents of these masters interacted with this beautiful place, and produced glamorous masterpieces. On May 19, 2013, the China Post issued the “Beautiful China”, a six-piece set of stamps. One of them is featured with the Xinghua Duotian Agrosystem.

Figure 17 Outlaws of the Marsh

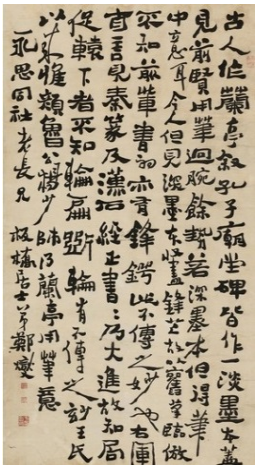


Figure 18 Calligraphy Style

Figure 19 Old Duotian (1978)
Shoot by Lv Houmin

Figure 20 Xinghua Duotian
a Stamp of the Beautiful China Set

1.4.5 Traditional Festival Customs

People in this area highly value traditional festivals, such as the Spring Festival, the Tomb-Sweeping Day, the Dragon Boat Festival and the Mid-Autumn Festival, etc. They celebrate these festivals in different ways, which are maintained in their traditional style until now. Compared with people in the neighboring areas, people here, who are creative, have more diversified and unique festival customs. Following are some examples. In the eve of lunar New Year, it's their customs to eat taros, hoping to "meet good people in the coming year, and receive help when needed". Eating large taros also indicate their wishes to make more money. There are also taboos when it comes to the New Year's Eve dinner. For one thing, they avoid eating chicken and duck, with a wish to avoid quarrels. For another, they don't soak food in the soup. Because in Chinese, the word that describe this action also describe failure, and being soaked by rain. The people often go out and sell vegetables. Rain is not desirable when they do so. During the Spring Festival, the people would visit their relatives, the elderly and their friends. They would also participate in entertainments, such as dragon dancing, lion dancing, presenting Kylins, shouldering flower baskets, and lotus thrashing.

Figure 21 Presenting Kylins

Figure 22 Lotus Thrashing

1.4.6 Food Culture

Taro is a specialty of Xinghua Duotian Agrosystem. It is highly nutritious and easy to store. For the past 2000 years, taro has been widely grown in the southern part of the Yangtze River basin. The Longxiang taro grown in this system has a gentle and elegant flavor. During the peak growing season, the taros need to be watered till they are soaked for six times a day. Besides, the farmers need to ventilate the soil to meet air demand from roots. Xinghua Duotian Agrosystem, with its unique natural conditions, presents a favorable habitat for taros. There are many dishes made of taros. Among them, the most distinctive ones are the "taro bouilli" and "Toufu with Crab

Roe". The Xinghua chive can be used as condiment or as the main ingredient. In addition, since there are many rivers and lakes in this area, pond snail abounds, which is also raw materials for the local cuisine.

Figure 23 Longxiang Taro

Figure 24 Toufu with Crab Roe

1.4.7 Folklore Art and Marriage Culture

The folk art in this area is well established and is vigorously developed. It has mainly the following manifestations: temple fair, stilts dragon dance of Gaojiadang Village, singing festivals, farmer's painting, and Shipohua (the painting featured with torn books and pictures) etc. They all display vivid regional features. In 2002, Duotian Town is the only place in north Jiangsu to be named by the Province as the "Village of Folk Art in Jiangsu Province".

Figure 25 Temple Fair

Figure 26 Panguan Dance

Figure 27 Farmer's Painting

Figure 28 Shipo Painting

The marriage customs is still quite traditional, with “welcoming bride with sedan ship” as the main feature. As the duotian is traversed by many rivers, people could not go out without boat. Therefore, welcoming bride with sedan-ship turns into an important part in the marriage ceremony. In the past, people always used ship to welcome the bride, while they also use a sedan. That was the reason why they called it “sedan-ship”. One needs to use barge poles or paddles to punt the ship. Once the sedan ship has set out, it should not stop to take a rest in the halfway regardless of the distance or weather.

Figure 29 Marriage Custom—Welcoming Bride in Ship

1.4.8 Architecture Culture

“You can choose wherever you want to live in Duotian”, is a catch phrase for people in this area. It indicates that as the duotian is high, you can choose wherever you want to live and be free from floods. Since ancient times, this area has been densely populated with limited land. In the past, the majority of people lived in the short and small mud-thatched cottage, some even in “dingtoufu”, which referred to a very small and short mud thatched south-faced cottage, very long in south-north direction and short in west-east direction. People always build cottages in the duotian by choosing convenient locations. Therefore, the villages were scattered around either in the east of in the west. The only unification was that they were all built south-faced towards the sun. At that time, the streets were not broad, neither were the lanes straight, all villages looked loose and natural.

1.4.9 Barge-woman and Folk Tune Singing

On top of the hundreds of “islets” surrounded by water, are beautiful yellow rape flowers in season. In the traversing rivers, we can see barge-women, with colorful kerchiefs on their head, rowing a wooden boat full of joyful tourists and singing folk tunes of water villages in the Lixiahe area. These women are called

"barge-woman". Half of the people who work in the agricultural industry are female. They are not only the main force of agricultural production, but also play active roles in the tourism reception activities after the booming of countryside tourism. Many women act as tour guides, barge-woman, as well as folk song singers. The barge-woman's singing while rowing the boat in the traversing river has become a beautiful scenery which is well-received by tourists.

Figure 30 Barge-woman in the flower sea

1.5 Remarkable landscapes, land and water resources management features

Xinghua Duotian Agrosystem is covered up by land in 30% and by water in 70%. Water is the vital resources in this area. Due to its unique water and soil utilization method, the view is different from what we have always imagined: rivers flow gently under small bridges; green-roof buildings stand on both sides of the waterways. It brings us both the rustic charm and the harmony between human and the nature.

Its water-land utilization method adopts compound mechanism of multilevel cultivation in space and multi-sequencing arrangement in time. In terms of spatial structure, farmers make full use of space to grow vegetables as well as develop aquaculture; in terms of time sequence, they adopt multiple cropping methods according to the growth features of different crops and seasonal changes so as to make the full use of the land and sunshine resources. The changing and colorful natural landscape was created by the skilled and reasonable land management.

Xinghua Duotian Agrosystem has various natural landscapes with the oilseed rape flower, water forest, and wetlands etc. There are thousands of river channels, and the scenery is exquisite. Tourists at home and abroad are attracted to the duotian to

appreciate its beauty. Among Twelve Views in Shaoyang listed in Ming Dynasty, three were in the duotian area: Fruit Garden along Rivers, Ten Mile Lotus Pond and Autumn Moon of De Sheng Lake, representing beautiful scenery of the duotian in different season. In the spring, duotian with rape flowers is like splendid yellow flower sea. In the rest of the year, duotian is exquisitely carved jade in the shiny jade plate. The Magnificent Qiandao Rape Flower Sea was listed as the top one in the ranking of China's Most Beautiful Rape Flower Seas in 2011. The Xinghua•China Qiandao Rape Flower Tourism Festival, successfully held for 5 years, has attracted over a million tourists. The impressive scenes of boating rowing in the watercourses and people walking in the rape flower sea have become the name card of Xinghua Duotian Agrosystem and are well-welcomed by tourists at home and abroad.

Figure 31 Scenery of the duotian in Different Seasons

Figure 32 Water Forest

Figure 33 Xumahuang Wetland

The water forest, covering an area of 1.33 Km^2 and located in Lizhong town, also offers impressive sceneries. This artificial ecological forest has forest in the duotian and breeds fish in the furrows. With rich water resources and traversing rivers, you can enjoy the scenery of "circuiting rivers and large amount of sequoia standing aside of the rivers". The forest contains 0.7 Km^2 of forestland and the other area is full of

water, with pond cypress (*Taxodium ascendens*) as the main tree variety and Egrets, black cuckoo, ducks as the main inhabiting birds. The towering trees, singing birds, together with jumping fish in the furrow add up into a vigorous view of the forest. It is a paradise for wildlife animals. Normally, there are over 30 thousand birds and 60 thousand in prime time inhabiting in this forest. At dusk, when birds coming home and sky darkened, it is also magnificent view to appreciate. In 1980s, in order to develop and utilize wild wetland resources, local residents made the 1 Km^2 wetland into strips of duotian to grow100 thousand pond cypress (*Taxodium ascendens*) and the dawn redwood (*Metasequoia glyptostroboides*). In several decades, they turned into a splendid water forest and become the biggest artificial wetland forest ecological protection area in Lixiahe area.

The 10.68 Km^2 Xumahuang Wetland Park located in west suburban area is a well-preserved original wetland protection zone. Rowing a boat in the Autumn Snow Lake of Xumahuang Wetland Park, you can see pieces of lotus leaves, and crowded duckweed. In the greenish and steamy background, egrets and ducks may appear all of a sudden. Staying in this park will make you feel very close to nature. The most impressive scenery is the broad and natural reed lake. With reeds swaying and dancing in the wind, you would be intoxicated by the beauty even when it is still not the blossom time of reed flowers. Besides that, you can also appreciate the beautiful sceneries of Ten Miles Lotus Pond and Desheng Lake.

Figure 34 Ten Mile Lotus Pond

Figure 35 Desheng Lake (Ancient Battlefield of military and civilian armed force beating Jin military)

2. Historic relevance

2.1 The History of Xinghua Duotian Agrosystem

According to historical records and archaeological research, Lixiahe area belonged to East sea coast area five thousand years ago. Xinghua Duotian has generally gone through changes from gulf-lagoon-lake-water net plain. Meanwhile, local farmers' livelihood also went from fishing, to a combination of fishing and agriculture and to crop farming. The water-land utilization gradually transformed from water to land.

2.1.1 Fishing and Hunting Period-Nan Dang Ancient Cultural Relics

Ancient Cultural Relics of Nan Dang Lake discovered in 1992 through archaeological excavations is only 3 Km away from Duotian Town, which obviously indicated that Duotian area shares the same ancestors with Relics of Nan Dang Lake. Human activities in Duotian area can be traced back to as early as the Neolithic Age, which is 4,200 years ago. In 2008, the Relics of Geng Jia Duo was discovered about one meter below the surface of the duotian by the archaeological survey, covering an area about 30,000 square meters. According to experts, the Relics of Geng Jia Duo can be traced back to the period of Spring and Autumn Period to the early Western Han Dynasty (800BC-160BC), 2800-2200 years from now.

Figure 36 Ancient Cultural Relics of Nan Dang Lake

Combining the findings of ancient arrowheads in Duotian town and the ancient cultural relics of Nan Dang Lake, we learned that present Duotian area was one of the major habitations of the Dongyi people in Yangtze-Huaihe river basin as early as in Shang and Zhou Dynasty. Dongyi was a joint name for nationalities living in East sea coastal area in Shang and Zhou Dynasty, also a part of ancient nationalities of China, whose main livelihood was fishing. Therefore, we could find out that Xinghua Duotian area used to take fishing as its main livelihood in the history.

2.1.2 Floating Field Period- Historical Documents Record

About 3000 years ago, the eastward-moving coastal line caused a fall of the water level in this area. In addition, with the warp brought by the Yellow River floods making the lake even shallower, it was perfect for the growing of hygrophyte such as cattail. At that time, this area was typical wetland with lakes. Ancient practitioners of duotian piled wooden frames in the swamp and covered them with soil and aquatic plants (such as turnip, i.e. water bamboo roots), which enabled the field to be raised above water. Because of its unique structure, people referred it as the floating field. As the duotian can float in the water, it raises when the water grows and falls when the water dries; this can free the farmland from being submerged.

There were related records about the Xinghua floating field in the works of famous ancient scholars of China, such as *"Jin: Biography of Mao Qu"*, "*Anthology of Su Dongpo"* by Su Dongpo in North Song Dynasty, "*The Book on Farming"* by Wang Zhen in Ming Dynasty and "*Wanling Collection"* by Mei Yaochen in North Song Dynasty. Gao Gu from Ming Dynasty described duotian in his book named

"*Inscribe the Draft of Xinghua Country Chronicles"* as "wild ducks were dancing at the turnip fields, while the wild gooses were singing over the reed islets" and Xu Qianfang recorded it in his "*Records of Natural Conditions and Social Customs of Yangzhou"* that "In Xinghua area, there were so-called lump, which is an area of several acres of land surrounded by water. This is an innovation based on the local conditions since when vegetables are grow on it in the winter, irrigation can be done by using buckets to draw water from nearby rivers; therefore good harvest of vegetables can be achieved each year".

2.1.3 Formation of the Duotian- Water Conservancy Construction and Sediment Accumulation

Since ancient times, in order to prevent floods and dredge the waterway, the Lixiahe area, where Xinghua was located, was an important area of water conservancy construction. In the second year of Dai Zong period of Tang Dynasty, Magistrate of Huainan-Li Cheng presided over the construction of "Chang Feng Weir". In the North Song Dynasty, as the magistrate of Xinghua City, Fan Chung-yen constructed the "Fan Gong Dyke" on the basis of "Chang Feng Weir", which effectively blocked the seawater from pouring from the west. The progressive water conservancy construction has offered conditions for wetland transforming into land; In addition, the Yellow River diverted to the South, which brought a great amount of sediment to Lixiahe area. Swamps in Xinghua Country in particular, were raised above water, thus ancient practitioners of duotian continued to accumulate sludge and pile up the duotian. Therefore hundreds of thousands of islets of raised land that surrounded by water were shaped for reclamation and cultivation. The initial duotian was formed.

Early years of Hongwu (reign title of the Emperor Zhu Yuanzhang of Ming Dynasty) in Ming Dynasty, Emperor Zhu Yuanzhang ordered several hundreds of thousands of southern population migrate from Suzhou and Kunshan and other places to Lixiahe area in the north of the Yangtze River. The large number of immigrants brought advanced production technology and culture to duotian area, which greatly enlarged the scale of duotian and promoted the development of this area. This great yet primitive duotian project that entirely based on manual reclamation and construction lasted till the 1990s when there was not a single piece of wasteland in duotian area to be further reclaimed and constructed.

2.1.4 Transformation of the Duotian-Result of Rapidly Expanded Population

Duotian was generally high before the 1960s, the range of height was from 2- 3 meters to 4-5 meters, and therefore they could be used for flood control. In the late 1960s, a measure called “release the shores” was carried to enlarge the cultivated area to satisfy the needs for survival of the rapidly expanded population. Local farmers lowered the raised piles by digging or connected the adjacent two or three piles by filling the furrows among them or by extending the piles towards the center of the water. In the 1980s, due to the implementation of the Household Contract Responsibility System, farmers had the ownership of the cultivated area. Since then, most of duotian was dug lower for the purpose of cultivated area expansion and cultivation convenience. In addition, the excavated soil could be sold to bricks and tiles plants or construction projects in the city to make extra profits. The raised pile suddenly became flat and low; the current average height of them is a little more than one meter. With this uniformed height, raised piles lost its well-proportioned charm of the past. Most of the raised piles we saw today are the piles that were made by local farmers after the 1980s.

2.2 Historic Meaning for the Sustainable Development of Agriculture

Xinghua is located in the Lixiahe hinterland in central Jiangsu Province. Its low-lying position shaped the area like “the bottom of a pot”. Duotian is a unique land utilization method developed by ancestor of Xinghua as a way to adapt to changes of local conditions, to tackle the threat of floods that were becoming more and more severe during the Ming and Qing Dynasty and to meet the needs of rapidly expanded population.

2.2.1 Fighting against Floods

Xinghua Area located in the southern region of the core area of the ancient Sheyang Lake. According to *Geography Record of the Whole World during the Reign of Tai Ping*, Sheyang Lake was one of the five biggest lakes in Jiangsu Province, which were 300 miles long and 300 miles wide. Since lakes were intensively distributed in that area and the connections between these lakes were unobstructed, it was very helpful in flood control and prevention. As a result, despite the fact that this was a low-lying area, floods seldom occurred. When it comes to the Ming and Qing Dynasties, especially after Pan Jixun fixed the bed of stream and attempted to wash

out the sludge of the Yellow River, large amount of sediment in Yellow River was accumulated in Subei plain and coastal areas nearby, which accelerated the siltation rate in Sheyang Lake located in the South of the Huai River.

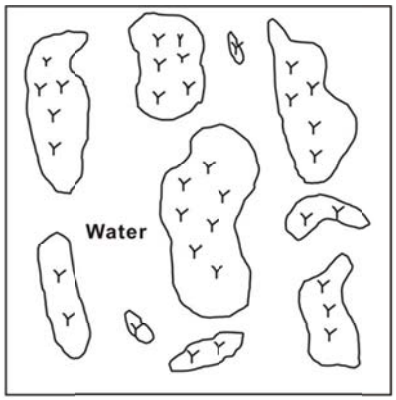


Figure 37 Morphology and Distribution Diagram of Raised Fields

Continued deposition of sediments greatly reduced the flood control and discharge capability of Sheyang Lake. When flood season came, water from other rivers and lakes pooled to the "pot-bottom" low-lying Xinghua area in astonishing speed and created the phenomenon of "All water goes to Xinghua". Double-pronged attacked by water from the upstream and seawater poured backward, Xinghua suffered from frequent floods and became the "corridor for floods". Living in this flood-stricken area, local people tried everything possible to survive. The duotian, with its relatively higher terrain, displayed its advantages when facing violent floods. With the protection of duotian, local people were free from the fear of floods. In addition, except the flats at the highest points of duotian, the slopes of them could also be used for plantation, which would guarantee the harvest of food for the family during floods seasons.

2.2.2 Food Security

Xinghua was located in the middle of the area between Yangtze River and Huai River just right beside the Great Canal. As an area with thriving commercial trades, the population grew really fast in Ming and Qing Dynasties. According to the 3rd Volume of "*Revised General History of Xinghua City"*, the population of Xinghua city is increased by 30 times from Yuan Dynasty to Ming and Qing Dynasties (table 5). Without any significant innovation in agricultural science and technology, the enormous food consumption brought by the population growth could only be solved by increasing the area of cultivated lands. Therefore, with the rapid growth of population, most of the swamps in Xinghua area were greatly cultivated. In the 17th year of Jiajing (reign title of one emperor of Ming Dynasty), the total amount of cultivated farmland in Xinghua City was 179.8km^2; according to *Comprehensive Books of Taxation and Services*, the total amount of cultivated farmland in Xinghua City was 197.95 km^2 in the Qing Dynasty. Despite the fact that Xinghua suffered

frequent floods during this period and many lands were abandoned, the total cultivated land area still increased by almost 20 km^2. As a county set up in 920 AD, Xinghua city had no available mountainous farmland or any unclaimed wasteland ready for plantation, thus the reclamation of duotian from the lake became an important source of cultivated land in Xinghua---a major agricultural county located in the middle plain of China.

Table 5 Populations in Different Historic Period in Xinghua City

Dynasty	Year	Population
Yuan Dynasty	1271-1368	8628
Ming Dynasty	1391	65020
	1412	65020
	1552	76729
	1583	129470
Qing Dynasty	1657	32998
	1796	305005
	1849	337052

3. Contemporary relevance

3.1 The Water-land Utilization model of low-lying wetland

Xinghua Duotian Agrosystem is located in low-lying and flat land with a shape as the side of an axe. Ancestors in this area creatively adapted their land into islet-like duotian according to local land and water conditions. Apart from the function of flood prevention, the duotian also turned wild lake and wetland into the “County of Vegetables”. This agrosystem is a great example showing the harmony between human and nature as well as rational utilization of water and land resources. The development and utilization modes of duotian also changed with times. In order to meet with the demand of expanded population, the previous high duotian were dug into lower ones and two or three pieces of duotian were connected into one. This would expand the duotian area and provide convenience for farming. The multi-dimensional development agricultural mode, featuring growing vegetables in duotian and breeding fish and shrimp in the furrow, embodies the ecological wisdom embedded in traditional agriculture. This mode also allows farmers to grow different crops according to seasonal changes so as to make the most of the land resources. For

places with large amount of wetland, inadequate personnel and financial support, this development mode could be the most effective one and should serve as a guide for wetland development and utilization.

3.2 Important base for high quality vegetables

Xinghua Duotian Agrosystem is located in the north subtropical humid zone. With synchronized peak period of temperature, sunshine and water, it is a perfect place for agricultural production. The duotian is piled up with lake and wetland mud with boggy soil texture. Rich in organic matter and microelement of Ca, Fe, and Mg, it is a perfect place for growing vegetables. With mild climate and clear air and water, vegetables produced here have great quality and high output compared to those in normal field. The duotian could meet all the environmental requirements to produce pollution-free vegetables.

3.3 The effective use of unique landscape resources

The unique agricultural landscape, good ecological environment and rich folklore culture are precious resources for tourism development in Xinghua Duotian Agrosystem. Rape flower duotian, water forest, Wetland Park, aquatic ecological garden and other famous scenic sites are all within the scope of Xinghua Duotian Agrosystem. By taking advantage of the high quality resources of duotian, wetland, water, and farmland, and rationally develop leisure agricultural & ecological tourism, the local economic development can be promoted and the farmer's income can be increased. It is also an effective way of dynamic protection of traditional agricultural resources. In 2013, the duotian area has received almost 2 million tourists and the amount of local residents who work in tourism reception business has reached to 3524. Apart from doing farm-work in duotian, local residents also take part in providing catering and accommodation services. By doing so, they have improved their living standard gradually. According to the income survey of residents in Ganggu Town, where "Qiandao Rape Flower" is located, one third of the household income is from tourism. In addition, the burgeoning tourism also promotes the sales of local agricultural products. The price of taro, chives and Chinese chives has increased by several times in recent years. The development of the duotian tourism has improved people's life and given them an opportunity to understand the importance for protecting this traditional agricultural resource.

3.4 Sustainable Development of Wetland Agricultural Ecosystem

The Xinghua Duotian Agrosystem is a complete and scientific ecosystem embodying the harmony between nature and people, In this area, people uses natural fertilizer and pays attention to rational planting and scientific management. Formed and fertilized naturally, with thick, soft and fertile soil, the duotian is perfect for growing vegetables. Local farmers arrange crops according to soil conditions and make the most of the land resources so that the duotian could be covered with vegetables all year around and have stronger sustainable development momentum. Governments of the Xinghua Duotian Agrosystem were dedicated to the maintenance and protection of this system. By formulating measures of water and soil erosion prevention and improving agricultural production conditions and eco-environment, the governments have played important roles in promoting its agricultural sustainable development.

3.5 Promotion and Application of Traditional Vegetable Farming Techniques

Based on the local agricultural resources, the agricultural department of Xinghua government has been dedicated to the research, integration, demonstration and promotion of key scientific research result of the Xinghua Duotian Agrosystem and explores its inner mechanism so as to solve the problems of the unbalance between agricultural production and ecological environment. In order to inherit and protect this important agricultural heritage resource and better offer service for modern agriculture, the agricultural department has started to formulate standard planting technique of duotian so as to improve the comprehensive productivity of the system. Meanwhile, the agricultural technique promotion and service department at all levels pay more attention on this work and have actively conduct research, protection and utilization projects of traditional farming techniques in order to recover traditional planting. Recently, Xinghua city has formulated and issued several provincial level standards Geographic Indication Product-Xinghua Chive (Fresh) (DB32/T618), Geographic Indication Product-Xinghua Dehydrated Chive (DB32/T606), and Pollution-free Product-Longxiang Taro (DB32/T620). By formulating production standards and promoting technological application, we could promote the development of featured agricultural industry.

4. Threats and challenges

4.1 Flood Risks caused by Lowering Duotian

Recently, with the efforts of Huai River control, the frequency of floods has been reduced greatly. Local farmers do not relay on the duotian to fight against floods anymore. In order to expand arable land and make the farming activities more convenient, massive reconstruction projects were done on the original duotian. Farmers lower the high duotian and spread the soil into surrounding water, or connect two or three duotian into one. By doing so, the height of duotian would reduce from 3-4 meters to only 1 meter above the water and the duotian area is also expanded. The area of current duotian could be as large as 3 Mu, 3 times of the one before 1949.

Table 6 Change of Water Area and Duotian

		Before 1949	Now
Water	Depth	2-4m	1-3m
	Area Percentage	40%	32%
Duotian	Height	4 m	1m
	Largest Duotian	1 Mu	3 Mu
	Smallest Duotian	0.02 Mu	0.02Mu
	Pieces of Duotian/Mu	5	4

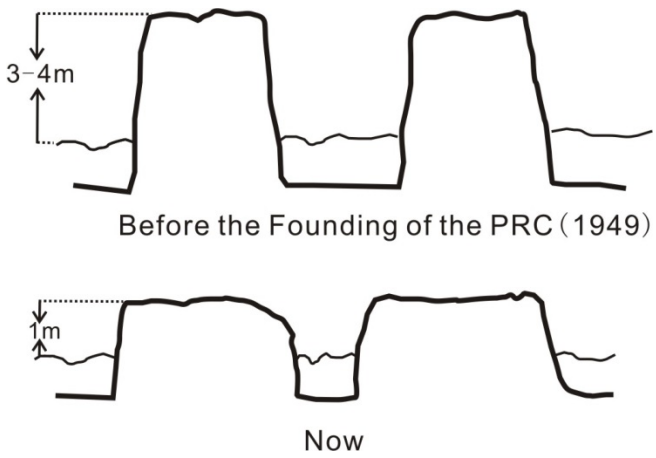


Figure 38 Change of the Duotian Height

However, the reconstruction has changed the original beauty of duotian when they were in different sizes and shapes and surrounded by water. In addition, with the decrease of brook numbers and water surface area, the flood prevention ability of these brooks is also affected; thus lowering of duotian height has increased the possibility of floods.

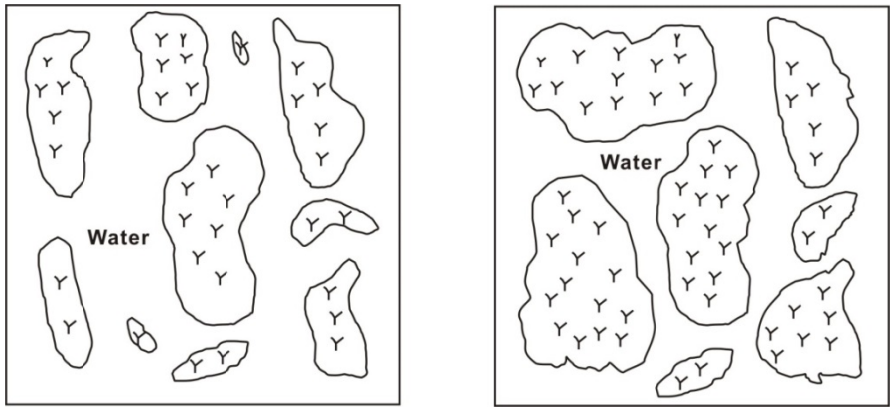


Figure 39 Increase of Duotian Area and Decrease of Water Area

4.2 Destruction of Duotian brought by Urbanization Construction

Figure 40 The Agricultural Land in Hejiaduo Occupied for Urbanization Construction

With the development of industry on countryside, some land has been used as industrial land; as population keeps expanding and people's living standard improving, people start to build houses on arable land. Some village building projects have reached the farmland. Because Duotian town is located in suburban area, its arable lands have been used for developmental construction due to the southward and eastward city planning. According to statistics, over 2km^2 land was taken over in three villages of Chengdong, Xinlianhe, and Nanchou in Duotian town. In addition, the construction projects of highway and roads for connecting village also occupied many lands, leading to potential decrease of the duotian area. It is urgent to protect the Xinghua Duotian Agrosystem.

4.3 Serious Impacts from Modern Agricultural Technology

In recent years, with the drainage of young labor, energy consumption farming methods such as dredging up the sludge, scraping the sludge and gathering the aqua-plants are not frequently used anymore. The traditional duotian farming

techniques are facing lost. As less people are conducting traditional farming methods, natural fertilizers of river mud and aqua-plants are also seldom used. With the increasing usage of compound fertilizer and inorganic fertilizer of urea, the quality guarantee of agricultural products, especially that of vegetables is challenged. The infrequent usage of traditional farming methods of dredging up the sludge and scraping the sludge will lead to the silting up of furrows; overgrow of aqua-plants, serious eutrophic phenomenon and degradation of farming environment in the duotian.

4.4 Inadequate Personnel and Financial Support

Similar as that in the other villages, farmers in the Xinghua Duotian Agrosystem are mainly middle-aged and elder people, normally with low educational level. Therefore, it is very difficult for them to meet the development demand of agricultural modernization. In turn, it would do harm to the maintenance and development of duotian system. Vegetable growing in the duotian area still takes the contracted household as a unit. Therefore, it has several disadvantageous characteristics such as scattered land, small growing scale and weak development momentum. Besides, the development of modern effective agricultural on the basis of inheriting traditional one calls for sufficient financial support.

5. Practical considerations

5.1 Ongoing efforts to promote the GIAHS

In recent years, local government of Xinghua City has carried a great deal of work in the following aspects in order to protect duotian landscape and promote duotian culture exploration:

(1) Actively applying for China's NIAHS: In May 2013, the Xinghua Duotian Agrosystem in Jiangsu province was identified as the first batch of China's NIAHS by Ministry of Agriculture. The mayor of Xinghua city made commitment on the conservation and development of the Xinghua Duotian Agrosystem on behalf of People's Government of Xinghua City.

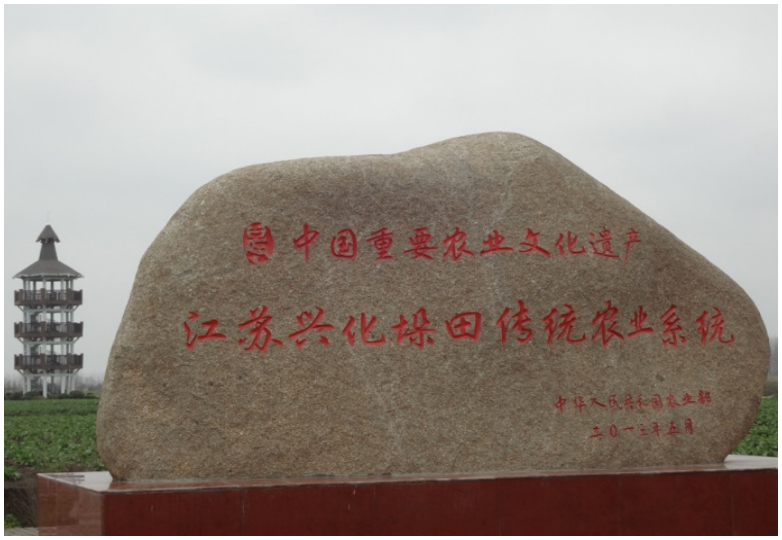


Figure 41. The Xinghua Duotian Agrosystem, Jiangsu Province was identified as the First Batch of China's NIAHS

(2) Actively applying for GIAHS: In May 2013, the Xinghua Duotian Agrosystem, Jiangsu province was identified as a GIAHS candidate site by Ministry of Agriculture. The local government has actively conducted application work; built application leading group; held several exchange meetings; and leaned experience from other GIAHS pilot sites and candidate sites.

(3) Carrying out various forms of promotional activities: actively taking part in related activities of agricultural heritage; summarizing related information on the conservation and development of the Xinghua Duotian Agrosystem in time; The 1st ERAHS Conference will be held in Xinghua city on 7-10 April 2014.

(4) People's Government of Xinghua city is actively formulating the conservation plan and exploring different values of the Xinghua Duotian Agrosystem, so as to promote its conservation and development.

(5) After experts and scholars were organized to study the agricultural, ecological and folklore culture of this system through profound survey and exploration, two books were published, including "*Prose Works on the Duotian"* from Inner Mongolia Publishing House and "*Magic Duotian"* from Southeast University Press.

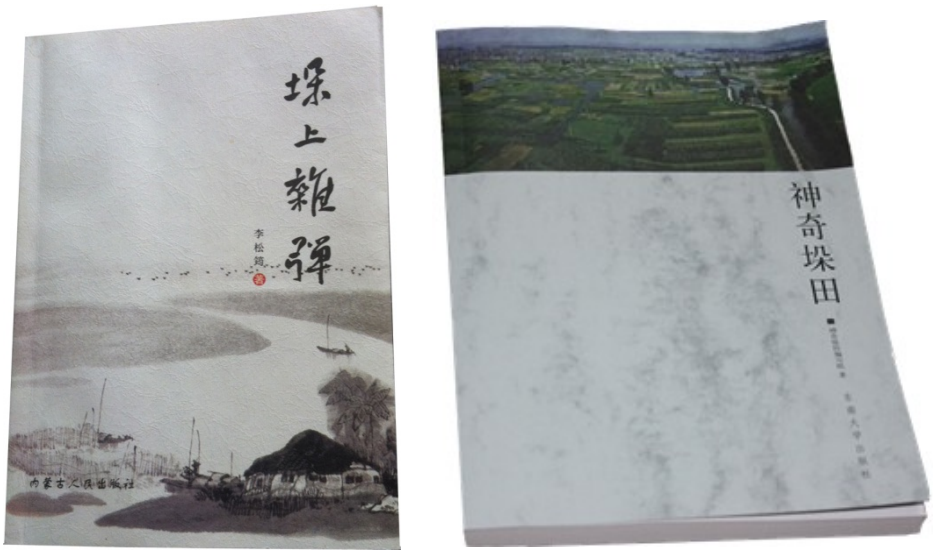


Figure 42 *Prose Works on the Duotian*（Left）*Magic Duotian*（Right）

(6) After appointing experts to conduct profound investigation on the ecological landscape and historical culture of this system, the initial strategic plan had been drafted for the protective development of the Xinghua Duotian Agrosystem.

(7) Actively applying for the state-level ecological township.

(8) Building vegetable raw materials production base with the leading of enterprises engaged in processing agricultural products and promoting standardized production and growing procedures, and increasing the ratio of green & pollution-free vegetable production.

5.2 Potentials and opportunities for sustainability and management of the GIAHS

5.2.1 Development Potential

(1) The duotian landscape has been listed as one of the 7th batch Provincial Level Culture Relic Protection Sites in Jiangsu province for its immovable cultural relics. The local government is formulating plans to protect it. This will serve as the legislative base for the conservation and inheritance effort of the Xinghua Duotian Agrosystem.

(2) In terms of city regional development function orientation, the People's Government of Xinghua city has tentatively placed duotian area as an eco-agricultural protection and sight-seeing zone. This area will be dedicated to develop the tertiary industry service sector and would not set up new industrial

enterprises. This will lay a solid planning base for the conservation and inheritance effort of the Xinghua Duotian Agrosystem.

(3) Some tourism cultural experts and investors have shown great interest in protection duotian landscape and developing cultural tourism and sightseeing business on the basis of profound conservation. The negotiation and initial planning have been on the way. This will serve as a development base for the conservation and inheritance effort of the Xinghua Duotian Agrosystem.

5.2.2 Development Opportunity

(1) The Xinghua Duotian Agrosystem, a unique wonder not only in China, but also in the world, is an important agricultural heritage. Governments at all levels attach great importance on the conservation and development of the Xinghua Duotian Agrosystem and state that protecting and inheriting it is preserving a miracle of Chinese agricultural culture. By doing so, people at home and abroad could learn about the wisdom of Chinese farmers, understand the unique charm of Chinese traditional farming culture and know the rich meaning of Chinese traditional culture. At the same time, the endeavors of protecting and inheriting duotian agricultural heritage will serve as a precious experience and model for construction of eco-agriculture and promotion of green & nuisance free agricultural products.

(2) With the improving of living standards, people attach more importance on food safety. By protecting and inheriting duotian agricultural heritage and combining traditional farming culture with modern civilization, we could develop modern agriculture on the basis of traditional culture, improve product quality and productivity in duotian crop farming. Thus, we could further increase farmer's income and promote construction of socialism new countryside.

(3) Sustainable tourism has enjoyed rapid development in recent years. Thus, we could combine the efforts of protecting and inheriting duotian agricultural heritage with local tourism and sightseeing business and develop ecological tourism and cultural tourism on the basis of preserving duotian landscape and agricultural heritage. By doing so, we could gain new driving force for local economic development, offer new channel to increase local farmer's income, and provide succeed experience and proven practice for the integration of rural-urban

continuum into the business districts in urban areas as well as the development of new services.

5.3 Expected impacts of GIAHS on society and ecology

5.3.1 Social impacts

The Xinghua Duotian Agrosystem is a unique disaster resistance and alleviation production mode and land utilization method that farmers developed in the process of adapting to local natural conditions. Originated from traditional farming method, it offers a natural survival mode for farmers to live in harmony with nature. Nowadays, the conflict between the increasing population and limited land resources has made it a difficult task to realize this harmony in the limited land. The Xinghua Duotian Agrosystem has set a great example to address this issue and could serve as a good experience for similar areas to utilize land rationally and develop survival mode that is in line with local conditions. Conducting systematic conservation of the Xinghua Duotian Agrosystem can not only better protect this agricultural heritage and its related resources, traditional techniques & culture, but also raise the prestige of the Xinghua Duotian Agrosystem and promote the development of local ecological agriculture and sustainable tourism. Thus, we could support social and economic development and realize a harmonious relationship between human beings and nature.

5.3.2 Ecological impacts

With the improvement of science and technology and the intensive utilization of land, great achievement has been made in agriculture. However, it also caused increasingly serious ecological and environmental problems. The traditional farming methods have exclusive advantages in adapting to climate changes, providing ecological system service and offering more varieties of products. For example, local farmers always raise canal mud besides duotian to grow taros in order to prevent collapse and erosion of duotian. In addition, since GIAHS project emphasize the protection of traditional agriculture and its related biological and cultural diversity, it could play an active role in environmental protection in rural areas, and offer new opportunities for solving environmental problems here.

5.4 Motivation of multi-stakeholders

5.4.1 Local community

Local residents have shown great enthusiasm in protection of the Xinghua Duotian Agrosystem. Firstly, this traditional agrosystem is what their livelihood depends on. They mainly participate in vegetable growing and aquaculture business here. The local ecological environment can be protected while conserving this traditional agrosystem, which will ensure the high quality of agricultural products. By doing so, we could increase the market price of local agricultural products, increase farmers' income and improve their living standards. Secondly, the conservation effort of the Xinghua Duotian Agrosystem will raise its prestige and promote sustainable tourism. Thus, it will also increase local residents' income. Finally, by protecting and advertising the Xinghua Duotian Agrosystem, local residents will gain a sense of belonging and cultural pride towards their hometown.

5.4.2 People's Government of Xinghua City

Local government of Xinghua city has been strategically leading the efforts of conserving and developing duotian from managerial level. Firstly, a great deal of work has been done to conserve the precious traditional agricultural mode from the influence of urbanization development and preserve this valuable treasure for future generations. Secondly, local government has tried to increase people's awareness of protecting duotian by advertising the Xinghua Duotian Agrosystem so as to realize better conservation goals. In addition, the economic development can be enhanced and the income for local residents can be increased by building agricultural product with GIAHS logo and creating organic industry chain. Finally, local government also endeavors to rationally develop duotian tourism and promote themed sustainable tourism combing sightseeing, leisure, vacation and shopping on the basis of agricultural heritage protection. By doing so, the popularity of Xinghua can be increased, the related industries can be promoted as well as this area can be improved in both cultural and economic terms.

5.4.3 People's Government of China

The Xinghua Duotian Agrosystem is a classic traditional agricultural production model with long history and of high cultural and economic value. The national government would offer great support to this project. Firstly, it is important to protect

this agricultural heritage with high historical value. Secondly, it can set a good example for other agricultural ecological systems. Besides, with the active influence of GIAHS, it can support regional cooperation, fully realize the economic and ecological benefits of the agricultural products and promote the sustainable development of eco-agriculture in this system.

5.4.4 Related Enterprise

Enterprises related to Xinghua duotian featured agricultural products and tourism hope that their products could get higher value with the help of GIAHS. In that case, their product value and popularity will be enhanced and economic output could be increased, so as to realize long term development of these enterprises.

5.4.5 Visitors

In order to enjoy the beautiful scenery of duotian landscape and enjoy the delicious local food, tourists would also support the protection effort of the Xinghua Duotian Agrosystem. Their main motivation lies in their wish to appreciate the splendid view.

6. Dynamic Conservation Plan for GIAHS Selected Site

6.1 Baseline description

6.1.1 A Series of Conservation and development activities have been done

（**1**）To put “protection of traditional farming in duotian” into the government work report in 2013, to strengthen the protection, and apply for the Globally Important Agricultural Heritage Systems (GIAHS) actively; on 18 March 2013, *Suggestions for Strengthening the Systematic Management of Traditional Farming in Duotian by the People’s Government of Xinghua City,* issued by Xinghua Government, has played a leading role in the traditional farming protection of the Xinghua Duotian Agrosystem; on 31 July 2013, the Mayor of Xinghua City, the representative of the People’s Government of Xinghua City, has made his promise to protect agricultural heritage, the landscape of duotian, related biological methods, biological diversity, knowledge system, cultural diversity and agricultural landscape. Meanwhile, the government is going to have long-term plan for protection and development by adopting dynamic protection, practical management and sustainable methods to

protect this agricultural heritage as well as improving the living standards of local residents.

（2）To enhance publicity, form a working group to investigate, excavate, and reorganize thoroughly upon the traditional agricultural culture, ecological culture and ethnic culture in duotian. The works that have already been published are "*Prose Works on the Duotian"* by Inner Mongolia Publishing House and "*Magic Duotian"* by Southeast University Press;

（3） To implement tasks and strengthen execution. To dredge the neighboring rivers and the main production rivers, to improve the environment actively; to consummate the infrastructure of villages, prohibit the construction of illegal structures, and develop villages based on laws and regulations; to set agricultural products processing enterprises as leaders in constructing the production bases of vegetables, to promote standardized production and plantation, to increase the portion of the output of green and pollution-free vegetables;

（4）To mobilize the entire personnel and strengthen the construction of both software and hardware. Xinghua has been selected as "the Hometown of Fork Arts in Jiangsu Province", "Strong Sports Town in Jiangsu Province" and "Ecological Town in Jiangsu Province" successively. It is also approved as one of the first batch "Nationally Important Agricultural Heritage Systems (NIAHS)" successfully. Local government will apply for National Eco-city and National Environmentally-friendly Demonstration City in 2014 according to their development plan;

（5）To engage experts to conduct investigation to the ecological landscape of duotian and its historical aspects. The investigation team has already made draft plan about the conservation and development of the Xinghua Duotian Agrosystem.

6.1.2 Principles for the dynamic conservation plans were set up

（1）To Combine conservation with development

Agricultural heritage is typically embodying of the harmonious and dynamic equilibrium achieved by human beings and nature in the process of long-term production. The Xinghua Duotian Agrosystem, as a kind of unique cultivated landscape, is the best example of utilizing, transforming, and harmonizing the nature by the local farmers. This ecosystem represents the core of sustainable development. Each component within the system is accord with the laws of nature. While setting out strategies of agricultural heritage protection and development, the government should

combine conservation with development in order to achieve sustainability in the perspective of ecology, economy and society.

（2）To Associate Government Guidance with the Market Operation

Duotian area abounds in vegetables and has already established the industry chain of plantation, processing and sales, and achieved the "integration among trade, industry and agriculture". Vegetable processing industry has already become the featured and pillar industries in this area. Besides, tourism is booming in this area. All of the governmental guidance, market operation and demand of the market development should be taken into consideration when the conservation and development plan is formulating, so as to achieve the integrated development among the primary, the secondary, and the tertiary industry.

（3）To Connect the Pieces with the Whole Pictures

When the conservation and development plan is formulating, each factor in duotian should be completely considered. Put "protective development of the landscape in duotian" into the design of the tourism development pattern, and achieve the protection and development of agricultural heritage in duotian by forming featured travel routes.

（4）To Engage Different Stakeholders and Share Benefits

When the conservation and development plan is formulating, the government should consider the profits of investors, the income of the local residents, and the legal revenue of the government. The Government should attach great importance on the protection of the interests of farmers as well as increasing the income of farmers, and finally mobilize the initiatives of farmers in the whole process.

6.1.3 The multiple values of the system have been studied

（1）Ecological Value

The Xinghua Duotian Agrosystem remains high ecological values, including: (a) biodiversity value. This system has a history of abounding in producing various fruits and vegetables. The crops and livestock are diversified as well. The agricultural system has more than 160 wild animals and 300 wild plants. (b) Water and soil maintenance value. The Xinghua Duotian Agrosystem has very rich water and soil resources. The traditional planting methods of local farmers can effectively conserve water and soil. With the intention of making full use of spaces, local farmers plant large number of vegetables as well as trees on the duotian. (c) Climate adjustment

value. In the forest of duotian, the radiation is lower that general fields by 45%-52%, temperature lower than the rest of the area by 0.8-1℃, the humidity is higher than normal fields by 3%-5%.

（2）Economic Value

The sources of income in duotian are: aquaculture, vegetable growing, and the newly emerged tourism with the theme of rape flower tour. By taking full advantage of the water and soil resources, duotian has largely increased its economic efficiency. Duotian Town produces great number of vegetables with good quality. The most famous pollution-free vegetables here are Longxiang taro and chive. According to statistics, the income gained from Longxiang taro growing is more than $6*10^6$ RMB/km^2 per year, the income brought by chives is nearly $1.5*10^7$ RMB/km^2, which also becomes the major income of local farmers; dehydrated vegetable processing becomes the pillar industry in this area. Duotian are famous for its abundant water resources, which could offer great support for various kinds of fish and shrimps in this area. Aquaculture becomes the second traditional industry just after vegetable industry, and this area is also regarded as “Freshwater Products Museum in Northern Yangtze River”.

（3）Cultural Value

Xinghua was influenced by both Chu and Wu cultures in history. The profound cultures have cultivated many educated people in this area, and created various folk arts. Litterateur Shi Naian once lived here, and Xinghua is also the birthplace of Zheng Banqiao. The folk arts here include: Stilts Dragon in Gaojiadang, singing activities in Duotian, and Farmer Painting and so on, which are all best reflections of the regional characteristics and sceneries. In 2002, Duotian Town became the only town in Northern Jiangsu to be nominated as “Folk Arts Town in Jiangsu Province”. Besides, the food culture here is also famous, the cuisines made by taros and chives are incredibly delicious.

（4）Landscape Value

By now, the islet-like farmland landscape of duotian, has not been discovered elsewhere either nationally or globally, except in Xinghua City, Jiangsu Province or other small parts of Jiangyan area nearby. As a spectacular sight, such large-scaled duotian landscape is unique in China and even globally. The traditional agricultural systems of duotian vary, including rape flower duotian, and forest-fishing ditch

duotian, Wetland Park and so on. Great numbers of islets and rivers make unique beautiful scenery of a region full of waters and lakes. This special landscape has been awarded as one of the "Top Ten Discoveries of the Third Archaeological Survey in Jiangsu Province" and one of the "Most Important Discoveries of the Third Archaeological Survey in China". In 2011, it was listed as one of the 7th Batch Provincial Level Culture Relic Protection Sites.

（5）Tourism Value

The precious tourism resource of duotian is formed by the unique landscape and development of land and water resource of. The Xinghua duotian presents brand new beautiful scenery of regions of waters and lakes. The new scenery is different from what we have always imagined: rivers flow gently under small bridges; green-roof buildings stand on both sides of the waterways. Xinghua duotian bring us both harmony between human and the nature, and the rustic charm. Four seasons in the duotian are all beautiful with different characteristics: Summer and autumn are the seasons of harvesting, fragrance of fruits spreads all over the air. In winter, duotian covers by thick snow, which will bring a sense of holiness and purity. With more and more tourists coming and visiting the rape flower fields, water forest, Xumahuang wetland, the tourism in duotian becomes increasingly popular nowadays.

In 2013, the Fifth Xinghua•China Qiandao Rape Flower Tourism Festival received over 1 million people, that was also the fifth time that Xinghua had successful hosted this festival. Because of which, the popularity and reputation of Xinghua duotian has been largely improved domestically.

6.1.4 The functional areas of the system have been Delimited

Xinghua duotian mainly distribute in Duotian Town, Ganggu Town, Lizhong Town, Xijiao Town, Zhoufen Town. The southeastern corner is at Gaojiadang Village, Duotian Town, Xinghua City, which is located at N32°52'48.31" and E119°55'49.46". The eastern corner is at Zhuye Village, Zhongbao Town, Xinghua City, which is located at N33°02'55.46" and E119°50'03.56". The northeastern corner is at Cuiyi Village, Zhoufen Town, Xinghua City, which is located at N33°07'11.87" and E119°46'24.67". The northwestern corner is at Cuier Village, Zhoufen Town, Xinghua City, which is located at N33°06'50.05" and E119°43'47.07". The southwestern corner is at Guanlin Village, Hengjing Town, Gaoyou City, which is located at N32°56'03.53" and E119°43'04.72". The southern corner is at Shuangtan Village,

Zhaoyang Town, Xinghua City, which is located at N32°56'00.46" and E119°43'57.99". The total area of the Xinghua Duotian Agrosystem is 312 km^2 with the core area of 40 km^2.

Duotian Town covers 16.67km^2. The northwestern corner is at Luzhouxi Village, Duotian Town, Xinghua City, which is located at N32°55'28.32" and E119°53'37.89". The northeastern corner is at Luzhou Village, Duotian Town, Xinghua City, which is located at N32°55'35.21" and E119°55'41.77". The southwestern corner is at Nanyuan Village, Duotian Town, Xinghua City, which is located at N32°52'13.83" and E119°53'31.64". The southeast corner is at Gaojiadang Village, Duotian Town, Xinghua City, which is located at N32°52'48.31" and E119°55'49.46".

Ganggu Town covers 4.33km^2. The northern corner is at Wanwang Village, Ganggu Town, Xinghua City, which is located at N33°03'42.03" and E119°48'55.16". The southern corner is at Zhouhan Village, Ganggu Town, Xinghua City, which is located at N33°01'19.08" and E119°48'47.69". The eastern corner is at Zhuye Village, Zhongbao Town, Xinghua City, which is located at N33°02'55.46" and E119°50'03.56". The western corner is at Wanwang Village, Ganggu Town, Xinghua City, which is located at N 33°02'30.03" and E 119°47'59.82". The place is famous for rape flowers.

Lizhong Town covers 8.67km^2. The northwestern corner is at Lizhong Town, Xinghua City, which is located at N33°03.997' and E119°42.121'. The northeastern corner is at Lizhong Town, Xinghua City, which is located at N33°04.217' and E119°43.532'. The southwestern corner is at Caowang Village, Lizhong Town, Xinghua City, which is located at N33°01.737' and E119°42.427'. The southeastern corner is at Lizhong Town, Xinghua City, which is located at N33°01.810' and E119°43.753'. This place is famous for its water forests.

Xijiao Town covers 6.33km^2. The northwestern corner is at Weian Village, Xijiao Town, Xinghua City, which is located at N32°58'44.83" and E119°43'14.04". The northeastern corner is at Huanghua Village, Lizhong Town, Xinghua City, which is located at N32°59'08.59" and E119°44'12.06". The southwestern corner is at Guanlin Village, Hengjing Town, Gaoyou City, which is located at N32°56'03.53" and E119°43'04.72". The southeastern corner is at Shuangtan Village, Zhaoyang Town, Xinghua City, which is located at N32°56'00.46" and E119°43'57.99". This place is famous for Xumahuang Wetland Park.

Zhoufen Town covers 4.0km^2. The northwestern corner is at Cuier Village,

Zhoufen Town, Xinghua City, which is located at N33°06'50.05" and E119°43'47.07". The southwestern corner is at Xiegou Village, Zhoufen Town, Xinghua City, which is located at N33°04'18.76" and E119°44'09.64". The northeastern corner is at Cuiyi Village, Zhoufen Town, Xinghua City, which is located at N33°07'11.87" and E119°46'24.67". The southeastern corner is at Cuisan Village, Zhoufen Town, Xinghua City, which is located at N33°04'40.90" and E119°46'32.00".

Table 7. Distribution of Duotian in the Xinghua Duotian Agrosystem

Location	**Area（km^2）**	**Villages**	**Typical Landscape**
Duotian Town	16.67	Luzhou,Wangheng,Desheng, Gaojiadang,Zhengbei,Zhang zhuang,Lingqu,Yangdang,Zh angpi,Shenjia,Shuichan,Huxi	Duotian
Ganggu Town	8.67	Dongwan, Wanwang, Xiaguang	Rape Flower
Lizhong Town	4.33	Susong,Caodong	Water Forest
Xijiao Town	6.33	Xuyu,Mahuang	Xumahuang Wetland
Zhoufen Town	4.00	Cuiyi,Cuier,Cuisan,Cuisi, Xiegou	Fishery Ecological Garden
Total	**40.0 （about 6000 Mu）**		

6.2 Planning activities for dynamic conservation of the system

In order to promote the conservation and development of the Xinghua Duotian Agrosystem, a series of activities will be taken. The conservation measures include enhancing the protection of agricultural ecology, agro-culture and agricultural landscape. The development measures include promoting ecological products, sustainable tourism, and the cultural awareness for the traditional agricultural heritage (table 8).

Table 8. Conservation and development activities for the Xinghua Duotian Agrosystem

Content	Action	Responsible Department	Implementation Time	Detailed Activities
Enhancement of Agricultural ecology protection	Investigation and resignation of the size of duotian	Agricultural Department	2013-2014	1. Investigations of the size, rivers, water, and agricultural conditions, collect data, and establish a database of duotian.
	Enhance Agricultural Heritage Site Investigation	Agricultural Department	2013-2020	1. Real-time detection on the biodiversity changes within this area. Recover traditional species growing on the basis of protecting biodiversity stability.
				2. Renovate environment of this area and enhance supervision. Strengthen prevention and control of agricultural non-point source pollution
				3. Standardized production and processing of ecological products, establish supervision, reward and punishment system.
				4. Inspection on vegetables output of this area
	Duotian recovery, rivers dredging, roads improvements	Water Conservancy Department, Road Transport Department	2013-2014	1. Recover the original landscape and ecological system, actively dredge rivers in neighborhood, and achieve the final goal of making duotian taller, river channels wider, and water clearer.
				2 Improve the transport accessibilities by improving the conditions of rivers and bridges.
	Investigation and Protection of Agricultural species	Agricultural Department, Forestry Department	2013-2014	1. Investigation of agricultural products, wild animals and plants, agricultural resources and species of domestic animals.
				2. Collect and Protect featured species within the area.
	Integrated Pest Management	Agricultural Department	2013-2020	1. Use traditional methods of pest management instead of using pesticide, use organic fertilizer and farmyard manure instead of chemical fertilizer.
	Life Pollution Control	Environmental Protection Department	2013-2020	1. Dispose life wastes in landfills. Build life wastes collection regions at every 30 meters service radius in the core protection area.
				2. Set public toilets at every 400 meters near the main roads

				in villages, and dispose excrements in designated system.
	Drainage and Sewage	Environmental Protection Department	2013-2020	1. Set sewage treatment plants to meet the standards of water quality, after which, the water can be used in irrigation, production and recycling.
				2. The wastes that cannot be recycled in sewage treatment plants should go to septic tanks, biochemical pools and biogas digesters.
Enhancement of Agro-culture Protection	Agricultural Culture Investigation and Collection of Duotian	Cultural Relics Department	2013-2014	1. Conduct thorough investigation on traditional agricultural culture, folk arts, folk artists, skills and folk customs, proverbs, songs, poetry, and ancient buildings, etc.
				2. Research on the cultural resources and histories of duotian.
	Duotian Ethnic and Cultural Training Class	Culture And Broadcast Department, Agricultural Department	2013-2014	1. Hold ethnic and cultural training classes regularly and people who attend should include heads of government at every level, and farmer representatives.
	Establishment of Agricultural Culture Research Center	Culture And Broadcast Department	2013-2014	1. Conduct deep investigation of agricultural culture, ecological culture and ethnic culture in duotian.
				2. Publish series works of the Xinghua Duotian Agrosystem
				3. Advertising video shooting about the Xinghua Duotian Agrosystem
	Traditional Culture Temple Fair	Local Government	2013-2020	1. Stilts Dragons in Gaojiadang, Panguan Dance in Luzhou, Flower-drum dance, paper carvings and framing in Xinxuzhuang, and Sketch paintings, farmer paintings all have their own characteristics and artistic values.
	Application of Intangible Cultural Heritage and Cultural Relics Protection Units	Local Government	2013-2020	1. Within the period of implementation, the government should take ancient buildings protections and intangible cultural heritage into considerations.
Enhancement of Agricultural Landscape Protection	Research of the Landscape and Protection of	Water Conservancy Department, Construction Department	2013-2014	1. Conduct investigations towards the landscape, water quality and construction of farmlands, land utilization and building utilization, and establish a database.

	Duotian			2. Establish a specialized agency and conduct supervision on landscapes of villages to avoid illegal construction
				3. Protection of water forests, wetland, and fishery ecological garden.
	Ancient Building Repair and Village Renovation	Construction Department	2013-2014	1. Repair the repairable ancient buildings, for those cannot be repaired, keep them if no negative effects created.
				2. Have strict controls on building modern structures and Put a "vintage" style on modern buildings.
				3. The designs of the buildings should have a standardized style, and individuals will not be allowed to decorate the exteriors of buildings at their own wills.
Promote the Development of Ecological Products	Establishment of Aquatic Product, Crop and Vegetable Base	Local Government, Agricultural Department	2013-2020	1. Define the base of organic food production, green food production and pollution-free food production. Each base should follow strict production standards and management.
	Standardized Production	Agricultural Department	2013-2020	1. Promote the existing standards, normalize the vegetable and water products production by following standardized production procedures.
				2. Establish a thorough supervision, reward and punishment system to encourage corporations, which follow the standard procedures, and punish those who do not follow.
	Branding of Featured Farming and Sideline Products	Local Government, Related Enterprise	2013-2020	1. Develop agricultural eco-products as well as featured agricultural products so as to appreciate the products.
	Promotion of Featured Farming and Sideline Products	Local Government, Related Enterprise	2013-2020	1. Promote all kinds of agricultural sideline products by using different ways and actively take part in agricultural sideline exhibitions and promoting activities.
	Quality Authentication Featured Farming and Sideline	Agricultural Department, Local Government, Related Research Institutions	2013-2020	1. Based on the requirements of FAO, establish an authentication committee represents by FAO, MOA (Ministry of agriculture), the People's government of Jiangsu Province, and local governments, and develop the

	Products			brand authentication standards of Xinghua Duotian Agrosystem.
				2. The production base should work on the authentication of agricultural heritage. Based on their own development conditions, achieve organic authentications of various agricultural sideline products.
Promote the Development of Sustainable Tourism	Tourism resources survey and evaluation	Tourism Department, Local Government	2013-2020	1. Conduct general survey on tourism resources, especially on intangible historical and cultural resources in the area, and build regional tourism resources database.
	Tourism spots and routes design	Tourism Department, Local Government	2013-2020	1. Design featured tourism spots and routes, which can meet the need of modern tourism by taking into consideration the sustainable development of tourism
	Featured tourism products development	Tourism Department	2013-2016	1. Rely on duotian landscape and upgrade sightseeing products;
				2. Give full display of the oilseed rape flower sea tourism resources in Thousand Islands and promote agricultural sightseeing and agritourism;
				3. Fully develop forest leisure tourism and aquatic tourism activities with focus on the Aquatic Forest Park in Lizhong town;
				4. Develop folk-custom experience tourism in the duotian and ancient folk houses in Shagou.
				5. Profoundly develop wetland science popularization and educational tourism depending on Xumahuang Wetland Park.
				6. Explore farmhouse gourmet tour with the focus on Aquaculture Ecological Park in Zhoufen Town.
	Tourism transportation system construction	Road Transport Department, Tourism Department, Local Government	2013-2020	1. The transportation lines in the heritage sites should form a circuit so as to connect important tourism spots and development regions.
	Tourism infrastructure	Road Transport Department, Tourism Department,	2013-2020	1. Build public parking lots, toilets and tourism signs.
				2. Gradually implement no automobile policy in protection

	construction	Local Government		zone and realize zero auto-pollution. 3.Tourists should take internal transportation in the tourism spots, and we should build large parking lots and set adequate parking space according to the different tourism spots.
Promote the Development of Cultural Awareness for the Traditional Agricultural Heritage	Science Popularization and educational training	Local Government	2013-2020	1.Edit reading materials for leading cadres, practical technique handbook for farmers, and textbooks for primary school and junior high school with information related to Xinghua Duotian Agrosystem; 2.Introduce agrosystem knowledge in school exhibitions and entrance education, and cultivate local's resident's deep affection and pride towards the duotian; 3.Build and enhance the agricultural technique promotion and training system, made customized training plan for workers learning technique and promote scientific and technological training about the Xinghua Duotian Agrosystem;
	Media promotion	Local Government	2013-2020	1.Invite TV station and famous TV program host and director to broadcast and film documentary or film about the Xinghua Duotian Agrosystem 2.Promote the Xinghua Duotian Agrosystem with various media and give full display to the role of internet and new media; 3.Publish books on the protection of the Xinghua Duotian Agrosystem; invite famous writer, photographer to write or take photos of Xinghua Duotian.

6.3 The strategy for threats and challenges

6.3.1 Strategies to Cope with Potential Flood Caused by Lowering Duotian

In order to cope with the potential flood caused by lowing duotian, it is necessary to conduct survey and registration of the size and scale of the duotian and to recover the original landscape and ecological system in the Xinghua Duotian Agrosystem. The plan to "make the duotian taller, the river wider and the water clearer" can be realized by actively dredging the surrounding rivers and main production river, and enhancing the related flood prevention projects at the same time.

6.3.2 Strategies to Cope with Destruction of Duotian Brought by Urbanization Development

In order to cope with the destruction of duotian brought by urbanization development, it is necessary to formulate regulations on the Protection of the Xinghua Duotian Agrosystem, build up long-term protection mechanism, put forth unified land use plan by taking the urban and rural development as a whole, change the development style of cities to minimize the impacts of urbanization on the system, list the traditional agricultural region as the basic farmland protection areas and a key work of local government for its effective protection, and improve the awareness of local government especially urban construction department on protection of the system.

6.3.3 Strategies to cope with the great Impacts from Modern Agricultural Technology

In order to cope with the great impacts from modern agricultural technology, it is necessary to make full use of media to propaganda the Xinghua Duotian Agrosystem, enhance the perception of local people about the system, strengthen the traditional characteristics of the system, make the local people realize the great value of this agricultural heritage, improve Duotian green, organic vegetable prices and sales channels by regulating the market price, put forward effective measures to prevent the use of chemical fertilizers and pesticides, promote the ecological agriculture concept by local department of agriculture, supervise local vegetable production in

strict accordance with production standards by agricultural heritage, and minimize the impacts of model agricultural technologies.

6.3.4 Strategies to Cope with Inadequate Personnel and Financial Supports

In order to raise funds, increase investment and cultivate agrosystem conservation professionals, the People's Government of Xinghua City shall actively raise fund and establish a series of policies to support it. The social capitals can be attracted by building diversified fundraising channels, actively launching and competing for new projects and establishing compensation mechanisms. The method of "active delivery and active introduction of talents" shall be adopted to enhance the cultivation of culture heritage conservation professionals.

6.4 How to obtain and use protection funds

6.4.1 Broaden the Funding Channels

In order to obtain sufficient funding to promote the protection of the Xinghua Duotian Agrosystem, the local government will need broaden the sources of funding, establish multi-channel fund-raising methods and establish special Agrosystem Protection Fund that only works for this purpose. The fund can be primarily raised through the following channels:

(1) GEF: the FAO (Food and Agricultural Organization) will apply for special funds from GEF to support the protection of agriculture heritage in various countries.

(2) Eco-Compensation: as a reasonable way of compensation, eco-compensation will play a vital role in the protection of Xinghua Duotian Agrosystem. The loss of economic benefits of farmers due to the heritage protection shall be compensated through reasonable means and amount. This includes governmental transfer payment from the exchequer, compensation from related industries (such as organic agriculture, tourism industry, etc.). These compensations can be part of the special funds for the protection of Xinghua Duotian Agrosystem.

(3) Social funds from different sources: for example, it is possible to allow the beneficiaries of GIAHS, including enterprises and individuals, to directly devote part of their funds as back-investment for the special fund.

(4) Special funding: establish a special fund for the protection and development of the Xinghua Duotian Agrosystem in the local financial department.

(5) State funding: use the supporting policies concerning special products or some of the major strategies in national agricultural policies to obtain financial support from the state.

(6) International donations: to apply for supporting funds for the protection of the Xinghua Duotian Agrosystem from relevant international organizations.

6.4.2 Utilization of Funds

Firstly, the proportion of supportive funds which can be used for construction of major projects need to be increased appropriately, for example establishment of agricultural infrastructure and improving agricultural production conditions. Secondly, the financial support for ecological compensation should be strengthened for ecological protection. Beside, reasonable funds should be allocated for meetings and other promotional activities and also adequate funds should be ensured for scientific research.

6.4.3 Supervision and Inspection

Relevant departments need to carry out supervision and inspection for the management and usage of funds, to ensure safe, reasonable and effective investments. The contents of supervision and inspection include: (1) checking the management and use of major project funds during the year; (2) checking the implementation of project and Responsibility Contract of Engineering Quality, and if relevant, helping departments take their respective responsibilities seriously based on stipulations in the Responsibility Contract to ensure progress and quality control; (3) checking operation of rectification measures, and urging local governments and relevant departments to solve the major illegal problems that have not been corrected and handled properly; (4) investigating and punishing the activities of those violating the law and disciplining them. In addition, it should be strengthened to monitor the ecological environment to ensure rational use of funds and smoothness of ecological compensation.

6.5 Organization Constructions at Different Levels

The goal of organization construction is to ensure that the managers have clear ideas about the protection and development of the Xinghua Duotian Agrosystem, are able to conduct systematic guidance over the front-line managers, seek views and ideas from the farmers that owns heritage fields during relevant policy-making

processes and able to conduct dynamic adjustments according to the actual situations of the farmers and the community.

6.5.1 National level

The country provides a good policy environment and funding support for local agricultural heritage protection. Relevant departments such as the Ministry of Agriculture also give full attention and support for the declaration of NIAHS sites and candidate GIAHS sites. In the future, we should strengthen continuously the establishment of macro-organizational regulation and management departments to support, guide and promote agricultural heritage protection for successful long term outcomes.

6.5.2 Establishment of city, county and township organization

The leading work group of the Xinghua Duotian Agrosystem is established. Mayor of Xinghua City works as the head of the group, while deputy mayors that in charge of agriculture and culture are acting as deputy heads of the group; group members are heads of relevant departments, including financial department, agricultural department, culture and broadcast department, planning department, construction department and other related departments and relevant County heads, including Duotian town, Ganggu town, Lizhong town, Xijiao town, Zhoufen town, Shagou town and Linhun town. Subordinate offices of this work group and joint conference system are also established; specialized personnel are allocated to plan and coordinate the protection works. Relevant Counties and municipal departments already set up appropriate organizations to ensure the implementation and in place of personnel, funding and materials.

Personnel that participate in the management of the Xinghua Duotian Agrosystem shall attend working conferences on a regular basis and report their work progress as well as future work arrangements; problems occurred in the previous work shall also be raised for open discussion in the hope to address them with group wisdom and strength.

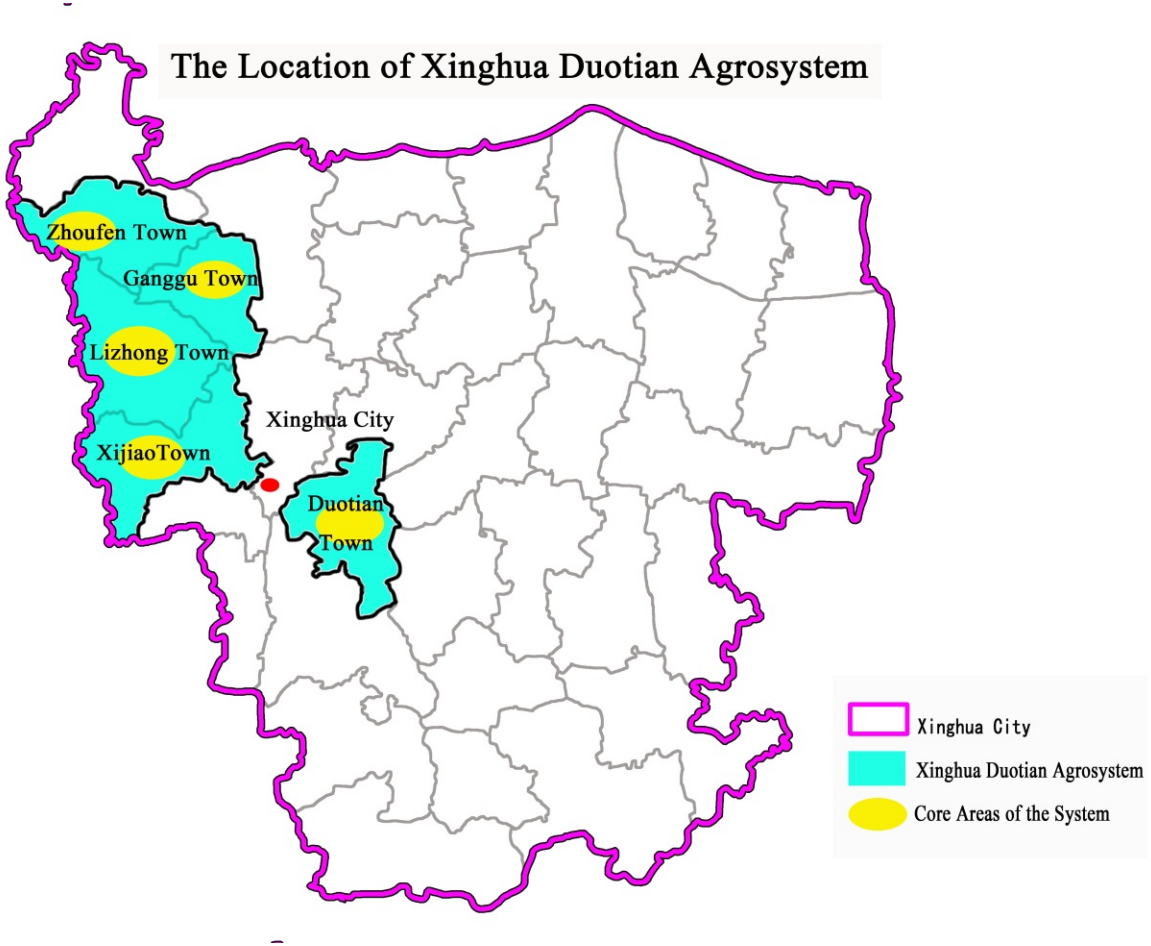
6.5.3 Establishment of village organization

Farmers are the main body responsible for agricultural heritage protection. We should establish a protection agency which is constituted mainly of farmers to ensure successful protection activities. We also need to establish a village committee,

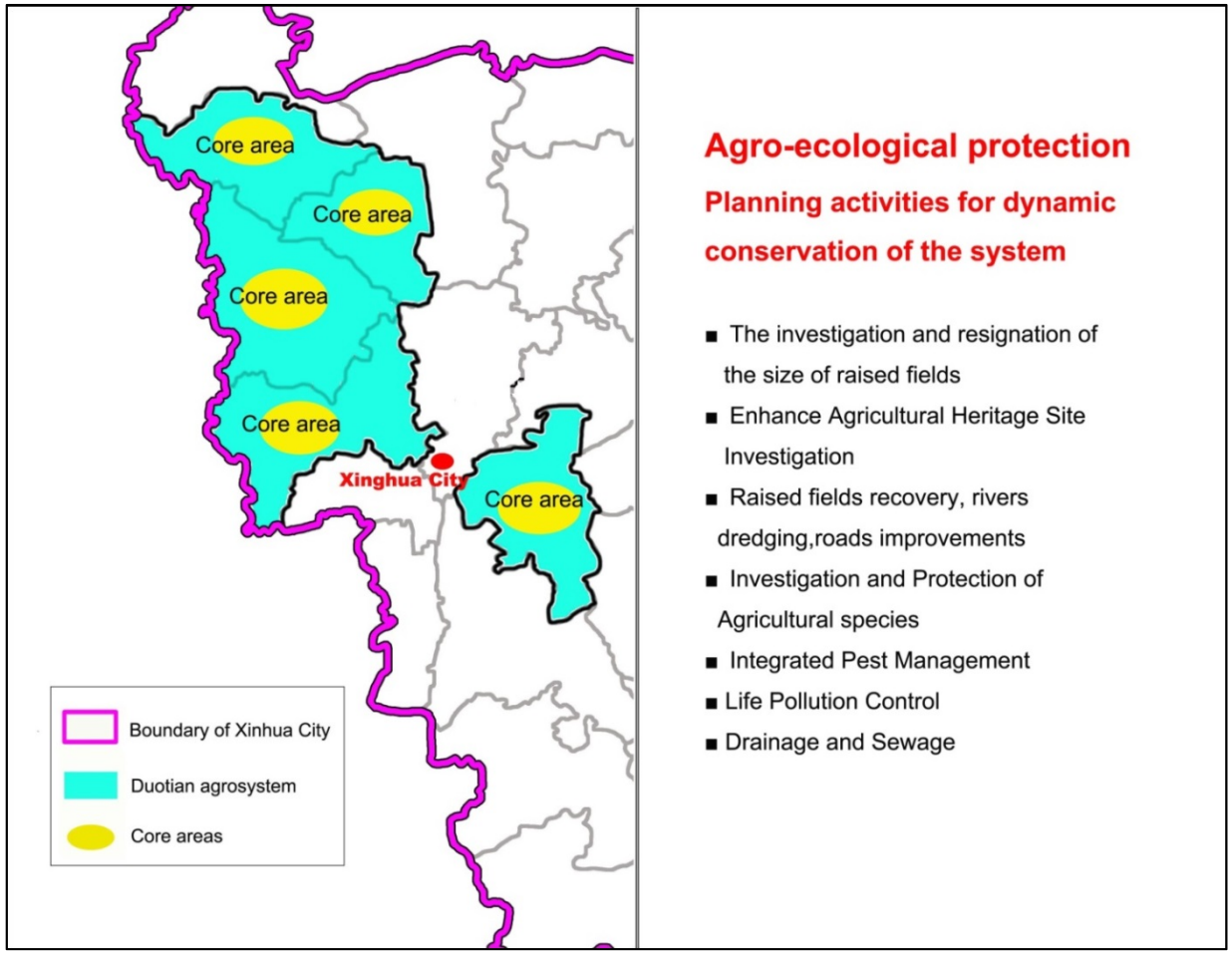
participated in by villagers, village cadres and village enterprises, and improve villagers' capacity for protection work, and to carry out community co-management and ensure that agricultural heritage can be protected successfully.

Appendix I: Map

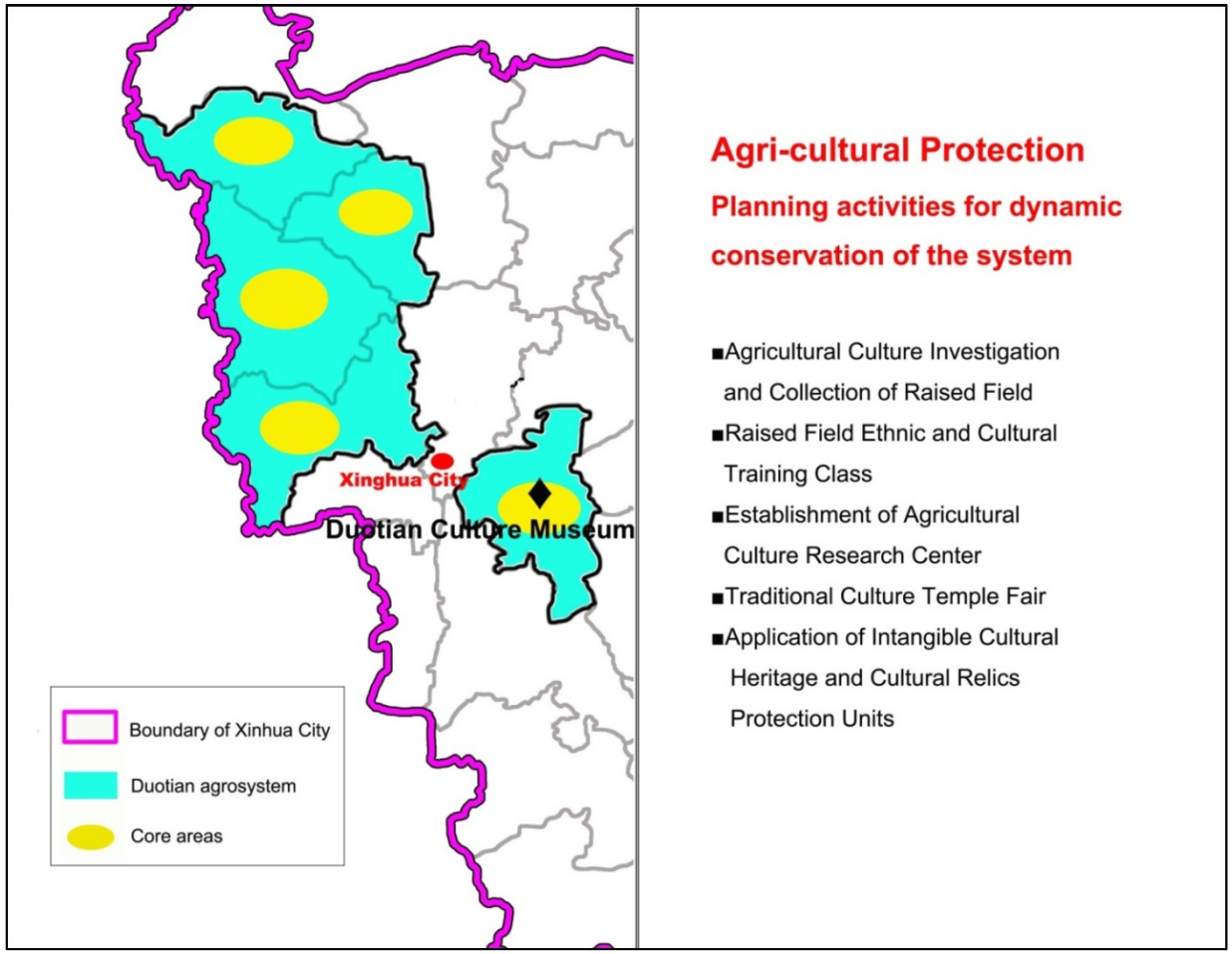
1. The location of Xinghua Duotian Agrosystem



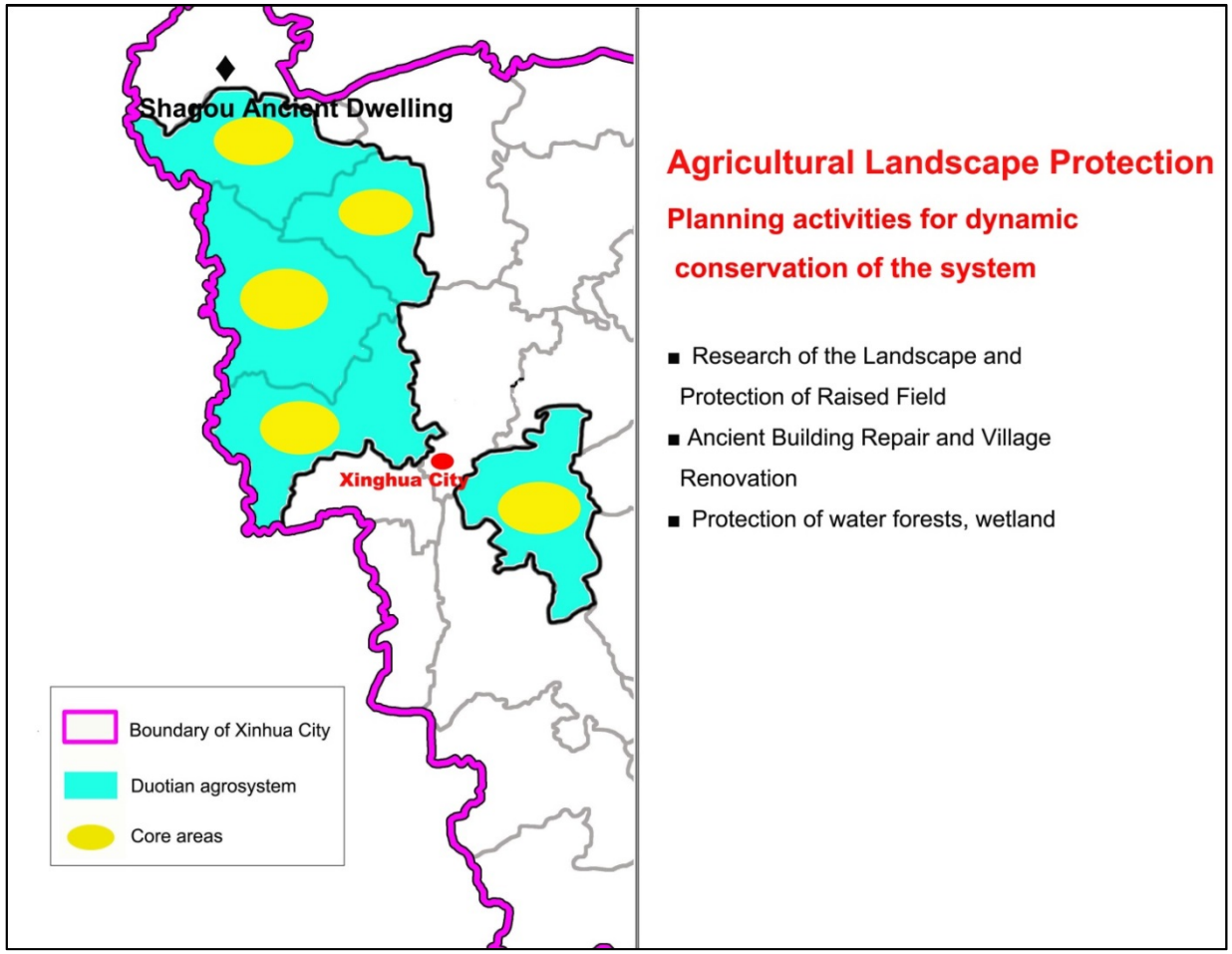
2. Agro-ecological protection plans for Xinghua Duotian Agrosystem



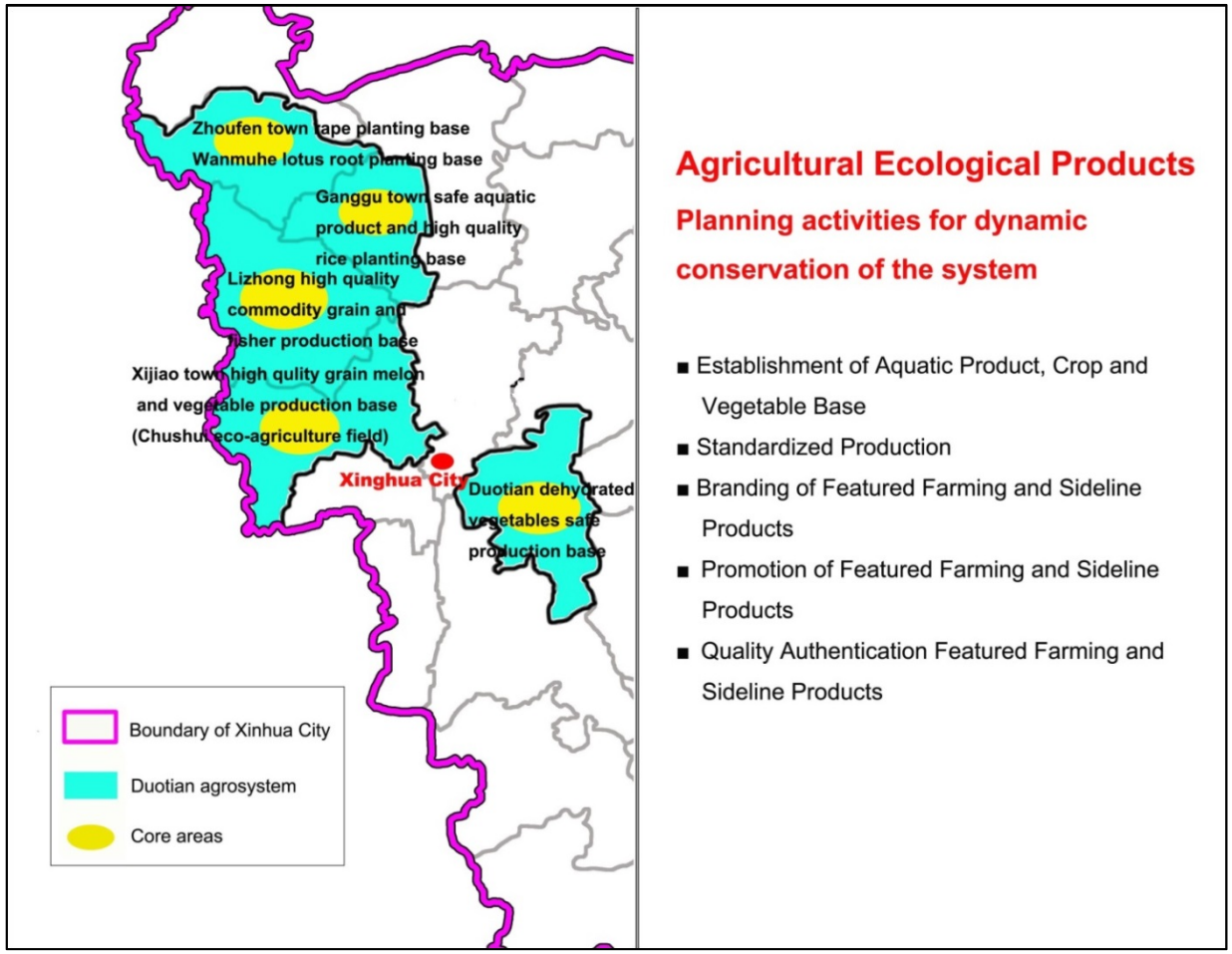
3. Agro-cultural protection plans for Xinghua Duotian Agrosystem



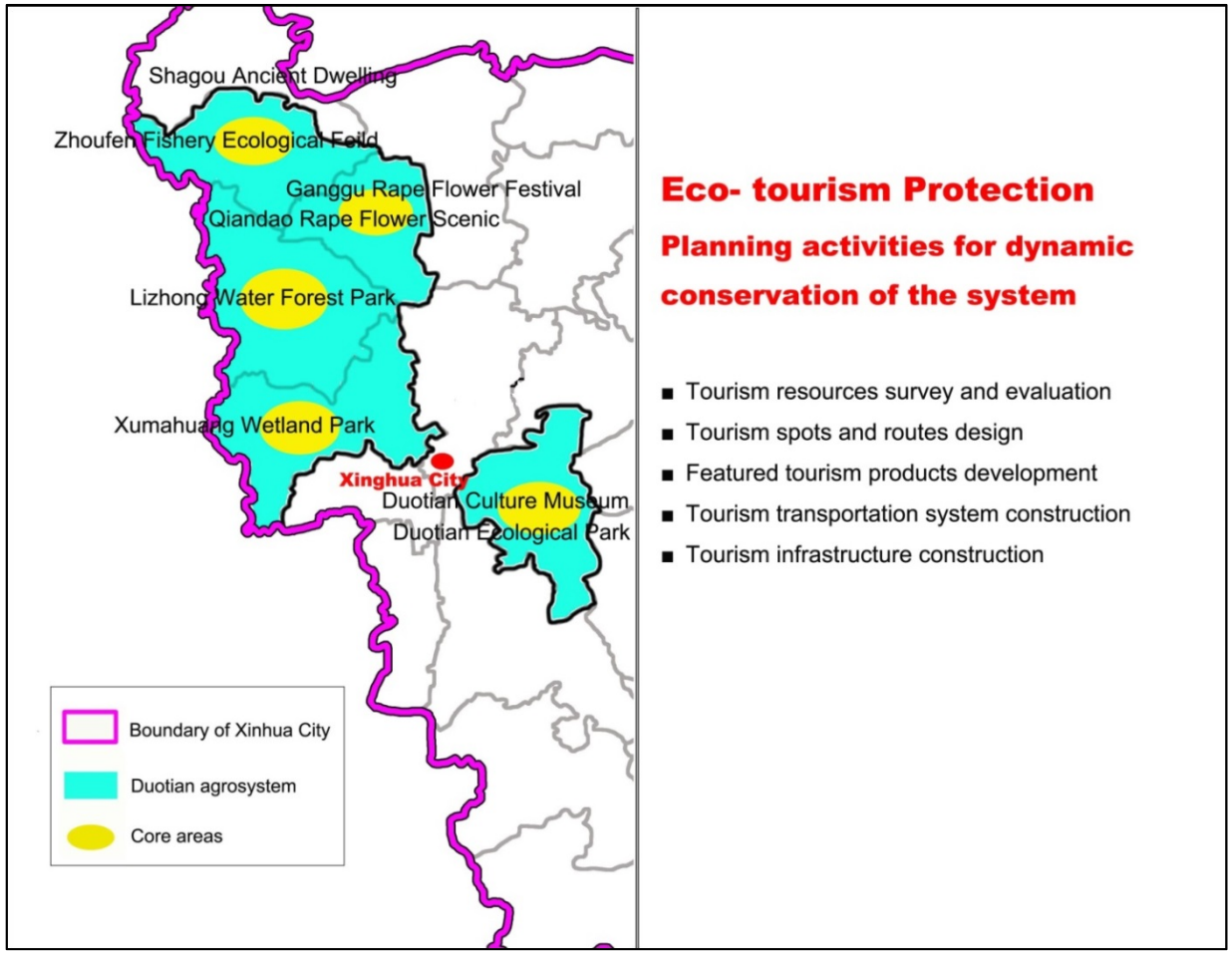
4. Agricultural landscape protection plans for Xinghua Duotian Agrosystem



5. Agricultural ecological products development plans for Xinghua Duotian Agrosystem



6. Agricultural eco-tourism products development plans for Xinghua Duotian Agrosystem



Appendix II: Agricultural and associated biodiversity

1. List of agricultural product varieties in the Ming Dynasty

Type	Varieties
Regular rice	36
Glutinous rice	8
Wheat	3
Bean	9
Millet	2
Sorghum	1
Corn	1
Linen	1
Cotton	1
Vegetables	Chinese yam, taro, lettuce, leek, Chinese chive, spring onion, garlic, Ma radish, eggplant, turnip, amaranth, coriander, Ping, mini garlic, carrot, scallions, crowndaisy chrysanthemum, kui, Chinese cabbage, algae, mustard, lettuce, Yunnan vegetable, mustard, boleng, weed, beet, celery, and xiong
Melons	As vegetables: Winter squash, cucumbers, towel gourd, wax gourd, snake melon, oriental pickling melon, bottle gourd; As food: pumpkin, Sibulan; As fruit: water melon, muskmelon, crisp melon, avalanche and pear melon

2. List of agricultural and fishery biodiversity

	Phylum	Class	Order	Family	Genus	Species	Photo
1	Magnoliophyta	Liliopsida	Asparagales	Alliaceae	Allium	Allium ascalonicum	
2	Magnoliophyta	Liliopsida	Asparagales	Alliaceae	Allium	Allium tuberosum	
3	Magnoliophyta	Liliopsida	Poales	Gramineae	Triticum	Triticum aestivum	
4	Magnoliophyta	Liliopsida	Poales	Gramineae	Hordeum	Hordeum vulgare	

5	Magnoliophyta	Liliopsida	Zingiberales	Zingiberaceae	Zingiber	Zingiber officinale Roscoe	
6	Magnoliophyta	Liliopsida	Cyperales	Gramineae	Zea	Zea mays	
7	Magnoliophyta	Liliopsida	Arales	Araceae	Colocasia	Colocasia esculenta	
8	Magnoliophyta	Dicotyledoneae	Capparales	Brassicaceae	Brassica	Brassica campestris	
9	Magnoliophyta	Dicotyledoneae	Capparales	Brassicaceae	Brassica	Brassica chinensis var chinensis	

10	Magnoliophyta	Dicotyledoneae	Capparales	Brassicaceae	Brassica	Brassica oleracea var. botrytis	
11	Magnoliophyta	Dicotyledoneae	Capparales	Brassicaceae	Brassica	Brassica oleracea	
12	Magnoliophyta	Dicotyledoneae	Capparales	Brassicaceae	Raphanus	Raphanus sativus	
13	Magnoliophyta	Dicotyledoneae	Lamiales	Pedaliaceae	Sesamum	Sesamum indicum	
14	Magnoliophyta	Dicotyledoneae	Cucurbitales	Cucurbitaceae	Cucurbita	Cucurbita pepo	

15	Magnoliophyta	Dicotyledoneae	Cucurbitales	Cucurbitaceae	Lagenaria	Lagenaria siceraria var. hispida	
16	Magnoliophyta	Dicotyledoneae	Cucurbitales	Cucurbitaceae	Cucumis	Cucumis sativus	
17	Magnoliophyta	Dicotyledoneae	Cucurbitales	Cucurbitaceae	Cucumis	Cucumis melo	
18	Magnoliophyta	Dicotyledoneae	Cucurbitales	Cucurbitaceae	Luffa	Luffa cylindrica	
19	Magnoliophyta	Dicotyledoneae	Asterales	Asteraceae	Kalimeris	Kalimeris indica	

20	Magnoliophyta	Dicotyledoneae	Rosales	Leguminosae	Lablab	Lablab purpureus	
21	Magnoliophyta	Dicotyledoneae	Rosales	Leguminosae	Vigna	Vigna unguiculata	
22	Magnoliophyta	Dicotyledoneae	Rosales	Leguminosae	Vicia	Vicia faba	
23	Magnoliophyta	Dicotyledoneae	Rosales	Leguminosae	Pisum	Pisum sativum	
24	Magnoliophyta	Dicotyledoneae	Rosales	Leguminosae	Glycine	Glycine max	

25	Magnoliophyta	Dicotyledoneae	Rosales	Papilionaceae	Arachis	Arachis hypogaea	
26	Magnoliophyta	Dicotyledoneae	Solanales	Solanaceae	Capsicum	Capsicum annuum	
27	Magnoliophyta	Dicotyledoneae	Solanales	Solanaceae	Solanum	Solanum melongena	
28	Magnoliophyta	Dicotyledoneae	Solanales	Solanaceae	Solanum	Solanum lycopersicum	
29	Magnoliophyta	Dicotyledoneae	Solanales	Solanaceae	Solanum	Solanum tuberosum	

30	Magnoliophyta	Dicotyledoneae	Apiales	Apiaceae	Apium	Apium graveolens	
31	Magnoliophyta	Dicotyledoneae	Apiales	Apiaceae	Daucus	Daucus carota	
32	Chordata	Actinopterygii	Osmeriformes	Osmeridae	Hemisalanx	Hemisalanx prognathus	
33	Chordata	Actinopterygii	Siluriformes	Bagridae	Pelteobagrus	Pelteobagrus fulvidraco	
34	Chordata	Actinopterygii	Siluriformes	Siluridae	Silurus	Silurus asotus	

35	Chordata	Actinopterygii	Siluriformes	Clariidae	Clarias	Clarias fuscus	
36	Chordata	Actinopterygii	Mugiliformes	Mugilidae	Mugil	Mugil cephalus	
37	Chordata	Osteichthyes	Synbgranchiformes	Synbranchidae	Monopterus	Monopterus albus	
38	Chordata	Osteichthyes	Cypriniformes	Cyprinidae	Cyprinus	Cyprinus carpio	
39	Chordata	Osteichthyes	Cypriniformes	Cyprinidae	Ctenopharyngodon	Ctenopharyngodon idellus	
40	Chordata	Osteichthyes	Cypriniformes	Cyprinidae	Carassius	Carassius auratus	

41	Chordata	Osteichthyes	Cypriniformes	Cyprinidae	Parabramis	Parabramis pekinensis	
42	Chordata	Osteichthyes	Cypriniformes	Cyprinidae	Erythroculter	Erythroculter ilishaeformis	
43	Chordata	Osteichthyes	Cypriniformes	Cyprinidae	Mylopharyngodon	Mylopharyngodon piceus	
44	Chordata	Osteichthyes	Cypriniformes	Cyprinidae	Hypophthalmichthys	Hypophthalmichthys nobilis	
45	Chordata	Osteichthyes	Cypriniformes	Cyprinidae	Pseudorasbora	Pseudorasbora parva	

46	Chordata	Osteichthyes	Cypriniformes	Cyprinidae	Rhodeus	Rhodeus sinensis Gunther	
47	Chordata	Osteichthyes	Cypriniformes	Cobitidae	Misgurnus	Misgurnus anguillicaudatus	
48	Chordata	Osteichthyes	Perciformes	Percichthyidae	Lateolabrax	Lateolabrax japonicus	
49	Chordata	Osteichthyes	Perciformes	Percichthyidae	Siniperca	Siniperca chuatsi	
50	Chordata	Osteichthyes	Perciformes	Channidae	Ophicephalus	Ophicephalus argus Cantor	

51	Chordata	Osteichthyes	Anguilliformes	Anguillidae	Anguilla	Anguilla japonica	
52	Chordata	Osteichthyes	Cypriniformes	Cyprinidae	Hypophthalmichthys	Hypophthalmichthys molitrix	
53	Arthropoda	Crustacea	Decapoda	Grapsidae	Eriocheir	Eriocheir sinensis Milne-Edwards	
54	Arthropoda	Crustacea	Decapoda	Astacidae	Procambarus	Procambarus clarkii	
55	Arthropoda	Crustacea	Decapoda	Palaemonidae	Macrobranchium	Macrobranchium nipponense	

56	Mollusca	Lamellibranchia	Unionoida	Unionidae	Anodonta	Anodonta fluminea	
57	Mollusca	Gastropoda	Mesogastropoda	Viviparidae	Margarya	Margarya melanioides	
58	Chordata	Mammalia	Artiodactyla	Suidee	Sus	Sus scrofa	
59	Chordata	Mammalia	Artiodactyla	Bovidae	Bubalus	Bubalus bubalus	
60	Chordata	Mammalia	Artiodactyla	Bovidae	Ovis	Ovis Caprinae	

61	Chordata	Aves	Galliformes	Phasianidae	Gallus	Gallus domestiaus	
62	Chordata	Aves	Anseriformes	Anatidae	Anas	Anas platyrhynchos	
63	Chordata	Aves	Anseriformes	Anatidae	Anser	Anser cygnoides	

3. List of related biodiversity

	Phylum	Class	Order	Family	Genus	Species	Photo
1	Gymnospermae	Ginkgopsida	Ginkgoales	Ginkgoaceae	Ginkgo	Ginkgo biloba	
2	Gymnospermae	Coniferopsida	Pinales	Taxodiaceae	Taxodium	Taxodium ascendens	
3	Gymnospermae	Coniferopsida	Pinales	Taxodiaceae	Metasequoia	Metasequoia glyptostroboides	
4	Angiospermae	Magnoliopsida	Urticales	Moraceae	Ficus	Ficus carica	

5	Angiospermae	Magnoliopsida	Nymphaeales	Nelumbonaceae	Nelumbo	Nelumbo nucifera	
6	Angiospermae	Magnoliopsida	Piperales	Saururaceae	Houttuynia	Houttuynia cordata	
7	Magnoliophyta	Dicotyledoneae	Laurales	Lauraceae	Cinnamomum	Cinnamomum camphora	
8	Magnoliophyta	Dicotyledoneae	Rutales	Meliaceae	Melia	Melia azedarach	
9	Magnoliophyta	Dicotyledoneae	Salicales	Salicaceae	Populus	Populus simonii	

10	Magnoliophyta	Dicotyledoneae	Salicales	Salicaceae	Salix	Salix babylonica	
11	Magnoliophyta	Dicotyledoneae	Urticales	Ulmaceae	Ulmus	Ulmus pumila	
12	Magnoliophyta	Dicotyledoneae	Urticales	Moraceae	Morus	Morus alba	
13	Magnoliophyta	Dicotyledoneae	Sapindales	Buxaceae	Buxus	Buxus sinica	
14	Magnoliophyta	Dicotyledoneae	Myrtales	Punicaceae	Punica	Punica granatum	

15	Magnoliophyta	Dicotyledoneae	Myrtales	Trapaceae	Trapa	Trapa bicornis	
16	Magnoliophyta	Dicotyledoneae	Apiales	Apiaceae	Cicuta	Cicuta virosa	
17	Magnoliophyta	Dicotyledoneae	Rosales	Rosaceae	Eriobotrya	Eriobotrya japonica	
18	Magnoliophyta	Dicotyledoneae	Rosales	Leguminosae	Sophora	Sophora japonica	
19	Magnoliophyta	Dicotyledoneae	Rubiales	Rubiaceae	Galium	Galium aparine var. tenerum	

20	Magnoliophyta	Dicotyledoneae	Asterales	Asteraceae	Cirsium	Cirsium segetum	
21	Magnoliophyta	Dicotyledoneae	Malvales	Sterculiaceae	Firmiana	Firmiana platanifolia	
22	Magnoliophyta	Dicotyledoneae	Tubiflorae	Solanaceae	Solanum	Solanum septemlobum	
23	Magnoliophyta	Dicotyledoneae	Capparales	Brassicaceae	Capsella	Capsella bursa-pastoris	
24	Magnoliophyta	Magnoliopsida	Scrophulariales	Scrophulariaceae	Paulownia	Paulownia Sieb	

25	Magnoliophyta	Magnoliopsida	Capparales	Brassicaceae	Orychophragmus	Orychophragmus violaceus	
26	Magnoliophyta	Liliopsida	Alismatales	Alismataceae	Sagittaria	Sagittaria sagittifolia	
27	Magnoliophyta	Liliopsida	Caryophyllales	Amaranthaceae	Amaranthus	Amaranthus tricolor	
28	Magnoliophyta	Liliopsida	Cyperales	Cyperaceae	Cyperus	Cyperus rotundus	
29	Magnoliophyta	Liliopsida	Cyperales	Cyperaceae	Heleocharis	Heleocharis dulcis	

30	Magnoliophyta	Liliopsida	Pandanales	Typhaceae	Typha	Typha angustifolia	
31	Magnoliophyta	Liliopsida	Poales	Gramineae	Phragmites	Phragmites australis	
32	Magnoliophyta	Liliopsida	Poales	Gramineae	Alopecurus	Alopecurus japonicus	
33	Magnoliophyta	Liliopsida	Poales	Gramineae	Alopecurus	Alopecurus aequalis Sobol	
34	Magnoliophyta	Liliopsida	Poales	Gramineae	Echinochloa	Echinochloa crusgalli	

35	Magnoliophyta	Liliopsida	Poales	Gramineae	Eleusine	Eleusine indica	
36	Magnoliophyta	Liliopsida	Poales	Gramineae	Phyllostachys	Phyllostachys heteroclada	
37	Magnoliophyta	Liliopsida	Poales	Gramineae	Digitaria	Digitaria sanguinalis	
38	Magnoliophyta	Liliopsida	Poales	Gramineae	Pennisetum	Pennisetum alopecuroides	
39	Magnoliophyta	Liliopsida	Poales	Gramineae	Cynodon	Cynodon dactylon	

40	Magnoliophyta	Liliopsida	Poales	Gramineae	Arundo	Arundo donax	
41	Magnoliophyta	Liliopsida	Poales	Gramineae	Zizania	Zizania latifolia	
42	Chordata	Mammalia	carnivora	mustelidae	Mustela	Mustela sibirica	
43	Chordata	Mammalia	Lagomorpha	Leporidae	Lepus	Lepus sinensis	
44	Chordata	Mammalia	Erinaceomorpha	Erinaceidae	Erinaceus	Erinaceus amurensis	

45	Chordata	Amphibian	Anura	Ranidae	Rana	Rana nigromaculata	
46	Chordata	Amphibian	Anura	Bufonidae	Bufo	Bufo melanostictus	
47	Chordata	Aves	Ciconiiformes	Ardeidae	Egretta	Egretta alba	
48	Chordata	Aves	Ciconiiformes	Ciconiidae	Ciconia	Ciconia boyciana	
49	Chordata	Aves	Ciconiiformes	Ardeidae	Nycticorax	Nycticorax nycticorax	

50	Chordata	Aves	Gruiformes	Gruidae	Grus	Grus japonensis	
51	Chordata	Aves	Galliformes	Phasianidae	Phasianus	Phasianus colchicus	
52	Chordata	Aves	Cuculiformes	Cuculidae	Cuculus	Cuculus clamosus	
53	Chordata	Aves	Passeriformes	Alaudidae	Alauda	Alauda arvensis	
54	Chordata	Aves	Passeriformes	Alaudidae	Melanocorypha	Melanocorypha bimaculata	

55	Chordata	Aves	Passeriformes	Sylviidae	Phylloscopus	Phylloscopus proregulus	
56	Chordata	Aves	Passeriformes	Hirundinidae	Hirundo	Hirundo rustica	
57	Chordata	Aves	Passeriformes	Paridae	Carduelis	Carduelis spinus	
58	Chordata	Aves	Passeriformes	Corvidae	Corvus	Corvus macrorhynchos	
59	Chordata	Aves	Falconiformes	Accipitridae	Accipiter	Accipiter cooperii	

60	Chordata	Aves	Falconiformes	Accipitridae	Aquila	Aquila clanga	
61	Chordata	Aves	Falconiformes	Accipitridae	Circus	Circus cyaneus	
62	Chordata	Aves	Falconiformes	Accipitridae	Buteo	Buteo burmanicus	
63	Chordata	Aves	Falconiformes	Accipitridae	Gyps	Gyps fulvus	
64	Chordata	Aves	Strigiformes	Strigidae			

65	Chordata	Aves	Anseriformes	Anatidae	Anas	Anas clypeata	
66	Chordata	Aves	Anseriformes	Anatidae	Cygnus	Cygnus cygnus	
67	Chordata	Aves	Anseriformes	Ploceidea	Passer	Passer montanus	
68	Chordata	Aves	Anseriformes	Corvidae	Pica	Pica pica	
69	Chordata	Aves	Anseriformes	Anatidae	Mergus	Mergus squamatus	

70	Chordata	Aves	Anseriformes	Anatidae	Aix	Aix galericulata	
71	Chordata	Reptilia	Squamata	Colubridae	Natrix	Natrix annularis	
72	Arthropoda	Insecta	Lepidoptera	Pieridae	Pierisrapae	Pierisrapae Linne	
73	Arthropoda	Insecta	Hymenoptera	Apidae	Apis	Apis cerana	

Appendix III: Photos

Xinghua Duotian

Xinghua Duotian (Old Time)

Marigold in Xinghua Duotian

Water Forest in Lizhong Town (Autumn)

Plowing Fields with Cattles

Scraping Sludges as Organic Fertilizer

Harvesting Longxiang Taro

Harvesting Leeks

Harvesting Lotus Roots

Leisure Time in Xinghua Duotian

Shipo Panting

walking on stilts

Celebration Activities in Xinghua Duotian