

China's GIAHS Conservation: National Framework

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1. Description of the Pilot System

Rice-fish agricultural system in Qingtian China was selected as GIAHS in May 2005. It is an indigenous agricultural system harbouring globally significant biodiversity (agrobiodiversity and associated biodiversity) which is under threat. In the complex system, non-biological factors (e.g., water, soil, light, heat, and air) and biological factors (e.g., animals, plants, and micro-organisms) are interrelated and interdependent. They form an ecosystem with unilateral functions. One factor changing will trigger a chain of reactions. According to the principles of ecology, the structure of the food chain in a system has a direct impact on the net output of the ecosystem.



The agro-biodiversity characteristics of the system are as following:

Agricultural species include: integrated use of forest (70% of watercatchment), paddies, home gardens, trees and hedges in the field and small livestock / poultry; 20 native rice varieties (many threatened); vegetables: lotus roots, beans, taro, eggplant and numerous other native vegetables; fruits: the Chinese plum (*Prunus Simoni*), mulberry; 6 native breeds of carp red/black/white/variegated carp.

Associated biodiversity include: 5 species of fish, amphibians, snails allowed in paddies; 7 species of wild vegetables collected in borders of fields; 62 forest species are used of which 21 as foods; 53 medicinals; and wild cats, snakes.

Rice-fish agricultural system has many ecosystem functions. In rice-fish system, rice and fish live together in the same field. This technique can be used with early rice, midseason rice, and late rice. Some contradictions between growing rice and raising fish are unavoidable. Therefore, fertilizer and pesticides

that can harm the fish are avoided. Generally, excessive engineering facilities are not necessary. Fish feed is not needed because the fish live on natural food in the paddy field. This is extensive culture. Average production is about 150 kg/ha and well-managed fields can produce over 750kg/ha. The disadvantage of this technique is that the growth period of the fish is comparatively short and the harvested fish are small.

Therefore, large fingerlings are usually used. The technique is occasionally used to stock adult fish for one year. In a rotation of rice and fish, the fallow field left after the rice is harvested is used to raise fish. Generally, fish fry or fingerlings are stocked. After the rice harvest, the straw is left in the field. When the land is irrigated, the straw decays, which makes the water suitable for feeding adult fish. In this form of rice-fish culture, fish have more space to move about and it is convenient to spread feed, but the growth period is relatively long. Compared with raising rice with raising rice with fish, production of fish is higher. Generally, fish yields are 300-450 kg/ha with maximum yields of over 1,500 kg/ha. Because it provides remarkable economic benefits, rotation of rice and fish is widely used in fallow winter fields, during the summer with green manure crops, for stocking fingerlings to produce table fish, and in seedling beds to stock fish fry for fingerling culture. In continuous rice-fish culture, rice and fish are raised together. Because the fish are raised after the paddy field is fallow, their growth period may be over one year, which produces better results. Generally, production reaches over 750 kg/ha. This form of culture is widely used in hilly and mountainous regions. The rice-fish system provides multiple goods and services including: food security (rice production); quality nutrition and income generation (consumption and sale of fish); prevention of malaria (reducing mosquito by fish); conservation of biodiversity (rice, fish and associated species due to reduction of pesticides); pest regulation; carbon and nutrient cycles; soil and water conservation and restoration. The rice-fish system also demonstrates an ingenious approach to inspiring how economic and social benefits can be achieved through encouraging essential ecological functions.

China's legal system¹ stipulates that most farmland is owned collectively by farmers. Launching in the end of 1970s, the rural household responsibility system (HRS) reform distributed the farmland (including cultivated land, water, and forest land etc.) to farmers. Farmers can decide by themselves what to grow in their land based on needs of home consumption and markets of agricultural products². As one of the production technologies and activities, whether to adopt

rice-fish farming is up to farmer's decision. Most farmers own both the water surface and the land in Qingtian County, Zhejiang Province. They usually move the fish in the rice field to the water ponds when the rice is harvested. Some farmers raise fish fry and young fish in their rice fields and sell them to the fish folks, who will then continue to raise them in fish ponds. It is relatively easy to move fish between the rice fields and the fish ponds, and the production cycle of rice-fish culture is also relatively short. As a result, farmers' input to the rice-fish system is not so much affected by the security of the land tenure.

As rice fields in China are small, farmers' cooperation in the village is essential to managing this rice-fish culture. In some cases, rice growers and fish growers cooperate in using same rice fields for production.

2. History of the Co-evolution of the Rice-fish Agriculture

Rice is one of principal food crops of the world. It provides 20 % of total calorie supply of the world population. Ninety percentages of rice fields are distributed in the Asia. Ninety percentage of them are wet fields, which are irrigated, rainfed or deepwater. Upland rice accounts for only a small percent of the rice areas and production. Over a long history, fish is farmed in some wet rice fields, either concurrently or rotationally with rice in Asia. The canon for fish culture written by Fan Li about 400 BC states: "...dig six mu of land into a pond ... put 2000 fry into the pond ...sell the rest in the market".

In a good year with ample rainfall and moderate weather, 2000 carp fry could produce numerous eggs. Some wise farmers may have placed excess fry in their rice fields. The fish in the rice fields may have grown better than those in the ponds, and the practice of raising fish in rice fields was born. There are no records of when the practice started, but this seems to be a logical explanation of how rice-fish farming began in China. The rice-fish farming system is described not only as one of production style, but also as one of the culture. Tombs of the mid-Eastern Han Dynasty (25-220 AD) were excavated in 1964 in Hanzhong County, Shanxi Province³. Two clay models were unearthed: a model of a pond and a model of a rice field. The pond model contained 15 miniature pieces (6 common carp, 1 soft-shell turtle, 3 frogs, and 5 water chestnuts). A stone carving of a pond and rice field model was discovered in the brick tomb of the Eastern Han Dynasty in 1977 in Emei County, Sichuan Province. Half the stone was carved into a pond with frogs, fish, and ducks. The other half was carved into a rice field with

an inlet and outlet, two farmers toiling on one side, and two heaps of manure on the other. Four mid-Han Dynasty tombs with 200 relics were excavated in 1978 in Mian County, Shanxi Province. One of the intact relics was a rice field model containing 18 pottery miniatures of aquatic plants and animals. There were sculptured frogs, eels, spiral shells, crucian carp, grass carp, common carp, and turtles in this model. Another of a winter rice field showed farmland with a reservoir that also contained these fish. These relics not only proved that rice-fish farming system was one of farmer's production practices 1700 years ago. It also proved that the early rice-fish farming system is a very diverse system.

The more detail written record of rice-fish farming is from Recipes for Four Seasons which was written by Cao Cao⁴ in Sanguo Dynasty (200-265 AD):

A small fish with yellow scales and a red tail, grown in the ricefields of Pi County northeast of Chendu, Sichuan Province can be used for making sauce.

After that, in Tang Dynasty, in Ming Dynasty, and in Qing Dynasty, there were also numerous written records about rice-fish farming system or culture. For example, Liu Xun (about 889-904 AD), wrote in *Wonders in Southern China*:

In Xin, Long, and other prefectures, land on the hillside is wasted but the flat areas near the houses are hoed into fields. When spring rains come, water collects in the fields around the houses. Grass carp fingerlings are then released into the flooded fields. One or two years later, when the fish are grown, the grass roots in the plots are all eaten. This method not only fertilizes the fields, but produces fish as well. Then, rice can be planted without weeds. This is the best way to farm.

It indicated that before 1000 years ago, China's farmers had adopted the rotational rice-fish farming technology. Another record was found in chronicle⁵ of Shunde County, Guangdong Province in Ming Dynasty (1573 AD). It states that:

The periphery of a land was trenched as a plot, called the field base.... In the plot, a pond was dug to rear fish. During the dry season, rice seedlings were transplanted to the plot. The area might be several hectares.

It indicated that rice-fish farming technology was further advanced 400 years ago. After the founding of the People's Republic of China in 1949, rice-fish culture developed quickly. In 1954, the fourth National Aquaculture Meeting proposed the development of rice-fish culture across the country. By 1959, the area

of rice fish culture had been expanded to 666,000 ha. From early 1960s to the mid 1970s, several factors, including the intensification of rice production and the large-scale application of chemical insecticides, impeded the development of rice-fish culture⁶. For example, in Guangdong Province the area of rice-fish culture dropped from 33,333 ha in the early 1950s to 320 ha in the mid 1970s, and in Hunan Province the area dropped from 232,000 ha in 1958 to 5,333 ha in 1978.

During the late 1970s, there were changes in rice production. Improved modern varieties of rice and less toxic chemicals were used and there were changes in the units of production. The production-contract system was implemented in rural areas starting in 1978 and this allowed individual families to become the main units of production. In addition, there was a rapid development of aquaculture, which required the production of a large amount of fry and fingerlings. This demand was partly met by fingerling production in paddy field. Research and supporting policy and development activities have also encouraged the expansion of rice-fish productions.

3. Threats to the Biodiversity and Ecosystem of the System

The rice-fish farming area in China had increased from 667000 ha in 1959 to 985000 ha in 1986 and 1532000 ha in 2000⁷. However, it has decreased from 1532000 ha in 2000 to 1528000 ha in 2001 and 1480000 ha in 2002. The rice-fish farming system is threatened by expansion of highly productive mono rice or fish systems, which include improved rice or fish varieties with excessive application of chemicals (especially pesticides for rice and antibiotic medicines for fish) in rice fields or fish ponds.

The food safety, ecological functions and environment conservation are seriously undervalued. With chemicals, rice growers do not need to depend on fish to regulate pests and recycle nutrition. The intensive fish culture produces much fish at a low cost to the market. During last 20 years, the total aquatic production in China has increased by 8.7 times, but the prices of aquatic products have increased by only 4.4 times. As a result, the benefits by raising fish in the rice fields over the mono rice production are diminishing.

The management of rice-fish system needs more labor and village cooperation than the mono rice production. A survey in Jiangsu Province showed that only half of farmers who adopted rice-fish farming technologies in 2002 would prefer planting single rice or other crops to rice-fish farming in 2003. Some farmers claimed that if they dig the same area of rice field as a

fish pond, they would make more money than the rice-fish farming. Some farmers who used to practice rice-fish farming reported that they prefer buying fishery products in markets to raising fish in their rice fields. The additional labor for managing a rice-fish system is valued at nearly as same as the fish it would produce. For fish to reach the marketing size, farmers often need to continue to raise fish in the pond or rice field after rice is harvested. This competes for land and labor, which are increasingly scarce in rural China. The integrated rice-fish farming is further threatened by the monoculture of rice or fish with the decreasing costs of production. The cost reduction of the mono-culture is achieved through promotion of high-yield varieties and chemical inputs. The little gain from adopting the rice-fish culture undermines continuation of the rice-fish culture, especially in more developed areas.

The barriers to improvement include:

- There aren't laws and regulations specifically on GIAHS conservation, lacks the direct legal basis in the conservation process.
 - The ecology restores project didn't play the obvious role while the endangered species haven't got concrete protective measures. The main reason was the investment is insufficient and the research is still at the initial stage
 - The cultural diversity conservation was still at the initial stage, the local authority takes insufficiently it
- However, the government is encouraging farmers to continue the rice-fish culture as one of environmentally friendly technologies. The local government's agricultural extension agents, particularly in the poor areas, are making great effort to extend the technology of the rice-fish farming. Sometimes, the government's objective in ecological environment is not consistent with farmers' interest in profits.

Qingtian County is among the few counties where farmers still practice the traditional rice-fish farming technology as well as the new rice-fish farming technology they have adopted. The promotion of the rice-fish system has multiple benefits:

- Contribute to conserve this traditional agricultural heritage with associated cultures and biodiversity;
- Improve farmers' health with reduction of pesticide application;
- Increase farmers' income in the marginal regions where labour opportunity cost is low;
- Improve safety and nutrition of food products from the rice-fish system; and
- Develop potential approaches to managing this unique system, such as eco-tourism
- Foster a local and classical culture related rice-fish system, e.g. Field-fish lantern dancing

4. Activity Plan

The rice-fish farming of Longxian Village covers an area of 393mu in 2005, many were deserted as the labour loss. The population lived in the village is 491, while almost 200 people live in abroad now.

4.1 Commonly agreed objectives

- Establishment of institutional framework, participatory mechanisms and free prior informed consent of farming communities;
- PRA of GIAHS (functioning, characteristics, threats, and opportunities);
- Preliminary assessment of policy, regulatory, and incentive environments and the identification of supportive measures or removal of perverse incentives;
- Fine tuning of participatory methods and tools for monitoring, evaluation and implementation of the Full Scale Project;
- Capacity Building of vulnerable Stakeholders;
- Small priority activities that directly benefit farmers and encourage the participatory assessment and project formulation; and
- Determine the Field Coordinator.

4.2 Adaptive management strategies

- Resume the traditional rice and fish species: In recent years, agricultural diversity and its values have gained evolving understandings, and the agro-ecological, bio-

logical and cultural diversity has been addressed for its importance to the sustainable development and food security. Food security has been a main problem obsessed many people today. GIAHS must prevent the trend of nutrition and biodiversity decrease. In Longxian village, there are altogether 393mu rice-fish field, as the project programmed, 60-70mu paddy fields would be forced to plant traditional rice species every year, and in six years later, all the rice-fish field will be refurbished by the traditional rice species before 1970s', such as Sanriqi, Red wanjin, etc.

- Develop the substitute industry: GIAHS will be established a self-support system by the project, we must find the way to substitute the traditional industry which can promote the development of GIAHS site. According to the experience and the situation of Longxian village, we propose that the eco-tourism and organic food production are two reasonable ways to go. While these two kinds of industry development need several years, thus a ecological compensation mechanism should be established first.

- Culture protection and succession: Culture is the base of the GIAHS site; the protection can not be really realized without culture collection and coordination. We will collect the folk tales and the convention, such as the tale of Longxian village, the fish lantern dance and so on; these culture forms are of significance for the rice-fish GIAHS conservation.

- The build of multi-stakeholder process: Structural conservation of Agriculture Heritage Systems the GIAHS initiative stands for a global concept; yet conservation happens through the establishment of national policy frameworks and local project implementation; GIAHS projects thus need support from international, national, local and village level. In virtue of all the organizations, the conservation can be realized.

- The build of national GIAHS mechanism: China is a large agricultural county with long history, there are many agricultural heritages in the process of its development, such as Mulberry base fish pond, pig-marsh gas-fruit, four-law-in-a-whole pattern and so on, are the precious experience from production. FAO plan to choose 100-150 GIAHS in the nearly 10-15 years, which will accelerate the declaration of Chinese agricultural heritages, we hope there will be 10 or even more GIAHS from china were elected. At the same time, China will build a national GIAHS mechanism, which will list all agricultural heritages with national significance, just like the World natural and cultural heritages. We'll try our best to conserve all the agricultural heritages as the programme planned.



4.3 Main activities

In national level:

1. *awareness raising*

- Formulate the laws and regulations which specially aims at GIAHS, in order to conserve the agriculture biodiversity, the cultural diversity and make the specific stipulation to each kind of development operation, carry on the moderate development in the basis of conservation.

- Publicize the GIAHS through various media (TV, newspaper, network, etc)

2. *policy analysis / reform*

- Take the suitable measure to accelerate natural reproduction according to the main goal district of land use.

- Enhance the county management and reform—new socialism countryside building.

3. *creation of a national framework for recognition and mainstreaming of GIAHS*

Formulate the GIAHS project by a specific administration, like MOA. and the local government.

- Elect the national agricultural heritage system.

In site level:

4. *conservation measures and adaptive management strategies for the biodiversity and the ecosystem*

- GIAHS can keep on serving a wide variety of functions by a approach called dynamic conservation .Dynamic conservation means making use of new chances to preserve century-old traditions. Tourism, eco-branded marketing, payment for environmental services and links between traditional and modern governance institutions can jointly provide enough resources to keep the GIAHS functioning.

5. *strengthening the traditional management system (traditional knowledge, social organization and institutions for the management of biodiversity and natural resources)*

- Reuse the traditional species and the farming system in the pilot site

- Collect the traditional knowledge

- Reform the houses construction style of the pilot site.

- Re-plan the land use system especially for those rice-fish fields.

6. *livelihood / economic activities based on / compatible with the bio-physical and cultural characteristics of the GIAHS*

- Traditional farming

- Stone carving

- Organic agriculture

- Eco-tourism

7. *creation of innovative institutional mechanisms in*

each pilot system for collection, management and publication of data and collaborative management on GIAHS between government, customary groups and civil society

- We need form a team to conserve the rice-fish farming system, set down a set of programmes to monitor and evaluate the system conservation.

4.4 The methods for implementation, monitoring and evaluation

- To carry on the monitor and the comprehensive research of biodiversity and the ecosystem

- To conduct the relative research to protect the endangered species in order to maintain the equilibrium of ecological system, guarantee the function of the whole system.

- To establish specialized culture protection agency, carry on the culture resources general survey, and develop culture demonstration , cultural innovation and the special study

4.5 The communication plan

- Communicate with farmers

- Communicate with national universities and research institutes

- Communicate with international partners.

4.6 Managerial / institutional arrangements

- The member of the team is constituted of:

- The local government, local organizations such as villager group, and some corporations; local authorities, such as MOA of Qingtian county, ministry of water and electricity conservancy, ministry of tourism, town government, and the village committee and local experts; Their function is to provide policy and fund support to the rice-fish farming system conservation, take charge of the conservation planning; Organize agriculture production,

- The government authorities, such as MOA of China, Agricultural Technology Promotion Center of the MOA , MOA of Zhejiang province, State Environmental Protection Administration, National CBD and Biosafety office, National Biosafety Office, SEPA CITES Management Authority; Their function is to Provide policy, scientific technique and project formation support, offer opportunities of training and project evaluation. They are coordinator and supervisor, take charge of the comprehensive management.

- University and research institute, such as CAS,

Zhejiang University. They give the scientific support, set down the development planning according to the local resource advantage and developing potential in the different phase of the project accordingly.

- NGOs: Ecological Society of China, Chinese Society of Agro-ecological Environment Protection, Agricultural society of China, China Biodiversity Conservation Foundation, rice-fish farming system society. They provide the fund and technique support to the GIAHS, give suggestions to the management method, safeguard, as well as the on-the-spot instruction.

- International partners: China Council for International Cooperation on Environment and Development (CCICED). On one hand, public care for food safety and ecological conservation is now being addressed through policies on monitoring, eco-labelling (Green Food/Organic Food Programs) and eco-agricultural practices. In addition, ecotourism on agricultural landscape is also being promoted. There is good potential to integrate the traditional rice-fish culture into those new policy changes. On the other hand, much has to be done to identify and remove inappropriate policies, institutions, and technologies that encourage shifting rice-fish system to intensive mono rice or fish systems. The rice-fish system is widely practiced in many coun-

tries, especially in Asia. The extension of the system has potential to reducing use of POPs in agriculture. It maintains ecological functions of carbon and nutritional cycles, protects the field degradation, and hosts a variety of rice, fish and other associated species.

4.7 Institutional co-ordination arrangements

Just as the graph (fig 1) shows, a multi-stakeholder process will be established to conserve the rice-fish farming system, and a set of programmes will be set down to monitor and evaluate the system conservation.

The members of the team constitutes of: Government authorities, local government, local organizations, University and research institute, NGOs, and International partners. They follows a up to down managing mechanism .MOA takes charge of the conservation on the whole, local government assistants it ,the NGOs, Inter national partner, universities and research centres provide the various support for the conservation of the system.

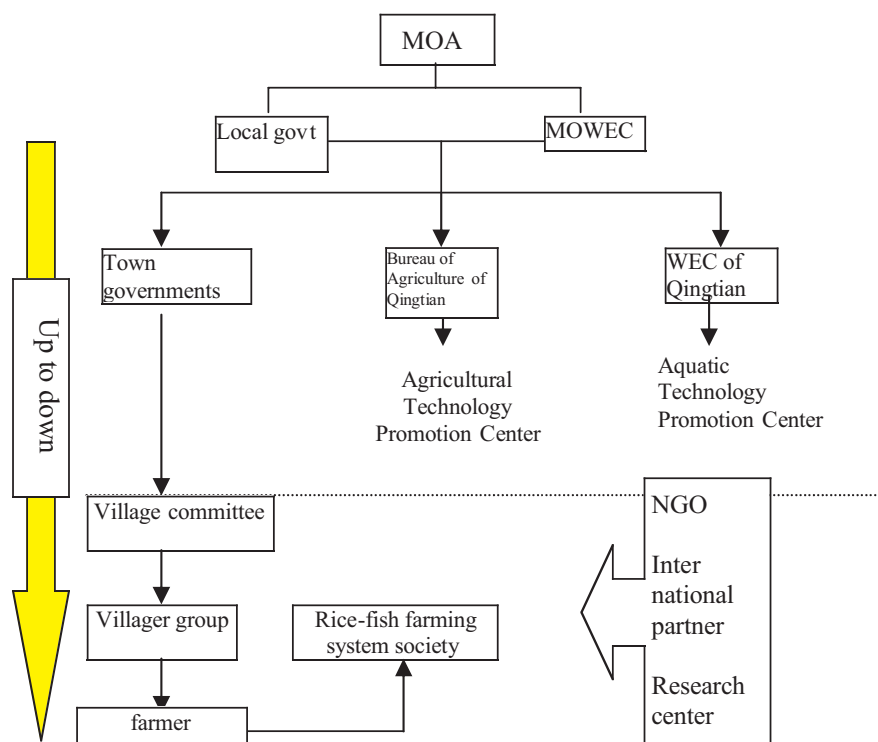


Fig.1The multi-stakeholder process stablished to conserve the rice-fish farming system

The detail information are as follows:

<i>Level</i>	<i>Prime tasks</i>	<i>Support needed</i>	<i>Likely stakeholder</i>
National	<p>Develop a national policy framework and institutional support for GIAHS adaptive conservation</p> <p>Develop a national guideline on nomination, labelling and monitoring of GIAHS</p> <p>Develop a national research network on agricultural heritage</p> <p>Support governments of Zhejiang Province and Qingtian County for establishment of a sustainable GIAHS in the pilot site in Longxian</p>	<p>Internationally acknowledged framework, including labelling standards for GIAHS</p> <p>National political support</p> <p>Project finances</p>	<p>Managing department: Ministry of Agriculture</p> <p>Technical support: Chinese Academy of Sciences</p> <p>Other partners: Ministry of Culture GEF focal point in Beijing NGOs FAO Rome FAO Beijing UNDP Beijing UNU/PLEC</p>
Provincial	<p>Mobilize provincial support to Qingtian County for establishment of a sustainable management system of GIAHS in Longxian</p> <p>Liaise between national and Qingtian County</p>	<p>National labelling/monitoring standards for GIAHS</p> <p>Provincial political support</p> <p>Project finances</p>	<p>Managing department: Department of Agriculture of Zhejiang</p> <p>Technical support: Zhejiang University</p>
County	<p>Develop supporting institutions for adaptive management of GIAHS in Longxian</p> <p>Develop and implement the adaptive management plan for GIAHS in Longxian</p> <p>Support communities to enhance multiple values of GIAHS as well as alternative livelihoods in Longxian</p>	<p>National labelling/monitoring standards for GIAHS</p> <p>Supporting national and provincial policies</p> <p>Technical support from academia</p> <p>Mandate to develop a GIAHS conservation initiative for international labelling</p> <p>Project finances</p>	<p>Managing department Qingtian Government; Agriculture Bureau</p> <p>Other partners Tourism Bureau; Water Bureau. Local businesses, etc.</p>
Community	<p>Develop adaptive management of its GIAHS (organic /ornamental agriculture, certification, product trading links, etc.) in Longxian</p> <p>Develop alternative livelihoods (natural links, cultural links, tourism, payment of environmental services) in Longxian</p>	<p>Facilitation for development of payment-for-services</p> <p>Clear standards of compliance for GIAHS labelling</p> <p>Technical support for re-inventing traditional practices (organic agriculture) in a future institutional setting</p>	<p>Communities in Lonxian</p> <p>Overseas Chinese network, Local businesses</p>

The forms of social organisation, customary institutions for ecosystem management included: to set up National Steering Committee, Technical Advisory Committee and Implementation Committee; took survey of the bio-diversity, land use type and land management, ecosystem functioning, local natural, social and economic situations.

Local government hold information meetings; gave the authority of Department of Agriculture of Qingtian County; they issued brochures and newsletters and took advantages of web-site, flyer for tourists, press releases and record media coverage to publicize the agriculture heritage. The local overseas Chinese establish a conservation organization called World Agricultural Heritage conservation Centre which can collect the donation of the overseas of Qingtian County to do the conservation work.



¹ The law system include the Land Management Law, Regulations for the Implementation of Land Management Law, Regulations for the Protection of Fundamental Farmland, Regulations for the Rehabilitation of Land, Provisional Regulations on Land Appreciation Tax, Measures for Management of the Construction-Used Land, etc..

² It is not like most of the developed countries, China's farmers still feed themselves by their grain productions. Rice and fish they produced in rice-fish farming usually as their important food. They only sell the surplus in the markets.

³ Liang, Jiamian. *History of China's Agricultural Sciences and Technology*. Chinese Agricultural Press. Beijing. 1986. pp. 155-158.

⁴ Cao Cao is the emperor of Wei in The Three Countries Dynasty.

⁵ Mackay, T. Kenneth (editor), *Rice-Fish Culture in China*. IDRC. 1995. pp.4

³ the year 1965-1975 also coincided with the cultural revolution. During this period, the raising of fish was considered a bourgeois way of making money and was officially discouraged. In addition, there were severe dislocations of research and extension during this period.

⁶ MOA. Unpublished fishery state.

