

# Comprehensive development of water and soil resources in PoYang Lake floodplain<sup>1</sup>

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**Abstract:** Poyang Lake is one of the largest fresh water lakes in China, and also is an important rice and farm production base. There is heavy population in this area. It always flood in this floodplain, suffers from huge social and economical wealth loss, especially in 1998. According to the principle of rebuilding floodplain that is established by the Chinese government after 1998'the biggest flood in Yangzi river, Jiangxi province government decided to put some cultivated land back lakes and put the embankment and the field in lakeside areas return to lakes in order to large water storage in Poyang Lake floodplain. Therefore, there exist a contradiction between agriculture producing, water and soil resources utilization and flood controlling. This paper investigated the current situation of agriculture production, analysis the existing problem, express some main measures for comprehensive development of water and soil resources in PoyangLake floodplain.

**Keywords:** PoyangLake, put the embankment and the field in lakeside areas return to lakes, Water and soil resources, ecological agricultural model, and comprehensive utilization

## 1 Introduction

Poyang-Lake, located in the Jiangxi Provincial Southeast China, is the largest freshwater lake and the largest natural water resource in China. The area of the lake is subject to dramatic fluctuations of water levels, shrinking to a tenth of this size in winter. Consequently the diverse mosaic of shallow lakes, mudflats and wet grasslands make Poyang one of the most important bio-diversity sites both in China and worldwide. However the area suffers from frequent flood and waterlogs, deforestation, draining of wetlands and pollution due to human activities and economic development.

PoyangLake is in the floodplain of the five inflowing rivers, and also receives backflow from the Yangtzi River at the height of the flood. The different between low water levels and high water levels at the height of the summer flood is a staggering 11meters.

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<sup>1</sup> Funded by the National Natural Science Foundation of China.

In order to alleviate the flood damage, the Chinese Government established a guideline for improving ecological environment, treating rivers and lakes, which is called "32words guideline", that is "seal a mountain pass to plant trees, put the cultivated lands back forest, draw dyke to let the flood through, put the embankment and the field in lakeside areas return to lakes, take labor in place of aid, migrate people in floodplain to rebuild town, reinforce main dike, dredge river bed".

According to the "32words guideline", Jiangxi Province government has initiated a project which put the embankment and the field land in lakeside areas return to lakes. This project included two models, one is called "double return" that is to put the dikes which influence flood through badly back lakes, and to put all cultivated fields inside back lakes. The other is called "single return" that is just to migrate people in lakeside areas to other high lands, where the dike will be burst easily, or there isn't a lot of people lived inside. This single return needn't to put the cultivated field back lakes.

This project involved 3 cities and 28counties (smaller local administrative units), influence the traditional agricultural production and live style in the areas badly. Poyang Lake is one of the biggest fresh water lakes in China, and also is an important rice and farm production base. There is heavy population in this area. Since 1949, 884 dikes were built in Poyang Lake, which protect more than 50861hectares fertile fields, so that the farmers' income has been increased greatly. But because people land reclamation again and again, narrow the river and reduce the storage, Poyang Lake became increasingly liable to floods and outbreaks of schistosomiasis, it results in poverty in this areas.

## **2 the status quo of water and soil resources developing in the floodplain**

### **2.1 the current situation**

There are a great lot even land and widest water surface in PoYangLake areas, which are optimum to plant, to farm and to breed aquatics. Farmers are very poor because of flood and waterlog every year. Since the biggest flood in 1998 and 1999, the local government and people adjust local agricultural production system and try much different ways to avoid the flood, the popular way is as follow.

- 1) Change planting crop into breed aquatics, develop aquatic product and livestock, especially concentrative breed aquatic with nets and boxes, also special type aquatics production breeding in the low-lying fields near likes and ponds.
- 2) Change paddy field to water surface, encourage farmer to develop hydrophilic

production like lotus root and water caltrop.

- 3) Plant grass on the bottomland to develop livestock and herd, use depositing fluid from marsh gas pool to breed fishes and to fertilize field, not only make the best of land and also provide feed for livestock.
- 4) Dig two-acre fishpond which breed fishes on peacetime and storage water when flood and build one-acre mesa that plant crop on it, this model called "2+1" model.

## **2.2 existing problems**

In order to avoid flood proactively, the agriculture activities should avoid flood season. In view of hydrology, the Yangtze River and five rivers called Xiushui, Xinjiang, Raohe, Ganjiang and Huhe influence the flood season. The flood season caused by five rivers is from June to July, and the flood season caused by Yangtze River is from July to August. This indicates that the flood season in Poyang Lake is from June to August. It needs a long time to fade away the flood water in case of flood, which is about 30 days according to the hydrology data<sup>[1]</sup>.

Because the period from June to August is planting time including planting double seasons rice or just one season rice, also including the growth time of cotton. It is impossible to escape flood season completely from the planting time of view. Meanwhile, there is no guarantee for the high efficient use of water and soil resources, because the infrastructure of water resources engineering in the areas has been damaged badly, especially after 1998's biggest flood.

The population in poverty in Duchang County, side of Poyang lake, is increasing. Flood not only makes impoverished directly, but also makes impoverished indirectly. Many farmers have new debt because of loss of farmland and building houses. Support and help are needed not only in financial aspect but also in technical aspect.

The market risk is another problem that blocks local agricultural production. In lack of advanced technology and investment and dependable information of markets, it results in the failure of production structure adjusting also. For example, farmers in a village of Pengzhi county had no choice but to eat by themselves because of very low market price of mushroom when they plant mushrooms vigorously.

## **3 main measures for comprehensive utilization of water and soil resources in Poyang Lake floodplain**

- 1) Models in this "double return" areas are suggested as:

- a) Comprehensive development of large water surfaces in lake areas. According to different water ecosystem, adopt the different breeding way to form a good circle of ecosystem, which is to breed fish, crab and pearl in water, to grow grass and to cultivate pigs on the bank by growing the grass and fertilizing water with pig dung, by breeding fish, crab and pearl with the grass.
  - b) Making the best of grass resources to herd for seasons in the altitude between 15m and 17m, Developing bulrush, pigweed, goosefoot in the altitude between 17m and 19m or in the areas where the submerge period is short, and enough water surface in low water season, and suitable to develop these water plant.
- 2) "mixed farming". To combine rice planting with economical crop (vegetable/soya) and feed crop, to combine crop planting with herding, breeding, foresting in "single return" areas.
  - 3) Reconstruction of the damaged ecological system. For the prevention of soil and water erosion, to build reservoirs and ponds in mountains for storing water for the prevention of droughts, to plant trees and grasses for gradually increasing thickness of arable land and enhance land fertility. In hilly area, fostering natural forest on the slope over 25° is blocked. On the bare slope below 25°, trees and grasses comprised of arbors, bushes and grasses, or developed orchards and planted grasses were planted to protect the slopes. This pattern was described as "forests and grasses are on top and ponds below, fruits and grains are cultivated on bottomland□livestock farming and aquaculture promote mutually".
  - 4) Scientifically utilization of land resource, the eco-economic pattern of "pig-biogas-fruit (vegetable/fish/ others)"to prevent rural pollution was greatly developed. For instance, one local household combines his lavatory, barn and biogas pond (about 6 – 10m<sup>3</sup>) together and raises 4 pigs and cultivates about 10 mu fruits. Feces are fermented in the biogas ponds. The produced biogas can provide energy for cooking and lighting. The biomass liquor can be used as feed supplement and good surface fertilizer. The biomass residues can be returned to farmland and increase 30~40% fertilizer efficiency.
  - 5) comprehensive measures to control schistosomiasis. To block the small

branches of the Lake Poyang with low dams from its main water body in order to reduce the chance people and live stocks' contacting the contaminated water. The branch ponds can be used to raise fishes or water fowls. To change the downfold into fish ponds to stabilize the water level, to plant trees by water to establish barrier belt, to change the paddy field at high land into dry land and restructure the crop pattern to fruit and vegetable cultivation, to reduce the number of farm cattle and raising pigs in pens; Blocked off lake beaches and forbidden fishing in schistosomiasis epidemic seasons. Meanwhile, to improve water supply facilities and sanitation conditions and to build biogas ponds.

- 6) Varieties of science and technology stations and night schools have been set up in flood prone areas, the mass of farmers have been trained by science, technology and ecological consciousness education to help eliminate poverty and ignorance. Some key enterprises have been grown up to connect local farmers' production with the markets outside and to direct local agricultural activities.

#### **4. Achievements**

Through the implement of this project and efforts of local governments and local residents, significant social, ecological and economic benefits have been achieved in the flood prone areas in Poyang Lake.

In past 20 years, the area of afforestation was up to 2.3 million hectares and the barren mountains suitable to afforestation have almost disappeared. The area of soil erosion has reduced from 3.3 million hectares to 1.3 million hectares, the forest covering rate has rose from 31.5% to 59.7%. The annual average amount of sand and soil coming into Poyang Lake reduced from 53.35 million tons to 24.00 millions tons. The area of water surface of Poyang Lake has almost restored with 4.6 billion m<sup>3</sup> capacity of floodwater store, and the wetland area has greatly expanded. The main levees in lake area have been reinforced and capacity of flood control has enhanced. Water quality has been improved. The water quality of the main body of Poyang Lake has reached the Grade II water quality standard. The gross production value of agriculture, forest and husbandry of the whole province was up to 11.45 billion Yuan in 2002. It rose 2.33 times than that in 1985, among which agriculture increased 1.77 times; forest 1.63 times; animal husbandry 3.13 times; and fishery 12.1 times. People's life standard has greatly enhanced. The rural annual mean income increased from 287 Yuan in 1985 to 2,450

Yuan in 2003. Population of 4.5 million has got rid of poverty.

The migration and resettlement project carried in Poyang Lake Basin has provided a historic opportunity for the 115,000 households of the lake region to avoid a millennium old vicious cycle of flooding and devastation and to vastly improve their living environment. Moreover, power and water supplies, road traffic, and postal service are now available for every household. Taking advantage of the resettlement, many migrants have built facilities for the use of bio-gas which has greatly improved sanitary conditions as well as the production of energy in an environmentally sound manner. With the implementation of this project, more than 470,000 inhabitants of the Poyang Lake area are now benefiting from improved land-use patterns, more diversified economic opportunities and access to basic services and modern facilities. The residential and living environments of the migrants have been fundamentally improved and many people who know the region can hardly believe the quantum leap in quality of life that has occurred.

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