

Chapter 2

Rural Development in the Poyang Lake Region amid Floods

Abstract This chapter provides an introduction to the Poyang Lake Region, including local agriculture, flood history, and the levee system around Poyang Lake. The chapter also describes China's broader policy and development context, under which rural households develop their livelihoods. The PLR possesses unique social, economic, and environmental characteristics but also confronts the same issues for rural development as other rural areas in China. These issues include continued low levels of rural income and agriculture decline associated with increasing nonfarm income.

Keywords Poyang Lake Region • Agriculture • Flood hazards • Levees • Rural development issues • Policy context in China

2.1 The Dynamic Human-Environment System around Poyang Lake

The Poyang Lake Region, situated within the Yangtze River Basin, lies in northern Jiangxi Province and covers a 20,970 km² (Fig. 2.1). Comprising ten counties and two cities, Nanchang and Jiujiang, the PLR population totaled about 9.2 million in 2010, according to that year's census, with 78.3% of the population outside the two cities classified as rural. The region is relatively more developed than other rural areas in Jiangxi Province. The annual per capita net income of farmers was 5,789 CNY in 2010, slightly below the national average of 5,919 CNY (Yan et al. 2013). Based on household surveys across eight villages in the region, on average, 65% of rural income derived from nonfarm sources in 2006 (Tian et al. 2015a).

The PLR is a major agricultural production area for the province and, more generally, the nation. According to *Jiangxi Statistical Yearbook*, the region produced 19.08% of the total grain products in Jiangxi in 2004, as well as 32.47% of its cotton and 34.86% of its aquaculture products. The region's agriculture has been shaped by the physical environment; as a flood plain of Poyang Lake, the terrain is flat near the lake and gradually rises further away (Fig. 2.2).

Rice cultivation has traditionally dominated the economy. It is grown either once a year, from mid- or late June to early October, as "single cropping" or "one-season"

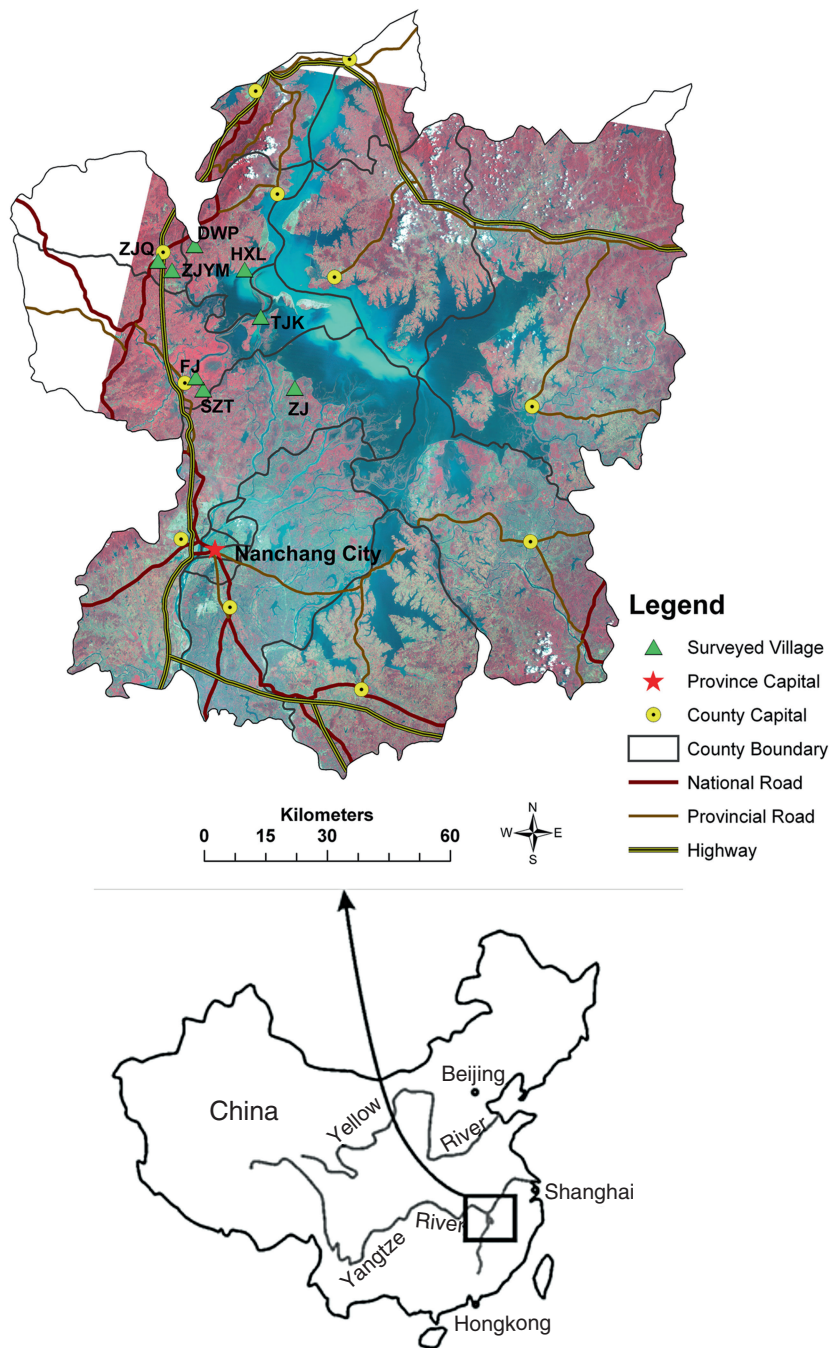


Fig. 2.1 The Poyang Lake Region (Tian et al. 2015a)

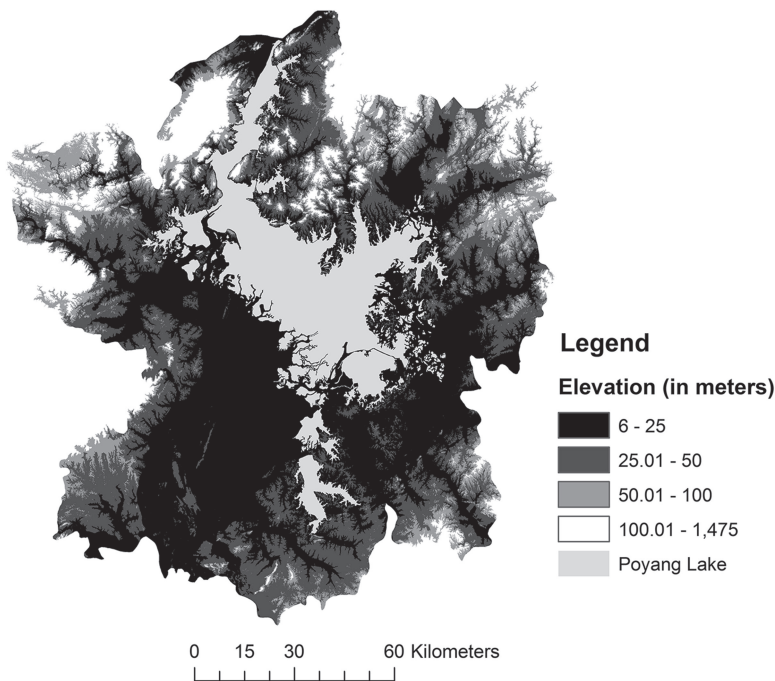


Fig. 2.2 The terrain of the PLR, mapped using a digital elevation model (Data source: Tian et al. 2015b)

rice, or double-cropped as “two-season” rice. In the latter case, the first crop is planted in late April and harvested in mid-July, and a second crop is planted in mid- or late July and harvested in late October or early November. In some areas, under the influences of nonfarm work and income, farmland plots that were traditionally used for two-season production have been converted to one-season rice (Shi et al. 2011; Tian et al. 2015a). The switch from one- to two-season rice has also been observed on remote sensing images elsewhere in the PLR (Li et al. 2012).

Cotton is an upland crop and tolerates dry conditions better than rice. It is usually planted in May and harvested from October until year’s end. Other agricultural products include rapeseed, sweet potatoes, and peanuts. Rapeseed is usually planted in the rice paddies or cotton fields after the harvests, and grows throughout the winter. Figure 2.3 shows some of these farmer activities.

Poyang Lake is the largest freshwater lake in China, and human development in the PLR is vulnerable to flooding from the lake (Zhao and Guo 2001; Zhu et al. 2002; Huang and Dai 2004; Huang et al. 2006; Wang et al. 2006; Chen and Zhao 2007; Ma 2007; Jiang et al. 2008). Situated in a topographical depression, the lake collects water from five major rivers in Jiangxi and drains from its northern rim into the Yangtze River at Hukou, about 700 km downstream of the Three Gorges Dam. The lakebed has an average depth about 8.4 m; however, the water level varies considerably throughout the year (Xu et al. 2001; Min 1997a, b).



Fig. 2.3 Agricultural activities around Poyang Lake. *Top row*: transplanting rice seedlings; picking watermelon seeds; *Second row*: applying fertilizers to rice; growing vegetables; *Third row*: harvesting rice; cleaning boat after a fishing trip; *Bottom row*: harvesting rice with machines; working in the cotton field

From April to June, seasonal rainfalls raise the water levels of the five rivers, and the lake waters rise as well. From July to September, seasonal rains cause the water of the Yangtze River to rise, and this water can flow southward back into Poyang

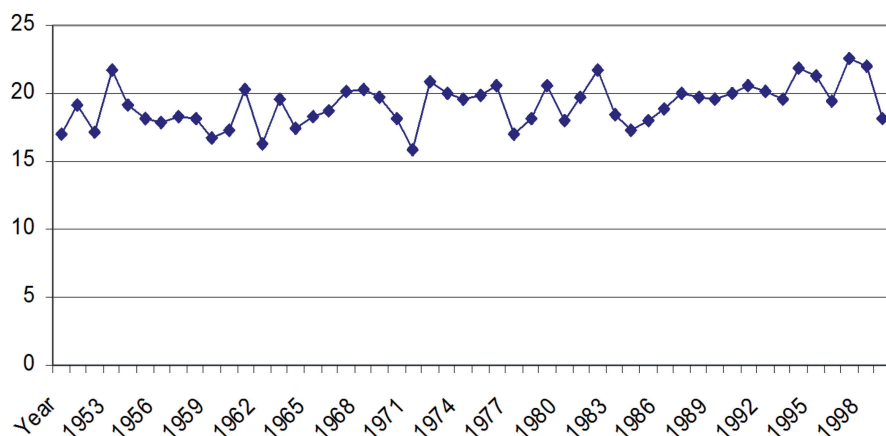


Fig. 2.4 High-water levels (in meters) from 1951 to 2001 (Data source: Tian et al. 2015b)

Lake. Historically, the most severe floods occurred when water levels in the five rivers and the Yangtze peaked at the same time. In fact, for the period 1950–1998, 83.7% of the highest lake levels were recorded from July to September, according to records at Hukou; and 65.3% of these record levels occurred in July.

Since 1950 the general trend has been toward higher rainy-season lake levels and greater frequency of severe flooding (Fig. 2.4; Min 1997a, b; Shankman and Liang 2003). During the period 1951–2001, the historical high-water level reached 22.59 m in 1998 at Hukou, and the lowest high-water level of 15.84 m occurred in 1972 (Jiang 2006; Qi et al. 2009). On average, the high-water level was 19.11 m. Nine major floods occurred in 1973, 1977, 1980, 1983, 1992, 1995, 1996, 1998, and 1999 when the high-water level exceeded 20.89 m. The 1998 food was the worst in recent history.

No severe floods have occurred since 1999; the lake responds to long-term climate and hydrologic cycles and has been in a low-level stage since 2000, according to local scientists who study its hydrology (Min and Liu, Pers. Comm.). Yet flooding concerns remain. In 2016 the lake again reached alarming levels, registering the highest water rise since 1999 and causing floods in some surrounding areas (Jiang and Qi, Pers. Comm.). Global climate change, the Three Gorges Dam, and ongoing sand dredging may increase the uncertainty of the flood regime.

For hundreds of years, the people living around Poyang Lake have built levees to protect the land from flooding. Since 1949 the Chinese government has expanded and strengthened the levee system, in part to reclaim wetlands for increased agricultural production and to accommodate the area's rapid population growth. As a result, more than 10,000 km² of wetland that had previously undergone annual flooding has been converted to farmland and settlements (Peng 1999). About 57% of the flood-prone area (defined as the area below an elevation of 20.75 m) in the PLR is protected by levees, and the remainder is mainly permanent and seasonal water surface (Jiang 2006).

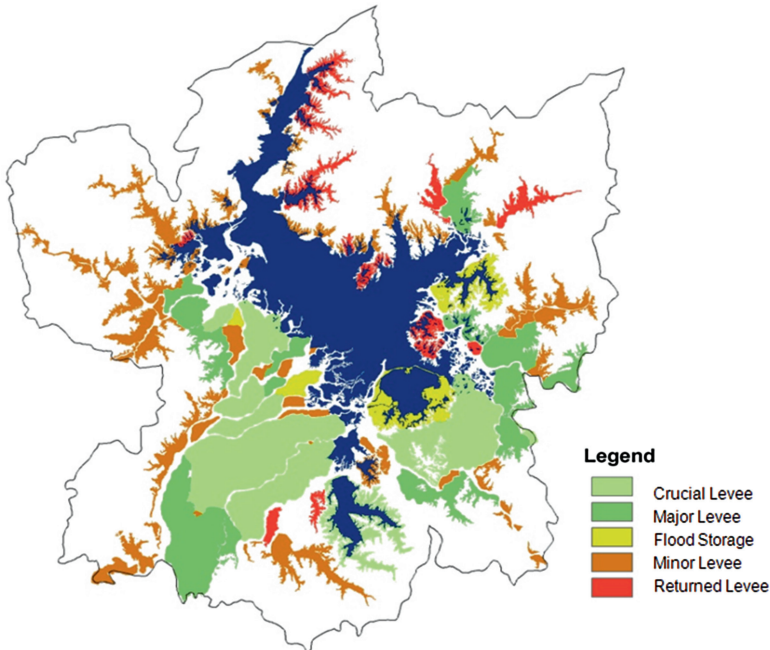


Fig. 2.5 Polders and different types of levees (Levee data source: Jiang 2006). Returned levees refer to levees that enclose abandoned polders under the “returning farmland to lake” policy

This extensive levee construction, however, offers both security and peril. It has resulted in a reduction of the lake’s water storage capacity, increasing the risk of severe floods (Dou et al. 1999; Ma et al. 2004; Wu et al. 2004). The floodwaters of 1998, for example, breached many important levees and caused significant economic damage.

There are special designations for the levees, based on the amount of farmland and settlement area they contain (Peng 1999; Jiang 2006; Fig. 2.5). Crucial levees enclose more than 66.7 km² of farmland, as well as large cities or county capitals, and were built high and strong (i.e., with concrete). Major levees were built to protect more than 33.3 km² of farmland. Minor levees, usually built by rural farmers, protect farmland totaling less than 33.3 km² and tend to be poorly constructed and maintained. About 63% of farmland in the PLR below an elevation of 21 m was protected by crucial and major levees (Jiang et al. 2008).

In 1986 the government of Jiangxi designated four polders (the areas of land enclosed by levees) for floodwater storage, to increase the area’s floodwater storage capacity. According to the policy, the levees enclosing these polders would be opened to discharge water when lake levels at Hukou reach 18.7 m. However, these polders were intensively farmed, and the government did not order the levees to be opened during the 1998 flood.

After the 1998 flood, the Chinese government implemented a policy to mitigate flooding by restoring some of the natural wetlands. This “returning farmland to lake” policy resulted in the abandonment of many minor polders. The abandoned polders were classified into two types: “partial return” and “complete return.” In the partial-return polders, the villagers were resettled to higher ground, but their farmland could still be cultivated. In the complete-return polders, villagers were resettled and their farms were restored to wetland. Government regulations stipulate that when the lake levels reach 18.7 m, levees protecting partial-return polders of less than 6.67 km² will be opened, and when lake levels reach 19.8 m, the levees enclosing the partial-return areas of more than 6.67 km² will be opened.

Agricultural scientists in the Poyang Lake Region have developed land-use practices that can potentially reduce flood damage and increase land profitability (Yu 2002; Yuan et al. 2002a, b, 2007; Wang et al. 2002). These include planting new rice breeds whose growth cycles or rotation patterns will not coincide with severe flooding seasons. Some involve planning land uses based on spatial variations in elevation and other properties of the natural environment. For example, farmers could cultivate flood-tolerable crops in the lower-lying areas.

These practices have not been widely adopted, in part because government agencies have limited human and financial resources for promoting them. Moreover, land-use planning based on spatial configurations usually requires consideration of a relatively large area, and such practices are not practical for individual households with small, fragmented landholdings, which is the case in many villages in the PLR. Based on the survey data collected from 1522 farmland plots in the region, on average, a household manages a farmland area of 8.28 mu (about 0.6 ha) consisting of 6.56 plots, with the mean plot size about 0.77 mu, or 0.06 ha (Tian et al. 2015a).

The PLR also holds great ecological importance. The coastal zone and wetlands around Poyang Lake serve as important habitats for more than 332 species of birds, of which 13 are internationally protected, including the critically endangered Siberian Crane. Natural reserves around Poyang Lake have been established for wildlife protection, but the reserves are not large enough to provide wintering habitat for the migratory cranes and other birds, and the variety and extent of protected wetland habitats need to be expanded (Bird Life International 2000; Kanai et al. 2002).

2.2 Broader Development and Policy Context in China

As with other rural areas in China, rural livelihoods in the Poyang Lake Region are affected by a variety of institutional factors and policy changes. From 1949 to the late 1970s, development policy in China focused on heavy industry under strong central planning (Lin 2009). To increase agricultural productivity and ultimately to support industrial development, communal farming systems were put into operation from 1966 to 1978. Heavy industry had no need for a large labor force, and rural migration into urban areas was controlled by a household registration system called

hukou, which differentiated urban and rural households, and classified a household as either urban or rural. Urban *hukou* was also associated with state-subsidized social benefits at that time. For example, the work units in cities provided free housing for their “formal” employees who held urban *hukou*. The health care and education systems in cities were also limited to urban *hukou* holders. A gap in development and living standards began to grow between rural and urban areas.

As China launched economic reforms in the late 1970s, the communal systems were dismantled and replaced by a Household Responsibility System. Under the Household Responsibility System, farmland was contracted out to farmer households (for up to 30 years), shifting production decisions to individual households (Heerink et al. 2007; Long 2014). Prices for agricultural products were also increased to encourage agricultural production, and a portion of the production that exceeded a quota was sold at higher, but controlled, prices. As a result, rural income and agricultural production increased rapidly during this early period of economic reforms (Fan 1991; Lin 1992).

The period from 1985 to 1993 saw a decrease in the state control on the marketing and purchasing of agricultural products. A dual price system was established for major products, like grain, oil-bearing crops, and pork, in which prices were fixed for the procurement quota, while surplus production was sold at market prices or negotiated contract prices. In 1993 procurement quotas were reduced and, in some regions, even eliminated. In this period, other products, such as fruits and aquatic products, were freely traded on the market.

The period from 1994 to 2003 marked the reintroduction of a government procurement system for grain, as maintaining grain production and securing affordable food supplies became a priority for the Chinese government. To promote grain production, prices were increased to a level even higher than world market prices, and the government spent a large amount of money subsidizing grain procurement, export, and storage. The Governor’s Grain Bag Responsibility System was implemented, which made provincial and local governments responsible for agricultural production to ensure food self-sufficiency at the provincial level.

The growth of the industrial sector, resulting from economic reforms, also created a demand for labor in urban centers and spurred rural-urban migration. Rural income, however, entered a stagnant period in the late 1980s, and the rate of grain production slowed as well (Huang et al. 2010). Arthur Lewis’s theory of Unlimited Supply of Labor can explain, to some degree, the slow wage growth for migrant workers (Cai 2010; Yao and Zhang 2010; Zhang et al. 2011). Using a simple two-sector macroeconomic model, Lewis (1954) showed that in the initial stage of development, the industrial sector only draws additional labor from the agricultural sector, and migrant workers’ wages do not rise with the growth of the industrial sector. China has a large rural labor surplus due to limited farmland (Hui and Huo 2007). The average cultivated land was about 0.6 ha per household, according to the country’s 2007 agricultural census.

As a large rural population turns to migratory work, farmland is cultivated carelessly or left fallow in some areas. As noted, migrant workers were also not treated the same as “formal employees” by the work units in cities and did not enjoy the

same benefits as urban *hukou* holders (Yin 2008). Disparities widened meanwhile in the broader social and cultural development between urban and rural areas. These problems were formalized into what became known as the Three Rural Issues, namely agriculture, farmers, and rural areas (Zhang et al. 2004; Zhang and Chen 2005; Shi et al. 2006; Yu and Jensen 2010). Improving rural income, reducing the rural-urban gap and promoting agriculture have remained major challenges and top priorities of the government, as described in a series of No. 1 Policy Documents issued by the Central Committee since 2004.

Also in 2004, the government initiated policies designed to improve agricultural productivity and raise farm income. These included the elimination of agriculture taxes, and subsidies to farmer households in the form of cash, high-quality seeds, and machinery. China's agricultural subsidies have risen significantly since 2008 (Gale 2013), but they have had only limited impacts toward increasing agricultural output, chiefly because nonfarm income is playing a greater role in the farmers' agricultural production decisions (Gale et al. 2005; Heerink et al. 2006; Huang et al. 2011; Gale 2013; Tian et al. 2016).

In 2006, China launched another rural development program called "building a new countryside." The program represents an integrated approach to rural development issues with multiple purposes of improving livelihoods, promoting a civilized social atmosphere, developing clean and tidy villages, and enhancing efficient management (Long and Woods 2011). The program has brought greater public investment in infrastructure across rural China. Fig. 2.6 shows a model village of the "building a new countryside" program.

The government's recent approach to promoting rural development reflects its commitment to strengthening farmer households' land rights through the issuance of land certificates and extensions of their contract periods. Land in rural China is owned nominally by "collectives," which are not well defined (Liu et al. 2014); all land in China is ultimately owned by the state. Farmer households have use rights for the contracted farmland and can subcontract their farmland to other households in private land rental markets.

The government has also been encouraging farmer households to use the land rental markets for farmland consolidation. As noted, farm operations are typically small; farmland consolidation could increase land-use efficiency and agricultural income. In the past few years, China has stepped up its effort in farmland consolidation by providing a variety of supports, ranging from cash subsidies to assistance in the construction of facilities, such as sheds, barns, and grain-sunning ground, to large farms.

Most recently, China announced new guidelines on migration and further reform of the *hukou* system in 2014. These include completely opening up towns and county-level cities to allow rural households to settle in these smaller cities; gradually opening up medium-sized cities with populations between 500,000 and one million; controlling residency in large cities with populations between one million and three million; strictly controlling populations in large cities with populations of more than five million (<http://cpc.people.com.cn/n/2014/0730/c64387-25370735.html>).



Fig. 2.6 A model village of the “building a new countryside” program. From top to bottom: development plans; the village; new houses; children’s playground; a bulletin on which are written ten ways to become rich and ten things to avoid. Ways to become rich: learn new skills, work hard, plan carefully, obey the law, value honesty, cooperate, help one other, educate the next generation, serve the community, and love your country. Things to avoid: attending livelihoods carelessly, laziness, squandering money, gambling and using drugs...

The new policy moves away from the *hukou* system toward residency registration systems in cities. Any person can become a resident of a city if he/she obtains sufficient points that are awarded based on age, education, expertise, and other criteria. Cities will provide service and social benefits to all their residents. The point systems and the number of points required for residency differ among cities. Following these guidelines, in 2016, many major cities announced the elimination of *hukou*. Beijing, a little behind others, just announced to eliminate *hukou* on September 8, 2016 (<http://zhengce.beijing.gov.cn/library/192/399/276/334/929377/80771/index.html>). Jiangxi Province is expected to announce its *hukou* reform policy along this line, too.

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Rural Sustainability

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