

# More People and More Forest: Population, Policy and Land Use Change in the Xizhuang Watershed

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## Abstract

Land use changes in the Xizhuang watershed have been very dramatic over the past century, and historic events and national policies are considered to be responsible. Three periods of rapid forest degradation have been identified—World War II, the period of the 'Great Leap Forward', and the shift in the land use tenure system. Significant steps have been taken since these times to improve the forest resources, and the area under forest has expanded significantly as a result of two periods of aerial seeding of pine and the mobilisation and involvement of lowland farmers. There is no correlation between forest degradation and population growth. Forest expansion in recent years has come at the expense of farm land. Greater opportunities for off-farm employment resulting from more open policies are reducing the population pressure on the resources in the watershed. The strong enforcement of conservation policies, and responsible management of the forest by village leaders, is credited as the reason for the improvement in forest coverage.

## Introduction

Baoshan was an important city more than a thousand years ago when it was situated on the South Silk Road, a major trading access route to South Asian countries. The local environment has been degraded throughout history because of the high population density and early development for intensive agriculture. Large-scale deforestation occurred during World War II during the frontier fighting against Japanese troops to the west of the Nujiang (Salween) river. Much timber was felled by Chinese troops for construction of bridges and houses, and for fuelwood. During recent decades, the local government has made great efforts to reforest the degraded areas using aerial seeding, transplantation, and natural regeneration through arrangements with social institutions.

## Methodology

In 1997 and 1998 the PARDYP project developed an integrated spatial database for the Xizhuang watershed through the collection of secondary data, field surveys, interviews with farmers and other key informants, and an analysis of relevant socioeconomic policies. This database was used as a framework for analysing the changes in land cover and forest patterns over time, and as a tool for analysing the information collected through interviews and policy analysis.

The spatial database was developed using a 1982 topographical map as a base map, overlaying information from an existing 1991 land use map, and producing a 1998 land use map from field surveys. All the land-cover categories were digitised and entered into a geographic information system (GIS) using Arc/Info software at a PC workstation. The land cover was classified as forest, bush land, grassland, farm land, tea garden, settlement area, paddy, and other.

The socioeconomic database was developed through interviews with key informants including administrative and village leaders, older people who could provide general histories of land-use dynamics in the study area, and younger people who could provide insights into how land use may change in the future. Extensive household interviews were conducted with individual farmers in order to collect data on how families manage farm land across the landscape, and on how they collaborate with neighbouring farmers and communities when allocating and zoning land use. Participatory rural appraisal methods were used to construct time lines, and residents of the villages were interviewed to learn more about the socioeconomic factors contributing to their decisions to create or maintain forests in their area.

Topographic and land-use maps were used in the field as tools for soliciting discussion from local leaders and farmers on past land-use practices, present land-use conflicts, and their plans for the future. Secondary data on variables such as population and land tenure were collected from different government agencies at local administrative, township, and city levels. Government officials were interviewed in order to construct an account of both customary laws and government policies for governing the access to resources. The relations between government and local people under different land tenure systems were analysed to show how tenure affected the access of villagers to forest resources.

## Results

### *The Xizhuang Watershed and Its History*

The Xizhuang watershed is located 20 km north-west of Baoshan city near the highest peak in the Baoshan valley. It covers a total area of 3456 ha. As a result of population growth and urbanisation in Baoshan, the Xizhuang watershed is becoming increasingly important as a major source of water for irrigation, drinking, and industrial use. A drinking water company situated downstream of the Xizhuang watershed uses the stream as its principal source of water. One cement factory also relies on water from the watershed. Irrigation canals divert water for crucial irrigation activities in Banqiao Township, which lies in the main Baoshan valley. The Baimiao reservoir also has a water intake in the Xizhuang watershed. The water emanating from the Xizhuang is therefore of great importance to the area as a whole.

### *Administrative Structure*

The Xizhuang watershed consists of two full administrative villages (Lijiashi and Qingshui) and one major natural village (Xizhuang).

### *The Historical Change in Environment and Society*

A brief history of land and resource use in the watershed since 1950 is provided below.

- 1952, dense forest cover in the hills and shrubs along the river banks in the Xizhuang watershed
- Before 1953, practising of shifting cultivation (80% buckwheat and 20% potato) with 3-5 year fallow break, goats raised in the pasture land
- 1957-58, large areas of forest felled during the 'Great Leap Forward'
- 1958, construction of the Baimiao Reservoir downstream
- 1965, collectivisation of land and terrace construction
- 1966, pit-planting of some 1000 kg of pine seeds (*Pinus armandi*)
- 1967, pit-planting of another 1000 kg of pine seeds
- 1968, micro-hydropower station established
- 1974, forest survey in the watershed
- 1982, introduction of household responsibility system—more forest lost
- 1984, big floods in Qingshui village
- 1987, large-scale mud-flows and first aerial seeding of pine (*Pinus yunnanensis*)
- 1988, building of valley-side road for access to areas outside the watershed
- 1991, second aerial seeding
- 1994, 'wasteland auction'
- 1996, construction of new valley-bottom road

### *Different Stakeholders in Forest Resource Management*

Because of the importance of the Xizhuang watershed, the local Baoshan municipal government and the local communities have made great efforts recently towards reforestation in the area. They have minimised logging operations in the state forest in the upper catchment areas, and restricted the cutting rate to 500 cu.m per year for fuelwood, the profits from which provide incomes for the 11 staff at the state forest farm. The Forestry Bureau arranged two aerial seeding efforts in the watershed in 1987 and 1991. In more recent years, the villagers in the lower areas of the watershed have been mobilised to plant trees at the beginning of the monsoon season. Both the administrative villages, but particularly Lijiashi, have strong traditional institutions that govern the access to forest resources in terms of collection of timber, fuelwood, and non-timber forest products.

The major stakeholders in the management and use of forest resources in the Xizhuang watershed are as follow:

- the State Forest Farm, established in 1960 with 11 staff;
- the Township Forest Station, established in 1982 with 14 staff;
- the forest guards, one in each village; and
- the villagers.

### *The Effect of Changes in State Policies on Land Tenure and Land Use*

Since 1950 China has implemented numerous, and sometimes conflicting, policies affecting the ownership of agricultural and forested land. From 1983 to the present, Yunnan Province has implemented a policy called '*linyсандың*'. This policy defined and fixed the tenure and boundaries for three types of forest—state, collective, and household—with the objectives of stabilising the use of forest lands and partially shifting forest management control from the state to individuals. It was hoped that one of the results of this policy would be forest regeneration through community participation. The closed-canopy forests were commonly classified as state forest, while the local communities were given control of the collective, often degraded, forests for cutting timber for public and private use.

The major changes in land tenure policy in the Xizhuang watershed in the last fifty years are listed below.

- 1952, land reform
- 1958, the 'Great Leap Forward'
- 1965, people's commune
- 1982, household responsibility system
- 1994, 'wasteland auction'
- 1998, renewal of the household responsibility system for 30 years

### *Changes in Population Growth and Density*

According to local key informants, the population in the watershed has doubled since 1950. The total population in Xizhuang is now about 4200 (1998). The population in Lijashi administrative village in the years 1983 to 1996 is shown in Table 35. The average annual population growth was close to two per cent. The population density in the Xizhuang watershed is about 122 persons per sq. km, which is quite high compared to other mountainous areas in Yunnan.

**Table 35: Population Growth in Lijashi Administrative Village**

Year	Population	Year	Population	Year	Population
1983	1267	1989	1355	1995	1513
1984	1284	1990	1383	1996	1539
1985	1295	1991	1412	1997	not available
1986	1305	1992	1430	1998	not available
1987	1319	1993	1439		
1988	1326	1994	1451		

### *Changes in Land Use*

Tables 36 and 37 show the area, and percentage change in area, of different types of land cover between 1982 and 1998.

The total area of forest increased significantly from 1112 ha in 1982 to 2346 ha in 1998. Most of the increase took place after 1991 and at the expense of grassland. Free grazing of

**Table 36: Land Use Changes over Time in the Xizhuang Watershed**

Land Cover	Area in 1982 (ha)	Area in 1991 (ha)	Area in 1998 (ha)
Forest	1112	1370	2346
Bush land	157	35	269
Grassland	1015	1068	12
Farm land	902	531	471
Tea garden	145	185	206
Settlement	43	53	54
Paddy	81	68	0
Others	1	146	98

**Table 37: Percentage Change in Land Use between 1982 and 1998**

Land Cover	Change 1982-1991 (%)	Change 1991-1998 (%)	Change 1982-1998 (%)
Forest	+ 23	+ 71	+ 110
Bush land	- 78	+ 669	+ 72
Grassland	+ 5	- 99	- 99
Farm land	- 41	- 11	- 48
Tea garden	+ 28	+ 11	+ 42
Settlement	+ 23	+ 1	+ 26
Paddy	- 16	- 100	- 100
Others	+ 146	- 33	+ 99

goats was one of the most important activities in the agroecosystem in the past, and even in the 1980s it provided the major source of cash income for local communities. Grazing of goats was totally stopped in the late 1980s through government enforcement and local institutions in order to conserve vegetation cover and the water sources in the Xizhuang watershed. After 1991, virtually all grassland was afforested. Heavy fines were imposed for illegal grazing and cutting of trees.

In the 1960s, rice was introduced and fields were converted into paddies. As a result of the high elevation, rice yields were very low. Most farmers stopped producing rice in the early 1990s, and in 1998 there were no paddy fields left. Paddies were converted into fields for rainfed maize and wheat since these products could easily be exchanged for rice grown more efficiently in the lowland areas around Baoshan.

The total amount of upland farm land also decreased significantly between 1982 and 1998 as a result of the expansion of both forested land and tea gardens. In 1996, Baoshan City started to cultivate tobacco in order to raise revenue for local government. Some of the most fertile agricultural lands in the Xizhuang watershed were converted into tobacco plantations with government technical assistance and subsidies, and according to assigned quotas for each village. However, the decreasing price of tobacco and the intensive labour requirement discouraged the local farmers, and as soon as the first crops of tobacco failed, buckwheat was introduced as a replacement.

## Discussion and Conclusions

This study on land use change has provided a better understanding of the dynamics between people and resources.

### *The Effects of State Policies and Population Growth*

Forest management has been much affected by state policies during the past four decades in China. Changes in land tenure and resource titles have much influenced local livelihoods and the behaviour of farmers in managing the natural resources. Forest degradation in Baoshan since 1940 can be attributed to three causes: the impact of World War II, the 'Great Leap Forward' movement, and changes in the land tenure system. The degradation during World War II mainly resulted from cutting of timber for the construction of bridges and houses. During the 'Great Leap Forward', a lot of forests were cut for the fuelwood that was needed for backyard steel furnaces. Later, during the Cultural Revolution, the lack of government authority made it impossible to control logging. During the collective period, state policies played a key role in the degradation of forests through poorly thought-out efforts to manage local economies. These policies failed to address the complexity of the numerous ecological and cultural niches that exist in the landscape. The shift in land tenure from the collective system to the household responsibility system in the early 1980s also resulted in significant destruction of the forest resources.

Although the population has increased significantly, there was no correlation between population growth and deforestation. In fact, the forest cover has increased significantly at the expense of farm land. The reason for this is the introduction of the open door policy that allows farmers to seek off-farm employment in urban areas. This development started in the 1980s and has flourished with market development and other employment opportunities, which have increased significantly in the past 10 years.

### *The Effect of Traditional Local Institutions*

Traditional institutions play a key role in local resource management. These institutions have undergone many revisions (particularly in Lijiashi administrative village) in response to changes in the ecological and socioeconomic conditions in the watershed. National policy changes were strongly enforced by administrative village leaders in this area. They received several awards from Baoshan and Banqiao Township for their reforestation efforts and for improving the management of the forests.

The forest cover in Lijiashi administrative village has increased significantly compared to that in the neighbouring Qingshuo administrative village. Some farmers, however, complain that reforestation and stopping of grazing has greatly affected their cash income from livestock grazing, especially from goats which are now banned in the watershed.