

## **Chapter 2**

# **Chinese Himalayas and the Case Study Area**

The Chinese Himalayas consist of Tibet, Western Sichuan, and Western Yunnan. With a high elevation and many mountains, this is one of the major areas of forest and grassland in China. It also has the most abundant diversity of natural resources. The huge potential of its water-energy resources is significant for economic development.

However, there are serious environmental problems, especially of soil erosion and land degradation. The critical cause of soil erosion lies in the shortage of arable land. More than 50 per cent of cultivated land is located on slopes of more than 25°. Other serious obstacles to economic development and resource utilisation and protection in this area are its inaccessible frontier location, undeveloped traffic infrastructure, low education, and high illiteracy rates.

### **2.1 Tibet Autonomous Region**

The Tibet Autonomous Region (TAR) is located on the south-western frontier of China. Its area is 1.2 million sq.km. and its

population was 2.36 million at the end of 1994 (SPC 1996). It has a high elevation ranging from 4,000m on the plateau to over 8,000m at the peaks of the Himalayas. It has a typical plateau climate of low temperatures, little precipitation, and abundant sunshine. A small part is affected by the south western monsoon. Winter wheat, highland barley, and potatoes are grown there. Forest resources are concentrated in the Himalayan and Lianqing Tanggula ranges. There are 8.1 million ha of forest. Grassland accounts for 40 per cent of the total land. It is rich in lakes and water-energy resources. Natural-water energy is estimated to be 200 million kW (LABT 1994). Cultivation on slopes, especially on steep slopes in river valleys, has resulted in severe soil erosion, reduction of soil fertility, exposure of bedrock and loss of land capability.

### **2.2 Western Sichuan**

Western Sichuan is located on the south-eastern fringe of the Tibet Plateau. It has an area of 236,190 sq.km. Its population

is 1.52 million. It is a mountainous region with a cold climate of long winters and short summers. Its average annual precipitation is 650 mm, 80–90 per cent of which falls from May to October. It has 12.2 million ha of grassland. The volume of forest is 780 million cubic metres. There are enough water energy resources to develop 31 million kW. Its main mineral resources are gold, copper, lead, zinc, and mica. There are 247,000 ha of cultivated land, 85 per cent of which is non-irrigated farmland with steep slopes, gravelly soil, and low output; 50,000 ha of garden plots; 7.2 million ha of forest; 13.9 million ha of grassland; and 340,000 ha of natural conservation areas. Agricultural management is extensive and greater emphasis is placed on use than conservation, resulting in a lowering of land productivity. Forest resources have decreased rapidly. Forest cover has dropped from 25 per cent in the 1950s to 12 per cent today. Degraded grassland covers 1.6 million ha.

### 2.3 Western Yunnan

The area of Western Yunnan is 229,900 sq.km. Its population is 12.2 million (SBY 1994). Annual precipitation is about 1,600–1,700 mm, most of which falls in the summer. Its northern region lies above 2,500m, and the mountain peaks rise to 5,500m. This area is suitable for forestry and animal husbandry. The southern mountains lie in the subtropics, and are an important production area for cereal and economic crops. The forest resources of Western Yunnan are abundant. Forest cover is 29.5 per cent. Use of forest land is poor. Fuelwood accounts for 86 per cent of total energy in the countryside. Over 60 per cent of cultivated land is concentrated in the mountains and is mostly located on slopes greater than 30°. Its ability to retain water and soil is weak. Soil erosion affects 28.3 per cent of the

total land. Grassland covers 36.3 per cent, but much is desertified and degraded. Water energy provides the potential to build large or medium-sized power stations and the installed capacity could reach 5.2 million kW. The area is rich in mineral resources and has various non-ferrous metal mines.

### 2.4 Luquan Yi and Miao Nationalities' Autonomous County in Western Yunnan

Luquan Yi and Miao Nationality Autonomous County was established in 1985 and is a suburb of Kunming City. It lies in the mid-north of Yunnan Province. The county government is located in Pingshan Township. The township lies at an altitude of 1,679m, and is 90 km from Kunming City.

The total area of Luquan County is 4,249 sq.km. It is mostly precipitous with many rivers, but there is a small region of plains in the south. Between the mountain ridges, there are table lands and alluvial plains. These plains are primary areas for growing cereals and economic crops.

Rivers in Luquan County are tributaries of the Jinsha River (the upper reaches of the Yangtze River). In some segments, water flow is rapid and water energy abundant; theoretical potential water power is 898 MW, of which 220 MW can be used. Until 1990, 10,829 kW had been exploited, only about 4.9 per cent of available reserves. However, many people in the region do not have sufficient water for drinking or irrigation. Zhangjiu River has been used to irrigate paddy fields; and the area has become Luquan County's main grain production base. Shuanhua Reservoir, built in 1958, regulates water flow and prevents floods. It is currently used for irrigation and electricity generation. Luquan County has a

northern subtropical monsoon climate. It is mild with moderate rainfall, has distinct wet and dry seasons, and a non-frost season averaging 234 days a year. The mountainous terrain results in obvious vertical climatic change.

Progress was made in agriculture and industry in Luquan County during the 1950s and 1960s. For instance, highways were constructed, and mines and factories were set up. Nevertheless, economic development was slow and erratic. In 1981, the household contract responsibility system was established. Reform of the rural economic system has resulted in greater progress in agriculture, forestry, animal husbandry, and fisheries. Farmers' incomes have increased and living standards have risen.

The economic system was once purely public and collective. Now, with rural reform, the proportion of individual economic enterprises has risen in agriculture, the handicraft industry, processing industry, transportation, commerce, and trade. The collective economy in Luquan now involves electric power, hardware and machine production, construction, chemical industry, and commercial corporations.

Agriculture is dominant. In the early 1950s, agricultural output made up 95 per cent of the total output value. In 1961, the structure of production was adjusted so that agriculture, light industry, and heavy industry were developed in proportion. Since 1980, with economic reform and rapid growth, great change has taken place in production. In total output value, agriculture has fallen from 89 per cent in 1965 to 59 per cent in 1997. Forestry has also declined to 6.3 per cent in 1997. Fisheries and animal husbandry are being developed. They were 26.7 per cent and 10.2 per cent in 1990 (Editorial Committee 1995).

Industry, construction, transportation, postal services, telecommunication services, and commerce have been developed gradually.

After 1952, large-scale construction of water conservation works was undertaken. Improved varieties of crops and advanced farming machinery and methods were introduced. As a result, agricultural production developed rapidly. Average grain yield was raised from 1,650 kg per ha in 1949 to 2,865 kg per ha in 1990, an increase of 74 per cent. Total grain production was raised from 4,455 tonnes in 1949 to 102,943 tonnes in 1990. Agricultural has diversified into production of cash commodities. Of total agricultural output value, cash commodities account for 31 per cent.

The rural population makes up 97 per cent of the total in the county. People working in agriculture, forestry, animal husbandry, and fisheries make up 94.5 per cent of the total population. In 1990, the average cultivated land area was 0.064 ha per capita and 0.12 ha per rural worker. Grain production was 471 kg per capita and income was 417 yuan per capita. Grain crops include rice, corn, broad beans, soybeans, peas, other beans, potatoes, sweet potatoes, barley, oats, and buckwheat. Cash crops include rape, tobacco, flue-cured tobacco, sugarcane, peanuts, cotton, and hemp. Vegetables are mainly Chinese cabbage, green leaved vegetables, eggplant, melon, beans, and tuber crops.

Luquan County is one of the key units and basic timber forest areas in Yunnan Province. It is also a major part of the protection forest system in the upstream region of the Yangtze River. Its forestry has great potential, but although much forest management, protection, and plantation has been carried out since 1949, forest cover has been reduced by overfelling. Since the 1970s, av-

average annual forest consumption in the county is between 450,000 sq.m. and 500,000 sq.m.; much more than the 197,000 sq.m. of annual wood growth.

Widespread hill pastureland and plentiful crop straw provide good conditions for the development of animal husbandry. Varieties of livestock and poultry include buffaloes, cattle, horses, donkeys, mules, sheep, goats, pigs, rabbits, chickens, ducks, and geese. In 1990, the annual gross output value of animal husbandry reached 24.38 million yuan, accounting for 27 per cent of the total rural output value. In 1997, animal husbandry had a value of 126.47 million yuan, 34 per cent of the rural output. Annual fishery output value in the county in 1997 was 880,000 yuan, accounting for 0.2 per cent of total rural output.

The industrial base of Luquan County is not strong. Around 1949 there were some small workshops producing hand-woven cloth and local paper and some smithies. By 1997, industrial output value reached 220 million yuan, accounting for 24 per cent of the county's total output. Of the total industrial output value, light industry amounts to 62 per cent and heavy industry to 38 per cent; 18 per cent is publicly owned, 14 per cent is collective, and 68 per cent is private.

Except for power and building materials, industries produce low profits owing to shortage of capital, lack of qualified managers and technicians, inadequate transportation, and poor communication systems. In 1990, the annual average net income per capita was 225 yuan.

#### **2.4.1 Overview of Land Utilisation and Land Degradation in Luquan County**

In Luquan County, by the end of 1990, over 17,300 ha of slope land had been

terraced, accounting for 25 per cent of total cultivated land. Output from terraces is greater than from slope land. Changing slope land into terrace is a useful measure for protecting cultivated land and raising output. Water conservation facilities have also been constructed and reinforced. Water loss and soil erosion take place readily because of steep slopes. Afforestation of mountains and development of forestry are important for sustainable management. Tree planting and forest protection have been emphasised.

Integrated development of agriculture has been stressed. Grain and tobacco production, forestry, fruit-growing and herding of animals are developed in an integrated way. The multiple cropping index and land productivity have been raised through inter-cropping, under-crop sowing, and rotation. Intensive utilisation of land has been brought about through investment and intensive farming. Land administration is being strengthened, and misuse and occupation of cultivated land are strictly forbidden.

Severe soil erosion has been brought about by overfelling of forests. This problem is especially evident when floods occur. In times of flooding, lots of stone and sand wash down the slopes, submerging fields, destroying villages, and causing damage and death. There are a few debris flows. Areas of waste mountain and bare ranges increased from 45,000 ha in 1949 to 100,000 ha in 1990. Forest cover decreased from 40 per cent to 27 per cent in the same period. Sand content in every river has increased.

The cultivated land is of poor quality and has low productivity. Ninety per cent of cultivated land belongs to low- or middle-yield categories. Flat land only accounts for 5.6 per cent of the total cultivated

land. Luquan County has 73,000 ha of grassland, accounting for 17.5 per cent of the county's total area. Most grassland is unimproved. Overgrazing results in degraded grassland and livestock that are thin and small.

Problems in land use and management also include low utilisation efficiency, poor use of water resources, misuse of cultivated land for building houses and mining, lack of long-term planning, and loose implementation of relevant laws.