

TRADITIONAL LAND USE FOR SUSTAINABLE LAND USE: THE CASE OF YUNNAN PROVINCE, CHINA

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Summary

Traditional land use (TLU) has a long history and has been widely applied for many generations. The following findings are based on the investigation and analysis of this land use mode at different scales in five places in Yunnan Province, Southwestern China. The relations between the land use, environmental, economic, and social effects in regions with high population density, and low land area per rural household, are examined. The people living in these regions have developed some praiseworthy land use methods and technologies after thousands of years of experimentation and practice. These land use methods and technologies include intensive and precise farming, a diversified economy (diversified land use), self-sufficient or semi-self-sufficient farming, crop rotation, multiple cropping, intercropping, and relay cropping. The farmers attach great importance to the combination of tilling land, fertilizing land, and developing effective planting and fertilizing methods. For example, leguminous crops and green manures are planted in the field; straw is burnt or mulched back to the field; and farmyard manures including livestock's dung are applied to fertilize the field. For centuries, a mixture or rotation of crops has been a common strategy to suppress crop diseases and pests. For soil and water conservation, many irrigation works have been built and sloping fields transformed into terrace fields. TLU systems have evolved dynamically and many of them are very resilient to social and environmental changes. The positive aspects of TLU should be carefully examined and promoted to alleviate environmental problems that modern land use (MLU) systems cause and to help develop multifunctional land use systems. All these traditions provide a rich experience in developing sustainable land use systems (SLU).

1. Introduction

1.1. Presentations of Questions

Traditional land use (TLU) usually refers to the way, the method, and the technology of using land, which has been passed down for many generations. It has a long history and is still applied in many countries and regions in the world especially in those undergoing

development. In its earlier phase, this land use mode took the form of slash and burn cultivation, swiddening, and restoring the fertility of land through long fallowing. It was a primitive land use mode (now called Inceptive Land Use) which remained active in many regions of China for about 7 000 years. Today, inceptive land use is still practised in some remote and border areas as well as some mountainous areas inhabited by ethnic minorities in China.

Over the past 3 000 years, with agricultural development and social progress, TLU in China has developed various modes and technological systems after experiencing periods of iron-plough farming, dung-fertilizing farming, irrigation farming, dry farming, and intensive and precise farming, etc. Land has been primarily used to plant grain crops, and to a certain degree also used to plant economic crops and develop sidelines. As for the technologies, efforts have been taken to improve the varieties of crops and livestock. For instance, crop rotation, multiple crop, intercropping, and under-cropping have improved productivity. Leguminous plants and green manure crops are planted and farmyard manures including livestock's dung are collected and used to fertilize the field. Another example is the adoption of biological means to control and prevent plant diseases and insect pests, and to maintain the soil structure, improve the soil texture and enhance the soil fertility. Finally, many irrigation works are built and terrace farming is developed so as to promote intensive and precise farming.

In modern times, with rapid industrial development, machines and chemicals have been increasingly used in agriculture, and TLU is being replaced by modern land use (MLU). Owing to the considerable input of machines, chemical fertilizers, and pesticides, the productivity of fields and agricultural production have increased far beyond those achieved under the TLU mode, and as a whole agricultural development has been greatly boosted. After the introduction of MLU, however, high levels of farm industrialization and the application of chemicals have caused serious problems such as the excessive consumption of energy, the acceleration of environmental degradation, and food pollution. These have directly or indirectly endangered the development of agriculture and the survival of human beings.

As a result, green (or organic) food, a kind of food grown in non-polluted fields without using chemical fertilizers and pesticides (i.e., food produced using farmyard manures and controlled by biological means under the TLU mode), has become a fashionable pursuit of modern people. With the idea of sustainable development being widely accepted in the international community, there is an increasing trend away from MLU toward SLU. Therefore, questions are raised concerning TLU. Why has it lasted for thousands of years? What are its values, its roles, and its significance? Is it sustainable or not? Which aspects of it should be retained and carried forward for future land use? How can TLU be used to further develop SLU?

1.2. A Framework for Analysis

The analysis of TLU in this paper is performed at two scales. One is at the county, village, or landscape scale. For this, the land use modes and technologies in five places in Yunnan Province were selected to analyze the local ecological, economic, and social situations so as to determine the positive aspects of TLU. The other scale is that of land use mode at the

rural household level. The land use modes in areas with large populations and small land area were selected to analyze how the farmers improved their livelihoods.

Based on the analysis at these two levels, the basic features of TLU, as well as the associated ecological, economic, and social effects are summarized and compared with those of MLU. A thesis as to why TLU has existed for thousands of years is presented. Moreover, from the viewpoint of sustainable development, sustainable land use, and sustainable agriculture, some of the outstanding sustainable features of the methods and technologies applied in TLU are analyzed and summarized. The value and significance of applying these features for SLU are also proposed.

2. General Situation of Yunnan Province

Generally speaking, Yunnan has four characteristics. The first one is that mountains account for much of its land area. Within the province, mountainous areas occupy 84%; plateau areas take up 10%, and flat areas (including basins and valleys) account for merely 6% of the land area. The second characteristic is that there are 26 ethnic groups in Yunnan, accounting for nearly half of the total number of ethnic groups (56) in the country. The histories, traditions, cultures, customs, and lifestyles of the ethnic groups differ remarkably. The agricultural production modes, and the ways these different ethnic groups use land are also different. The third characteristic of Yunnan province is that it is situated on the border of China (geographical coordinates of 22°8'32" to 29°15'8" N and 97°31'39" to 106°11'47" E), far from the developed regions along the eastern coastline, and adjoining the underdeveloped countries Myanmar, Laos, and Vietnam. The last particular aspect is that the province is lagging behind the rest of the country in terms of economic development, with a lower per capita gross domestic product (GDP) and lower per capita income. On the whole, TLU prevails in Yunnan.

Generally, Yunnan has a low-latitude, plateau, mountain, and monsoon climate. However, there are various types of climate within the province owing to its complex, diversified landforms. Examples include the northern tropical climate, southern subtropical climate, central subtropical climate, northern subtropical climate, southern temperate climate, central temperate climate, and the cool temperate climate. Accordingly, the vegetation and soils of the province are diverse. These natural conditions lay a good foundation for the development of diversified land use and multifunctional agriculture in the province. The population of the province has grown rapidly. At the end of 1949, the province's total population was approximately 16 million. By the end of 2000, this number had increased to 42.4 million, suggesting a net increase of 26.5 million during the 51 years, and an annual increase of 518 800. Among the total population of the province at the end of 2000, the rural population reached 35.8 million, accounting for 84.5% of the total, suggesting that Yunnan is largely agricultural. The rapid growth of population has imposed increasing pressure on land, and has caused many ecological problems as well. The forest area has decreased sharply, farmland on steep slopes has increased, soil erosion has become a severe problem, environmental pollution has increased sharply, bio-diversity has been impacted adversely, and the general state of the environment has deteriorated.

According to *Land Use Investigation of Yunnan Province* in 2000, the total area of farmland was 6 339 677.1 ha (hectare), with the ratio of reclamation being at 16.5%. The

fertile farmland such as paddy fields, irrigated fields, flat dry fields, terrace dry fields, and vegetable fields covered 2 359 824 ha, accounting for 37.2% of the total farmland. More specifically, sloping fields, characterized by serious land deterioration and poor yield per unit area, occupied 2 891 018.9 ha, and accounted for 45.6% of the total farmland. The fields under slash and burn cultivation and swiddening covered 1 088 834.2 ha, accounting for 17.2% of all land. Generally speaking, the land use of Yunnan Province has largely taken the form of TLU. Although “Green Revolution” techniques have been implemented since the 1970s, the MLU mode remains marginal in Yunnan.

3. Analysis over Several TLU Modes at County and Village Level (or the Scale of Landscape)

3.1. Slash-and-burn Cultivation and Development of Intensive and Meticulous Farming and Mixed Farming of the Natives Living in the Mountains of Xishuangbanna

3.1.1. Slash-and-burn Cultivation

Before the 1950s, the natives living in the mountains of Xishuangbanna had practised slash-and-burn cultivation as the main form of land use in that area. Today, there are still some mountain villages continuing this form of land use. There are, however, some slight differences in the techniques used by different ethnic groups due to the different natural conditions and each group’s cultural background. In general these ethnic groups use a chopper to fell a forest, burn it to fertilize the soil, and then plant some dry-land crops where the forest has been cleared. After growing grain crops for one or more years, the land will be fallowed. Before a new forest grows up at the site, the villagers will carry out activities there such as hunting and collecting mushrooms, medicinal herbs and firewood, and managing some tree crops. Sometimes the land is also used to plant economic woody plants or graze cattle. When a new forest comes into being, the same cycle will be repeated. Because slash and burn cultivation provides only 50% of the food demanded, the villagers have to hunt animals and collect wild food to supplement their diets. This kind of land use is self-sufficient and hardly related to market demand. As shown in Figure 1, row (a), swiddening still prevails in Jiangbian Village in the Yi People’s communities in Mengyang Town, Jinghong County at Lancang River, with a per capita land area of approximately 1.25 ha. Simple and extensive use of land is its basic feature.

Slash and burn cultivation occupies large land areas, but this mode’s productivity is low. Due to population growth, the short fallow period not only impedes the growth of forest, but also endangers animal and plant species. The comparison between the five year swiddening area of Jiangbian Village, and the well-preserved nearby rainforest, shows that within the plant community the number of species has dropped to 48 from the previous 173, accounting for a loss of 72%. Among that, 80% of the arbor species have vanished; 61% of bush species are now lost; 76% of herb species have disappeared, and 67% of liana species are no longer seen in the area. In addition, slash and burn cultivation and hunting activity have also modified the habitats of wild animals. Large numbers of wild life have been hunted. Local residents sigh with emotion, stating, “people get more and more, but animals get less and less. One day, if a countryman wants to see animals, he will have to go to the zoo in cities.”

3.1.2. Paddy Agriculture

During the period from the late 1950s to the early 1960s, some mountain villagers migrated to the valley areas to grow rice, and there established a land use pattern focused on grain cropping. The land use case of Kunhan Village of the Bulang People in 1995 shown in Figure 1, row (b) displays the typical model of this type of development. Its basic features include:

- paddy fields distributed along terraces near villages (although sometimes these fields are far away from villages);
- simple types of land use, relying mainly on paddy fields and partially on dry fields;
- paddy fields cultivated precisely and mainly used to plant rice and other grain crops while the dry fields typically used to grow vegetables and feedstuffs;
- cultivation of fields for half a year and thereafter left unused for the other half of the year, meaning that fields need not be fertilized;
- great importance attached to the irrigation of the paddy fields, with water resources well conserved by means of afforestation; and
- emergence of a commodity economy, with selling rice being the main financial source for villagers.

Although the per capita area of farmland (including paddy field and dry field) of the villagers of Kunhan Village in 1995 was merely 0.071 ha, the food produced not only satisfied the food needs of villagers, but also produced surpluses. The development of paddy agriculture considerably decreased the land area that had been demanded for slash and burn agriculture, and reduced the influence and destruction on forests noticeably. In addition, the living conditions of the villagers improved.

3.1.3. Development of Diversified Land Use and Mixed Farming

To promote economic development, many villages plant a variety of economic crops while planting grain crops. A diversified land use mode and a mixed farming mode were formed, which is reflected in Figure 1, rows (c) and (d) (the land use case of Mannong Village of Dai People, and the Xinlongshan Village of Jinuo People in 1995, respectively). The land use mode and mixed farming mode include five main points. The first point involves planting economic crops, with the desired aim of making the best use of land resources. Various types of land use appear: paddy field, dry field, orchard, tea garden, rubber garden, and amomum (*Amomum villosum* is a medicinal plant) garden, etc. Second, the land use patterns become increasingly complicated, and the land blocks begin to fragment. Third, farmlands are cultivated only for half a year and left idle for the other half of the year. Paddy fields are mostly used to grow grain crops, and dry lands are usually used to grow vegetables and feedstuff such as maize. Fourth, the farmers have a strong sense of a commodity economy. The income from economic crops becomes their main financial source while grains are seldom sold. Finally, in consideration of their interests, farmers actively take part in the protection of the environment and natural resources. They pay great attention to intensive and meticulous cultivation. Besides obtaining enough food supply, the farmer households can also obtain an annual income ranging from 10 000 to 50 000 Renminbi (RMB) from the sale of economic crops.

Therefore, the rural economy has rapidly developed, and the villages, which were stricken by poverty in old times, are improving in appearance.

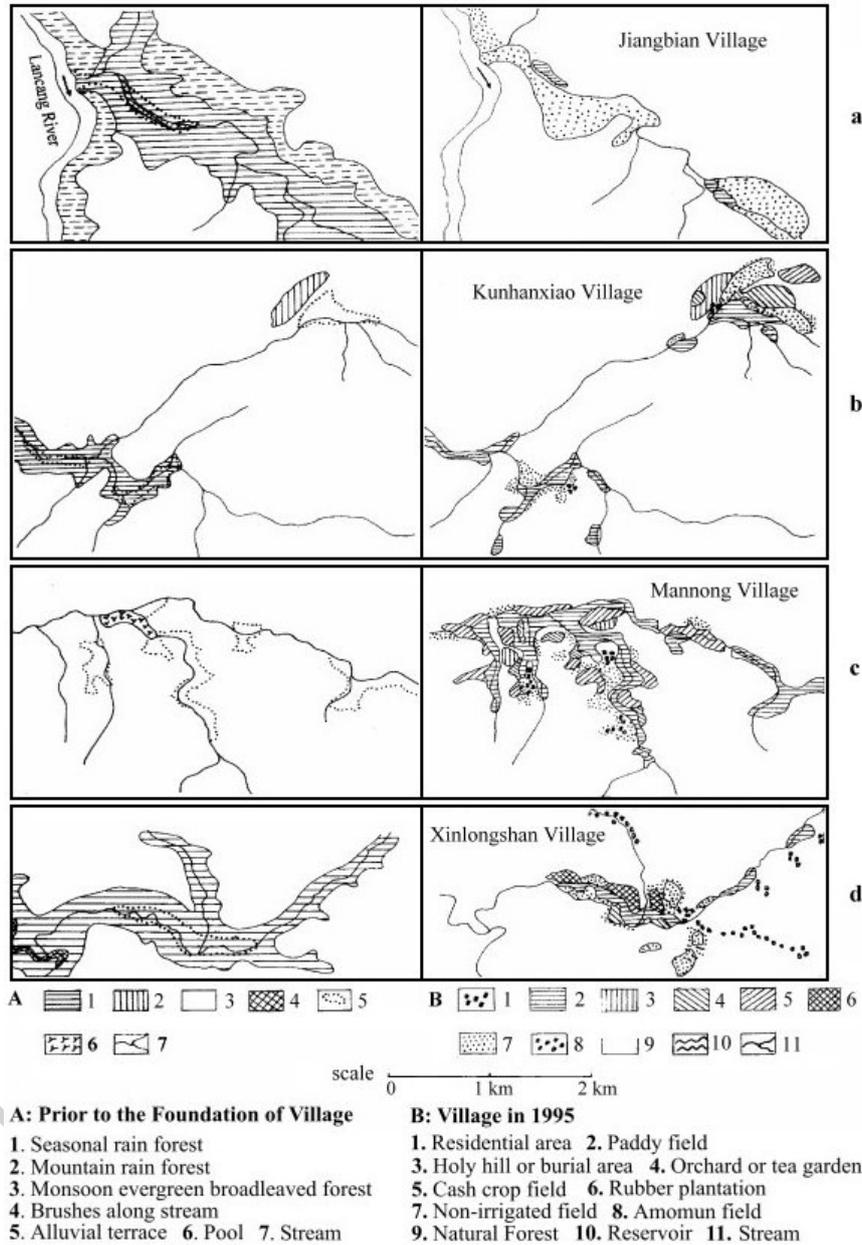


Figure 1. The change of land cover/land use of typical villages in Xishuangbanna

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Bibliography

FAO. (1993). FESLM: An International Framework for Evaluating Sustainable Land Management. *World Soil Resources Report 73*. Rome: FAO. [The report introduces what sustainable land use is and how to evaluate sustainable land use and management].

FAO. (1991). *The State of Food and Agriculture*. Rome: FAO. [The report formulates the strategic objectives of sustainable agriculture development and puts forward the important concept of Sustainable Agriculture and Rural Development (SARD)].

Jianmin, L. (ed.) (1997). *An Introduction to Agronomy*. Beijing: China Agricultural Science and Technology Press. [This book explains the origination and history of agriculture development and other aspects of agronomy].

National Bureau of Statistics of China. (2001). *China Statistical Yearbook-2001*. Beijing: China Statistical Press. [The statistical yearbook provides social and economic statistical data of China in 2000, including the statistical data of agricultural economy and environmental protection].

Shaoting, Yin. (1991). *A Cultural-Ecological System Full of Controversy----Slash-and-Burn Cultivation in Yunnan*. Kunming: Yunnan People's Press. [The book reveals the characteristics and the processes of development of slash-and-burn cultivation of highlanders in Yunnan Province of China].

Statistics Bureau of Yunnan Province. 2001. *Yunnan Statistical Yearbook-2001*. Beijing: China Statistical Press. [The statistical yearbook provides social and economic statistical data of Yunnan Province in from 1949 to 2000. The statistics include data on agricultural economy and environmental protection].

The World Commission on Environmental and Development. (1987). *Our Common Future*. Oxford: Oxford University Press. [The book explains what sustainable development is and how to achieve sustainable development].

Zhaolu, Wu. (2000). *Landscape Pattern and Land Use: A Case Study of Landscape Ecology in Mengyang Nature Reserve, Xishuangbanna, China*. Beijing: Higher Education Press. [The book analyzes land use models of mountain ethnic minority groups and their impacts on environment and biodiversity in Xishuangbanna of Yunnan from the point of view of landscape ecology].

Zisheng, Yang. (1999). Analysis of Soil Erosion Status and its Harms of the Sloping Cultivated Land in the Northeast Mountain Region of Yunnan Province. *Journal of Mountain Science* (Chinese) 17. 25-31. [The article reports on the severity of soil erosion on the sloping cultivated land and its growing threat to livelihoods in the eroded mountain region of the northeast Yunnan Province].

Zisheng, Yang. (1996). The Dynamic Change of Landscape Pattern and Its Optimal Design in Agricultural Region of High Mountains and Gorge in Nujiang River ----Taking Fugong County as an Example. Kunming, China: Yunnan University Press. [The book analyzes the dynamic changes of land use pattern (landscape pattern) from 1960 to 1995, and its ecological and economical effects in the agricultural region of high mountains and valleys in Nujiang River of China].

Biographical Sketches

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