

## Chapter 7

# **Management and Use of Natural Resources for Poverty Alleviation in Mountainous Areas of Western China**

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### **INTRODUCTION**

Occupying one-fifth of the world's land surface, mountains are an important component to biological diversity (Becher and Bugmann 2000; Turner 1997). Furthermore, they are a source of key resources such as minerals, forest products, and agricultural products. About 10% of the world's population depends on mountain resources (Wu Jishan 1994). As a major ecosystem representing the complex and interrelated ecology of our planet, mountains are extremely vulnerable to human activities and natural processes causing ecological imbalance. Mountains are the areas most sensitive to all climatic changes in the atmosphere. They are susceptible to accelerated soil erosion, landslides, and rapid loss of habitat and genetic diversity (Norbert et al. 2000), which have been the critical eco-environmental problems of the world.

In the past 10 years, the United Nations (UN) has played a key role in promoting understanding of poverty in mountainous areas and the importance of reinforcing the management of natural resources. UNCED(1992) in Agenda 21, entitled 'Managing Fragile Ecosystems: Sustainable Mountain Development' stated : "On the human side, there is widespread poverty among mountain inhabitants and loss of indigenous knowledge. As a result, most global mountain areas are experiencing environmental degradation. Hence, the proper management of mountain resources and socioeconomic development of the people deserve immediate action." The Secretariat of UNCSD emphasised that mountainous areas have many disadvantages when compared with the

plains, so we should pay special attention to them (UNCSD1997). Due to increasing poverty and social pressure, mountain ecosystems will further degrade, and this may have an important effect on global environmental change (Peterman and Peters 1998). Hence, it is necessary to develop special regional policies for the exploitation and management of mountain resources and to monitor changes in mountain ecosystems and their effects (Guisan and Holten 1995). In November 1998, the 53rd UN General Assembly declared 2002 as the International Year of Mountains (IYM) and called upon governments, international organisations, and non-governmental organisations to implement programmes for sustainable mountain development.

Mountainous areas occupy two-thirds of China and provide a direct life-support base for one-fifth of China's population. There are two challenges in implementing sustainable mountain development in China—the degradation of ecological environments and the high level of poverty in mountainous areas (Liu Yansui 1999a). Mountain development strategies have to focus on two tasks: the effective protection of mountain resources while using them and alleviating poverty as a development priority.

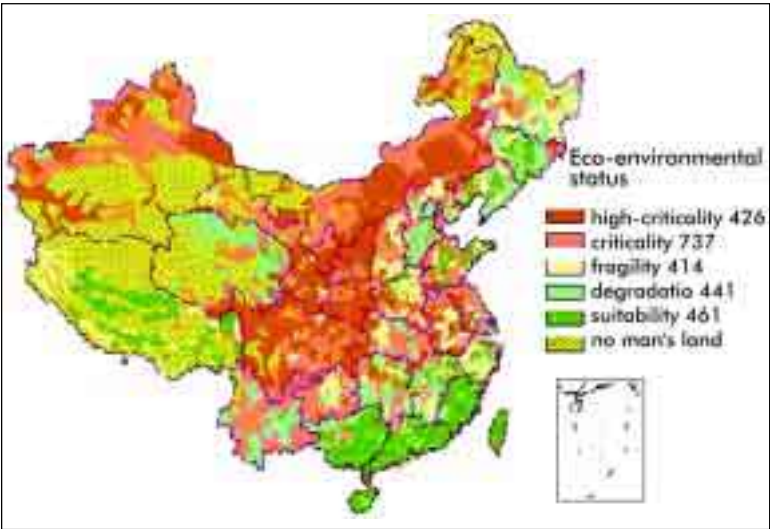
## **ECOLOGICAL ENVIRONMENT AND POVERTY IN MOUNTAINOUS AREAS**

### **Regional spread of mountain areas**

A mountain is a natural complex having altitude and slope. In general, a mountain country or district is a region where mountainous areas occupy above two-thirds of the total area (Xu Qiaoli and Tan Chuanfeng 1994). China is a typical mountainous country, with 1540 mountain counties, 661 counties in the plains, and 103 pastoral counties. There are 601 mountain counties in western China, 500 in middle China, and 439 in eastern China, occupying 76, 66, and 58% of each region's counties, respectively (Wang Weizhong 1999) (Table 1). Eastern, middle, and western China are all dominated by mountain counties. Figure1 shows the status of the physical environment in China.

**Ecological conditions of mountainous areas and features of poor counties**

To some extent, the ecological conditions of a region are products of human–nature interactions. With the help of GIS techniques, we assessed and analysed the environmental conditions of China using the assessment index system and the basic factors’ database (Figure 1). The areas with the worst environmental conditions lie in the Second Step of Topography in China (Ye Qinghua et al. 2000), southwards from Hulunbuir that lies at the foot of the Da Hinggan Mountains, extend from north to south-west, pass by the south and east of Inner Mongolia, the north of Shaanxi, the southeast of Ningxia and Gansu, the northwest and south of Sichuan, till reaching the north of Yunnan. The extent of environmental degradation shows an increasing trend as one moves from north-east to south-west in mountainous areas across China. These areas include 1163 counties. The distribution of poor counties in China coincides with the distribution of fragile eco-environmental zones. The 18 high-poverty areas in middle and western China are the eco-environmentally most endangered areas located in remote mountainous areas covering rocks, high-cold desert areas, loess plateau areas, and so on (Lu Dadao et al. 2000). The number of poverty counties in these areas accounts for 87% of the total number of poverty counties in China. The vulnerability and instability of mountain physical conditions are the basic conditions leading to the degradation of ecological environments. The irrational exploitation of resources leads to



**Figure 1: Eco-environmental situation and distribution of mountainous counties in China**

the degradation of ecological environments directly. However, economic deprivation and the survival needs of the poor are the endogenous driving forces of the degradation of ecological environments.

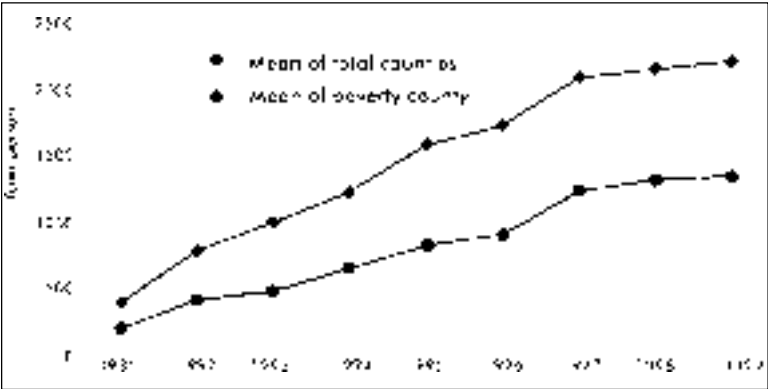
### **Natural resources and environmental conditions in poverty-stricken mountainous areas**

The distribution of the poor has a typical regional character. By the end of 1992, there were 80 million poor in China, accounting for 8.8% of the rural population. Most of these people live in the vast mountainous areas of middle and western China. These areas have many common characteristics: remoteness, limited and difficult transportation, ecological imbalance, unfavourable physical conditions, outdated production practices, low crop production, shortage of living energies, dependence on single sources of income, limited work opportunities, and information obstruction. Among these poor areas, there are two typical poverty-stricken regions: one is the 'Three-West' (Hexi and Dingxi of central Gansu, Xihai of southern Ningxia) loess plateau arid areas, with an area of about 380,000 sq.km. There, vegetation is sparse, desertification and soil erosion are serious, the water table is low, and aridity and water shortages are severe. Another is the karst areas lying in Yunnan, Guangxi, and Guizhou, covering an area of about 450,000 sq.km. Due to the excessive exploitation of natural resources, destruction of vegetation is very serious, the rocks are bared, and precipitation flows or vapourises very soon. The environmental reasons leading to the poverty of the two regions are: (i) the population exceeds the carrying capacity of the environment causing a vicious circle of resource extraction causing resource scarcity and promoting poverty, which again pushes increased resource use; (ii) the water shortage is severe, irrigation facilities are deficient, aridity is very serious, agricultural production is low and unstable; (iii) there is lack of scientific planning and effective management of natural resources in keeping with limitations and potentials.

### **Poverty alleviation and poverty trends in western China**

Since the reform and opening policies were carried out, China has recorded several achievements in the area of poverty alleviation. Through rural institutional reform, innovation, and systematic designing and implementation of the National 8.7 Poverty Eradication Programme, the number of rural poor has decreased from 250 million in 1978 to 30 million in 2000, and the poverty incidence dropped from 31% in 1978 to about 3% in 2000. The number of poor in the 12 provinces, autonomous regions, and municipalities in western China accounted for 51% of 80 million people in 1993. This had declined to 30 million people (or 50%)

at the end of 2000. In 1993, China had 592 national-designated poor counties, of which 366 were in western China. Thus western China is the most important and difficult area for poverty alleviation and development. The reasons are, first, that the rural income per capita in poverty-stricken counties is obviously lower than the national level. Furthermore, the disparity is increasing year by year (Figure 2). Among 366 poverty-stricken counties, about 256 are in remote mountain areas; these account for 71% of the total mountain counties in western China. These counties could be put into the following poverty-promoting categories: the desertified area of the south-east edge of the Inner Mongolian plateau, the severe soil-erosion area of the loess plateau, the ecological-degradation area of the Qinling Mountains, the fragile environment area of the karst plateau and hills, the isolated or semi-closed area of mountains and canyon in the Hengduan mountains, and the high-cool desert in the western mountainous areas. In addition to the common characteristics of poverty areas, the western poverty areas have several more: first, agriculture is the backbone of the local economy, but agricultural productivity is very low; second, local economic strength is low and external links are very weak, therefore, it is very difficult to overcome poverty through self-effort; third, the culture and motivation of workers limit improvements in farmers' incomes; fourth, the rural income per capita is low. These are the challenges to poverty alleviation efforts in western China.



**Figure 2: Comparison of farmers' incomes (per person) from 1985 to 1999**

## **EXPLOITATION OF NATURAL RESOURCES AND POVERTY ALLEVIATION IN MOUNTAINOUS AREAS**

### **Rational consideration**

- a) The status of the natural environment is closely linked to human activities and many bio-physical, geographic factors. It is essential that rural economic development in mountainous areas maintains a good, productive, ecological environment. Such efforts require the economic and technological support and participation of the people. If economic interests are overlooked, the initiative and input for productive environmental management will be weaker.
- b) The main environmental problems in poor mountainous areas are desertification, soil erosion, landslides and debris flow, and so on. The reasons behind these mountain hazards include not only bio-physical factors but also irrational human economic activities. Because of the excessive exploitation and destruction of natural resources, some ecosystems have become badly degraded even to irrecoverable levels (Liu Yansui 1999b). Ecological regeneration aims to revive the original situation of nature.
- c) Ecological regeneration is the core of sustainable mountain development. Based on this, the links between ecological recovery, resource exploitation, technological progress, and poverty-alleviation efforts should be considered carefully. Specifically, the farmers' interests and capacities must be considered during the implementation of environmental regeneration programmes such as the wild wood protection project, returning farmland to forest, water and soil conservation, and ecological afforestation. Safeguarding the survival and development rights of rural households should be emphasised.
- d) The integration of ecological regeneration and poverty alleviation is essential to promote development of the economy, society, and the environment in poverty-stricken areas. In keeping with this, the pilot schemes in western China (e.g., returning farmland to forest or grassland, covering hills with afforestation) should be further amended and implemented. Focus should include small watershed management, the development of ecological agriculture and rural energy, and then improve agricultural production conditions. For areas with serious ecological destruction and seriously deficient living conditions, we should implement migration-development projects in stages to alleviate poverty in different places.

## **Advantages and models to harness mountainous resources**

Proper harnessing of comparative advantages of natural endowment could be an effective way to ensure development and eradication of poverty in mountain areas. Based on the assessment indices of natural resources (e.g., quantity, quality, and location) mountains in China can be classified into 14 mountain systems (Xu Qiaoli and Tan Chuanfeng 1994). In central and western China, there are 10 mountain systems. The advantages of each natural resource and their combinations are listed in Table 2. These resources should be harnessed over time based on the principle of “from easy to difficult, from near to far, and in proper sequence.”

## **Ecological regeneration/development and poverty alleviation models in western China**

Different ecological regeneration and poverty alleviation models have been implemented in the country. A brief description of each model is given below.

### ***Wild wood protection projects***

The Chinese government began protection of natural forests in September 1998. By 2010, the government plans to invest 170 billion yuan and to decrease felling of trees (10 million m<sup>3</sup> annually). The project to protect natural forest has been implemented in the upper reaches of the Yangtze River and in the middle and upper reaches of the Yellow River, and includes Shaanxi, Gansu, Qinghai, Ningxia, Inner Mongolia, Shanxi, and Henan that lie in the middle and upper reaches of the Yellow River (delimited by Xiaolangdi reservoir area); and Yunnan, Sichuan, Guizhou, Chongqing, Hubei, and Xizang that lie in the upper reaches of the Yangtze River (delimited by the Three Gorges). The main tasks include: (i) preventing the cutting of natural forest, effective and proper management and protection of existent forest, scrub, and young forest by means of individual contraction and mountain closure; and (ii) accelerating the planting of trees or grasses (in deserted areas) as suitable and feasible. Natural forest resources play an important role in maintaining ecological balance, improving environmental quality, and protecting biodiversity. The project to protect natural forests implies that the government purchases environmental services. This is an important way to use trade mechanisms to protect mountain forest resources effectively. However, forbidding cutting of natural forest can also lead to closure of wood factories, reduction of local revenue, and lost jobs. Alternatives for addressing these problems need to be found.

**Table 2: Advantages and opportunities for comprehensively harnessing mountainous resources in central and western China**

Mountainous areas	Dominant niche resources and potential						Combination niche resources/opportunities
	1	2	3	4	5	6	
Tianshan-Altay Mts.	Mineral resources	Energy sources	Grassland	Arable land	Forest products	Tourism resources	Mineral, energy, agricultural, and pastoral resources
Pamir-Kunlun-Qilian Mts	Mineral resources	Grassland	Energy sources	Arable land	Special products of locality	Tourism resources	Mineral, agricultural, pastoral, and energy resources
Karakorum-Danggula Mts.	Tourism resources	Grassland	Energy sources	Forest products	Arable land	Climatic resources	Tourism, energy, agricultural, and pastoral resources
Gandise-Nyainqantangha Mts	Arable land	Mineral resources	Energy sources	Grassland	Forest products	Tourism resources	Agricultural and pastoral, mineral, energy resources
Himalayan Mts.	Arable land	Tourism resources	Climatic resources	Energy sources	Forest products	Grassland	Agricultural and pastoral, tourism, and climatic resources
Hengduan Mts	Energy sources	Mineral resources	Special products of locality	Forest products	Climatic resources	Tourism resources	Energy, mineral, and forest resources
Qinling-Daba Mts.	Tourism resources	Mineral resources	Climatic resources	Forest products	Grassland	Arable land	Tourism, mineral, and agricultural and forest resources
Wumeng-Dalou-Wuling	Mineral resources	Energy sources	Climatic resources	Tourist resources	Forest products	Grassland	Agricultural and industrial resources
Dahinggan-Yinshan	Forest products	Mineral resources	Grassland	Arable land	Tourism resources	Climatic resources	Agricultural and raw material resources
Yanshan-Taihang	Energy sources	Mineral resources	Special products of locality	Arable land	Tourism resources	Forest products	Energy, industry, and arable land resources



## ***Returning farmland to forest or grassland projects***

Returning farmland to forest or grassland is a long-term project directed to regeneration and integration of ecology and environment in implementing a western development strategy. According to the statistics of the Forestry Bureau of China, from 1999 to the end of 2001, 174 pilot counties have returned about 18.7 million mu (6 mu = 1 acre) of farmland to forest and planted trees in deserted areas on about 16.4 million mu. The subsidies for returning farmland to forest are distributed to households based on relevant regulations to help poor farmers living in mountainous areas.

The thrust and success of the project depend on the following sets of 'combinations': (i) closely co-ordinate and plan to return farmland to forest and promote industrial structure in mountainous areas; (ii) working out a 'win-win' path of poverty alleviation for farmers and promoting the regeneration of the environment; (iii) the co-ordination/combination of returning farmland to forest and development of farmland infrastructure, ensuring availability of essential croplands to farmers and improving their productivity per unit; (iv) the combination of returning farmland to forest and involved 'environmental' migration and poverty-alleviation through hill afforestation; (v) the combination of returning farmland to forest and programmes for rural energy development to reduce use of wood as fuel. The south-western region has gained some successful experiences in developing methane use, firewood-saving kitchen systems, mini-hydropower facilities, solar energy, wind power harnessing, and so on.

## ***Ecological project covering water and soil conservation***

The key project of water and soil conservation in the middle and upper reaches of the Yangtze River began in 1989. Through 2001, China invested more than 1.5 billion yuan in this project. The number of counties covered has increased to 191 in 11 provinces of the middle and upper reaches of the Yangtze River; the areas of water and soil conservation reach 5000 sq.km per year, with a total of 680,000 sq.km. In March 2001, the ecological project of water and soil conservation in the Yellow River began, involving Qinghai, Gansu, Ningxia, Inner Mongolia, Shaanxi, Shanxi, Henan, and Shandong. Its specific objectives are: the sandy areas in the Yellow River watershed are a key construction area focusing on a small watershed as the treatment unit, combining water and soil conservation in the watershed. Protecting the environment and reducing mud and sand flow into the Yellow River in order to develop the rural economy, it attempts to tackle the link between returning farmland to forest and grassland and effective protection of vegetation resources. The Yellow River watershed project could serve as an example of ecological regeneration that has special characteristics, extensive effects, and multiple benefits.

## **Establishment of natural reserve**

At present, China has set up 1276 nature reserves of various kinds, covering 123 million sq.km or 12% of China's total territory. Among these, 155 national nature reserves cover 58 million sq.km, about 6% of China's land territory. The number of nature reserves will increase to 1800 by 2010, with 180 national nature reserves covering about 16% of China's land territory. In the course of the 'Tenth-Five Plan', the State Environmental Protection Administration (SEPA) decided to set up 10 national ecological pilot areas, including Qinling Mountains, Heihe River, and so on. In recent years, the governments of Ningxia, Gansu, Yunnan, Sichuan, and Guangxi have established nature reserves, returning farmland to forest and grassland and promoting new types of industries in mountainous areas. New measures to help affected farmers have also been introduced.

## **Effectiveness of poverty alleviation approaches in western China**

The poverty alleviation project has experienced three phases—relieving poverty in general, project-oriented poverty alleviation, and household poverty alleviation. The current new phase of 'development-oriented poverty alleviation' initiated with the China rural poverty alleviation compendium (2001-2010) designed by the State Department went into effect in May 2001. 'The 8.7 Poverty Eradication Programme' implemented since 1994 in western regions has the following components: (i) directing the funds for poverty alleviation programmes to western poverty-stricken areas; (ii) improving the management level of cadres and the capacities of poverty-stricken families by training, and so on.; (iii) organising national authorities and social institutions to implement poverty alleviation initiatives at local levels; (iv) promoting poverty alleviation co-operation between west and east; (v) encouraging the flow of foreign funds and promoting co-operation with other countries to accelerate poverty alleviation and development. Because the ecology, natural resource conditions, and poverty situation vary from place to place, emphases, modes of operation, and final impacts differ in various parts of the region (Table 3).

## **CONCLUSIONS AND SUGGESTIONS**

### **Conclusions**

Since the world conference on environment and development was held in 1992, a large majority of governments and international organisations have begun to pay attention to resource management and poverty alleviation. A series of activities undertaken as a part of 'The International Year of Mountains' in 2002 attempted to shift the sustainable mountain development agenda from the 'investigation-focused stage' to the 'project-

**Table 3: Effect on poverty alleviation and resource exploitation in western China**

Area	Population of the poor (In 10 thousands)			Net income per farmer (yuan/person)			Resource exploitation
	1993	1999	Rate of poverty reduction	1994	1999	Annual rate of increase	
Shaanxi	500.0	47.4	15.1	547.7	1068.0	19	Industries on conservation of soil and water
Ningxia	139.8	17.9	14.5	429.0	1108.0	31.7	Tourism industries
Gansu	400.0	104.0	12.3	574.6	1057.1	16.8	Construction of Irrigation works, characteristic planting
Qinghai	119.0	32.9	12.0	530.9	1190.2	24.8	Exploitation of mineral resources and water saving irrigation
Xingjiang	176.0	56.0	11.3	635.7	1034.4	12.5	Planting and processing of economic crops
Yunnan	700.0	245.0	10.8	514.0	748.8	9.1	Land renovation and tourism industries
Guizhou	1000.0	287.0	11.9	456.0	1229.5	33.9	Reclamation of terraced fields and unused land
Tibet	48.0	9.7	13.3	435.7	1115.4	31.2	Dealing with the impeding factors for productivity
Sichuan	1000.0	266.0	12.2	426.0	1202.0	36.4	Adjustment of agricultural structure and labour service export

focused stage'. China is a typical mountainous country, with mountainous areas occupying two-thirds of its land territory and providing a direct life-support base for one-fifth of China's population. China has 1540 mountain counties, 601 (73%) of which lie in western China. There are 592 nationally identified poor counties defined by the 8.7 Poverty Eradication Programme; 366 (62%) of these lie in western China. In the process of poverty alleviation, the relationship between development of resources and ecological regeneration and poverty alleviation must be addressed simultaneously. This is more important when promoting projects on protection of natural forest, returning farmland to forest and grassland, the conservation of water and soil, and identifying and developing nature reserves.

The implementation of sustainable mountain development in western China is confronting two challenges: (i) degradation of the ecological environment and (ii) persistent poverty-promoting conditions in mountainous areas. The links and relationship between them should be fully understood and addressed in the process of sustainable development.

## **Suggestions**

Western development is a great trans-century strategy carried out by the Chinese government to reduce regional disparities and achieve prosperity for the whole nation. Its ultimate aims are eradication of poverty and effective environmental management. The western development strategy addresses the above issues. However, a few observations may be made. (i) Western development and poverty alleviation are both strategies to reduce regional disparities and achieve prosperity for the whole nation, but the objective conditions of western mountainous regions are different from those of other regions. Western development emphasises ecological reconstruction, the construction of major infrastructures, the transformation of regional industrial structures, and promoting the use of new science and technology. Besides the poor levels of living, cultural constraints and lack of enterprise are social factors obstructing the efforts at poverty alleviation. (ii) Sustainable development in the west calls for combining the thrusts on ecological regeneration involving returning farmland to forest and grassland, poverty alleviation involving innovative production patterns, changing industrial structures to tap new sources of economic growth—environmentally and economically safe and enriching solutions for poverty. (iii) Giving high importance to the development of labour resources for consolidating the foundation of poverty alleviation. Poverty not only means low income and low consumption, but also the shortage of education and skills. The low quality of skills in the population is the fundamental reason restricting economic development and leading to persistent poverty. Hence, building human resources through education

in science, technology, and functional training should receive increased attention. (iv) Development-oriented poverty alleviation is an effective approach to achieving sustainable poverty alleviation (Zhao Changwen 2000). At present, in mountainous areas of our country, especially in the west, there are many absolute poor living in resource-deficient environments lacking even the basic necessities for survival. While promoting poverty alleviation efforts in different places, focus on ecological migration from some areas would help to restore the optimal balance between natural and human resources.

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