

SOME ECONOMIC PROBLEMS OF AGRICULTURAL RESOURCES
DEVELOPMENT IN CHINA'S POOR MOUNTAIN AREAS

Zhang Dahua

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Considering the importance of grain production in mountain areas, the potentials for grain production need to be determined in advance. We can classify farmland according to altitude above sea level, slope, and soil texture as relatively fixed factors. We can also classify farmland according to variable factors such as chemical fertilizers, farmyard manures, pesticides, use of plastic sheets, use of improved varieties, multiple crop indexes, and so on. Using cross-sectional and time series data we can then estimate the production functions. The results of production function estimates should be confirmed by local level officials and agronomists.

We can also estimate the acreage, output, and output rate of other products such as oil crops, tea, silkworm cocoons, citrus, edible mushrooms, herbal medicines, and some mineral products which are mined by peasant farmers. Table 1 shows the increment per yuan of input in selected products in Zi-Yang county which is located in a poor mountain area of southern Shaanxi Province.

Section D

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Approaches to Poverty Alleviation:
Agricultural, Industrial, and Institutional
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Table 1: Increment per *yuan* of Input in Selected Products, Zi-Yang County, 1988

Product	RMB <i>yuan</i>	Product	RMB <i>yuan</i>
Grain	1.21-1.60	Edible mushrooms	5.00-7.00
Oil crop	1.20-1.25	Silkworm cocoons	6.49-6.20
Tea	3.10-5.30	Coal	1.09-1.91
Citrus	5.16-6.20	Manganese ore	1.13-1.23

Table 1 reveals that, *ceteris paribus*, peasants will not give priority to grain or oil crops, or coal, or manganese, or mining because increment in production per *yuan* of input is high in forest-related products such as silkworm cocoons, edible mushrooms, citrus fruits, and tea. One point should be noted however. Because of the importance of grain in poor mountain areas, peasants can move on to more profitable products only after self-sufficiency in or adequate availability of foodgrains.

2. Meeting Foodgrain Needs

In most mountain areas, the market price of grain (P) is negatively related to the level of grain self-sufficiency (X) or

P = a-bX

where,

a and b are constants.

Peasants will shift the resources from grain production to forestry and special products only when the output value of grain per *mu* equals, or is lower than, the output value of forestry and its special products per *mu*, that is -

$$P.Y \leq V$$

where,

P = price of grain

Y = grain yield per *mu*

V = output value of forestry and its special product per *mu*

or,

$$(a-bX) Y \leq V$$

This is the reason why the peasants in poor mountain areas place grain self-sufficiency as the first priority in agricultural development.

For most poor mountain areas in China, self-sufficiency appears to be the best way to solve the grain problem, because of the following reasons.

- Grain imports mean higher grain prices which mountain peasants cannot afford to buy.
- Transport costs are higher. Also road maintainance costs are also significant in the mountains. Further, fertiliser purchases are more worthwhile than grain purchases in the mountains.
- According to investigation and grain production functions, total yield increment from increased yield per *mu* from farmland with slopes of less than 2° can make up for the loss of yield from farmland with slopes of more than 25°.
- There are difficulties and risks involved in purchasing and transporting large quantities of grain from outside.
- The amount of cultivable land in the mountains remains low. So, once a mountain area achieves grain self-sufficiency, most of the agricultural resources, including labour, will be shifted to forestry, and horticulture, which are usually much more profitable than grain production.

3. Criteria for Coordination between Forestry and Agriculture

It is urgent to revert farmlands with slopes of more than 25° to plantations. However, for this to happen, peasants need to be assured of relatively quick returns.

Forestry is a long-run production system compared to agriculture. The first criterion for organising these two kinds of production is to let the net present value of long-run production gains equal the net present value of short-run gains.

$$NPV_l=NPV_s$$

since,

$$NPV_i=\sum_{i=1}^n \frac{G_{li}+GI_{li}}{(1+r)^i}$$

where,

- G_{li} = long-run gains in the i^{th} year
- GI_{li} = long-run gains from inter-cropping in the i^{th} year
- r = interest rate

and,

$$NPV_s=\sum_{i=1}^n \frac{\bar{G}_s}{(1+r)^i}$$

where,

- \bar{G}_s = average short-run gains

when the first criterion is met

$$\sum_{i=1}^n \frac{G_{li}+GI_{li}}{(1+r)^i} = \sum_{i=1}^n \frac{\bar{G}_s}{(1+r)^i}$$

$$\bar{G}_s = \sum_{i=1}^n \frac{G_{li}+GI_{li}}{(1+r)^i} \bigg/ \sum_{i=1}^n \frac{1}{(1+r)^i}$$

Thus, if this value of G_s is larger than the value on the right side, it is advantageous to use the land for short-run production; conversely, the long-run production system would be better.

The second criterion is to let the long-run net present value ratio of gains to input equal short-run net present value ratio of gains to input.

$$\sum_{i=1}^n \frac{G_{li} + GI_{li}}{(1+r)^i} \bigg/ \sum_{i=1}^n \frac{I_{li} + II_{li}}{(1+r)^i} = \sum_{i=1}^n \frac{\bar{G}_s}{(1+r)^i} \bigg/ \sum_{i=1}^n \frac{\bar{I}_s}{(1+r)^i}$$

where,

I_{li} = long run input in the i th year
 II_{li} = inter-cropping input in the long run in the i th year
 I_s = short-run average input

$$\bar{I}_s = \left[\sum_{i=1}^n \frac{I_{li} + II_{li}}{(1+r)^i} \bigg/ \sum_{i=1}^n \frac{G_{li} + GI_{li}}{(1+r)^i} \right] \sum_{i=1}^n \frac{\bar{G}_s}{(1+r)^i} \sum_{i=1}^n (1+r)^i$$

when,

the value of I_s is larger than the value of the right side, it means that the long run production system will be the more profitable, conversely, the short-run production system will be better.

The third criterion is to let long-run marginal net present value equal short-run marginal net present value.

$$\frac{\Delta NPV_1}{\Delta I_i} = \frac{\Delta NPV_s}{\Delta I_s}$$

4. Determination of the Key Strategy

An example of the determination of key strategy and associated key measures is presented in Figure 1.

Systems' dynamics helps in understanding the causalities between targets, products, and other relevant factors. Development programmes can be chosen accordingly and variables adjusted by policy objectives.

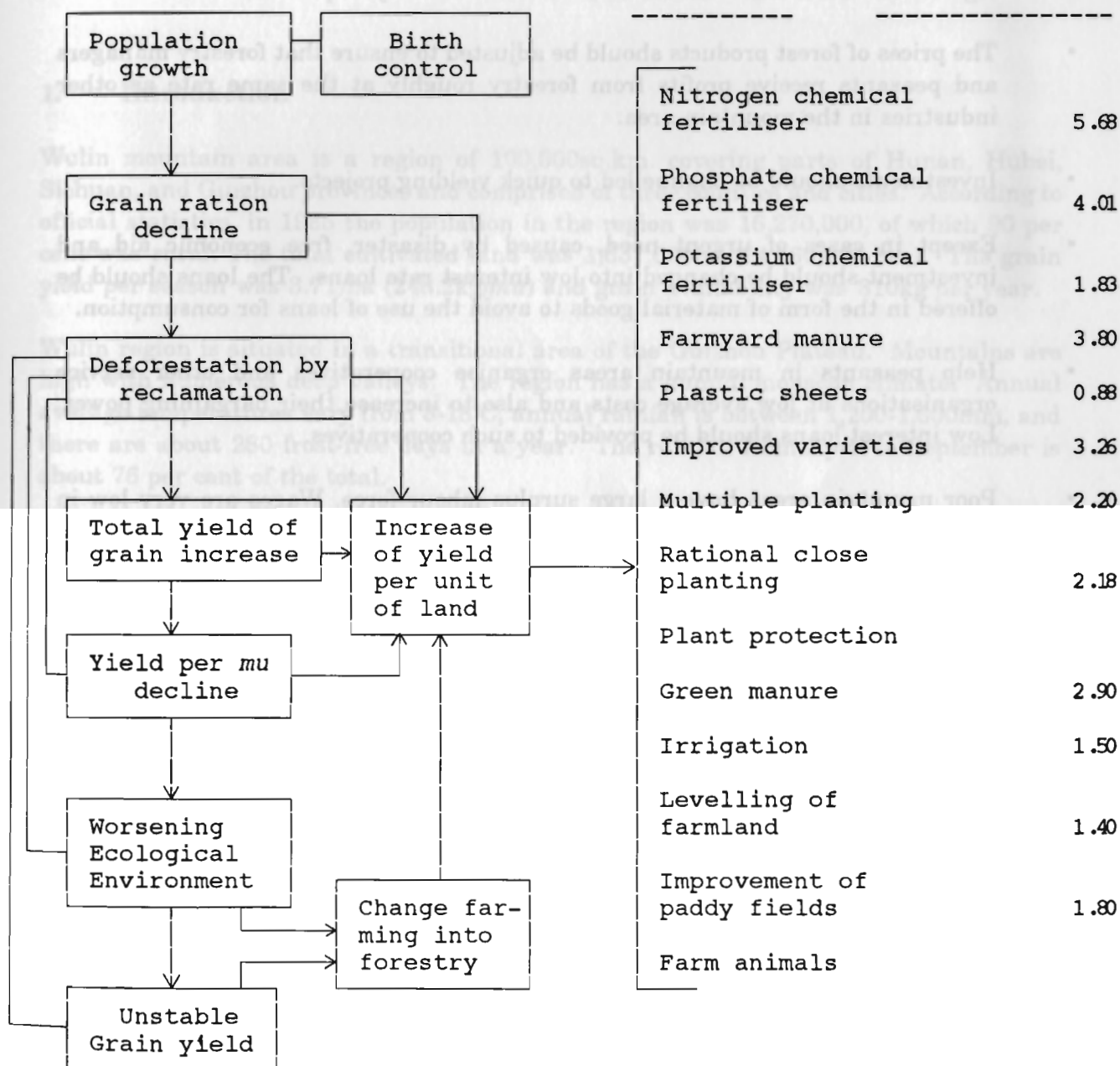
Figure 1: Determination of the Key Strategy and Key Measures for Grain Production in Zi-Yang County, 1988

Events or Factors

Strategies

Measures or
Inputs

Marginal Return
per yuan in the
Beginning



5. Policy Suggestions for Agricultural Development in Poor Mountain Areas

- Marginal returns from inputs, apart from labour, are much higher in poor mountain areas, so an increase in the supply of agricultural inputs, such as chemical fertilisers, pesticides, plastic sheets, diesel oil, and electricity, can contribute significantly to increases in the total agricultural output in a mountain economy.
- Reclamation of land in areas with slopes of more than 25° should be prohibited by legislation. Such lands should be reverted to forestry or pastures.
- The prices of forest products should be adjusted to ensure that forestry managers and peasants receive profits from forestry roughly at the same rate as other industries in the mountain area.
- Investments should be channelled to quick yielding projects.
- Except in cases of urgent need, caused by disaster, free economic aid and investment should be changed into low interest rate loans. The loans should be offered in the form of material goods to avoid the use of loans for consumption.
- Help peasants in mountain areas organise cooperatives and other service organisations at low average costs and also to increase their bargaining power. Low interest loans should be provided to such cooperatives.
- Poor mountain areas have a large surplus labour force. Wages are very low in these areas. There is a good opportunity to organise the labourers to engage in road building, irrigation works, farmland improvement, etc. The wages can be paid at favourable rates in the form of material goods.
- Since the working and living conditions in poor mountain areas are very hard, many technical personnel do not like to stay in these areas. Measures need to be taken to attract such personnel.

PROBLEMS AND STRATEGIES FOR INCREASING GRAIN PRODUCTION IN THE POOR RURAL REGION OF THE WULIN MOUNTAIN AREA

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Wen Zhongyou
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1. Introduction

Wulin mountain area is a region of 100,000sq.km. covering parts of Hunan, Hubei, Sichuan, and Guizhou provinces and comprised of three counties and cities. According to official statistics, in 1985 the population in the region was 16,270,000, of which 90 per cent was rural. The total cultivated land was 1,637,000ha (24,560,000 *mu*). The grain yield per season was 3.7T/ha (248.2kg/*mu*) and grain availability was 310kg per year.

Wulin region is situated in a transitional area of the Guizhou Plateau. Mountains are high with numerous deep valleys. The region has a humid, monsoon climate. Annual average temperatures vary from 8-18°C, annual rainfall is between 1,200-1,600mm, and there are about 280 frost-free days in a year. The rainfall from April to September is about 76 per cent of the total.

Cultivated areas are below 1,400m. The per capita holding is 0.086ha (1.3 *mu*). Under normal circumstances, there should be adequate food. However, in this region there are 40 poor counties. In 1985, the statistics of 33 counties indicated that the poor accounted for 56.9 per cent of the rural population. Grain production was very low, for example, average rice and maize yields were 3.5-4.2T/ha (250-280kg/*mu*) and 2.2-2.6T/ha (150-170kg/*mu*) respectively. About 226,500 tonnes of grain were imported each year.

2. Problems in Production of Spring Crops

Investigations showed that the following three factors were the most important in limiting grain production in the area.

Degrading Cultivated Areas and Natural Disasters

The cultivated land below 500m in elevation is only about 20 per cent of the total cultivated land (mainly rice fields). Over 50 per cent of dry land has slopes over 25°. The lands are very poor because of deforestation and subsequent soil erosion. Natural disasters are common. The main limiting factors for grain production are low temperatures during sowing time (March-April) and high temperatures, drought, or hailstorm during July-August.

Undeveloped Transportation

Mountain landforms cause difficulties for building railways and highways. Only the Zhiliu and Xiangqian railways cross the region on the southeastern edge. The railways have a low transportation capacity. Meanwhile, the quality of highways is bad and there are numerous break points. About 20 per cent of villages are without roads. The Wu River is at the western end of the region, but the freight volume of ships is small. Therefore, all these factors contribute to weak linkages with the outside world and restrict the development of agricultural production and a commercial economy.

Traditional Production Methods

The poor production quality is due to a low level of education and a shortage of specialists on agriculture. Illiterate and semi-illiterate people in the region account for around 28 per cent of the total population. There were five agricultural technicians per ten thousand people. Agricultural extension is quite limited, so is the propagation of modern varieties.

3. Strategies

To deal with these problems, the following strategies to increase grain production in the area were developed with the support of the Agricultural Department and have been implemented since 1988.

Promotion of New Harvesting Methods

In order to use natural resources fully in the region, the Chinese Academy of Agricultural Sciences organised teams of specialists in many scientific subjects and collaborated with 11 county governments to carry out a new "harvesting programme". Significant economic and social benefits have been achieved in the last four years. A number of counties has been relieved from poverty as a result of increases in grain production and yield.

Promotion of New Seedling Techniques

Although Wulin region has a humid, monsoon climate, seasonal distribution is not favourable to the needs of the growth of spring crops. Crops are often damaged due to low temperatures and cloudy and rainy days, resulting in rotted seeds and low survival rates of seedlings. These factors greatly limit the production of rice and maize.

To avoid the effect of low temperatures, as well as drought, the "nutrient pot" method was popularised to enable growth in a short period. This helped avoid low temperatures and (because of the shortened growth period) drought in the flowering stages. For rice, a two-stage seedlings' method was used to avoid rotted seedlings and to increase the survival rate of seedlings. This technique protects the plant in the heading and flowering stages and harvesting can be carried out before the **autumn rains**.

Use of hybrid rice, raising seedlings in two stages; standardised transplantation; integrated pest management for rice; use of hybrid maize; planting seeds by using two methods (raising seedlings in nutrients pots and direct sowing, both covered with plastic

film); close planting; and the scientific management of maize played key roles in producing high and stable yields of rice and maize in the Wulin mountain region. In 1991, the average rice and maize yields in the programme areas increased by 67 per cent and 32 per cent respectively compared to those of 1986.

Implementation of Joint Contracts

How can applied technology be disseminated and used in large areas under the new contract responsibility system of crop production in the rural areas of China? It seems that the organisation of production and the exploration of new management methods are very important for solving the problem of inadequate food and clothing in the Wulin mountain area. Applied agricultural technology was often demonstrated on an experimental basis in the past, but extension was limited. Also, local authorities faced a shortage of funds. To deal with this issue, a system of joint contracts with research institutions has been introduced. Research institutions and county governments sign joint contracts clarifying their responsibilities, rights, and benefits. The county government organises a leaders' group, consisting of cadres from several related departments, and establishes a technical guidance group. Similar groups are also organised at different levels in the towns and villages and contracts are worked out. The contract system is applied to all related departments, cadres, agricultural technicians, etc (Figure 1). Comprehensive services include technology dissemination (funds, seeds, fertilisers, plastic film, and pesticides) to the peasants at field level. Specialists and working groups from all levels train the extension workers and peasants. In the 11 counties which joined the harvesting programme in 1991, 547,000 people were trained and 250,000 copies of various technical materials were distributed.

These strategies have contributed to an increase in grain production and contributed to the alleviation of poverty in the Wulin mountain area.

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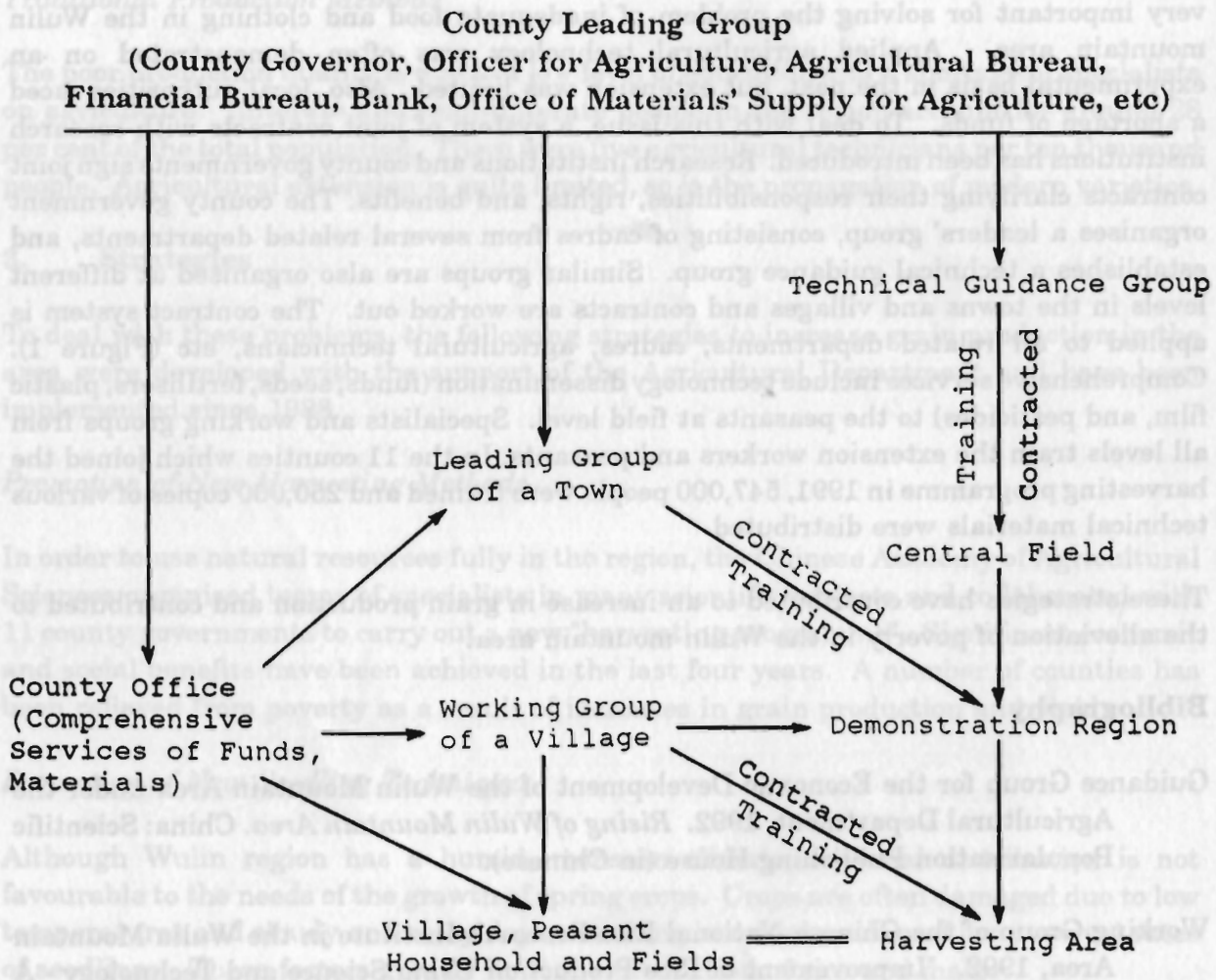
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Figure 1: Diagram of the Joint Contract of the Administration Department and Research Institutions



FROM POVERTY TO SUSTAINABLE DEVELOPMENT - A CASE STUDY OF NINGNAN COUNTY, SICHUAN, CHINA¹

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1. Introduction

This paper is devoted to the study and analysis of the transformation of a county in the Sichuan Mountains from poverty to relative prosperity. Ningnan county lies in the Liang Shan Yi Prefecture in Western Sichuan and was selected for this study for the following reasons.

- In recent years, the overall economy of Ningnan has witnessed relatively rapid development with characteristics of sustainability. It has been transformed from a poor area to a relatively developed one.
- The biological, sociocultural, and economic conditions of Ningnan are more or less typical of the Chinese mountains and represent both the constraints and opportunities of mountain specificities, i.e., inaccessibility, fragility, marginality, diversity, 'niche', and human adaptation mechanisms².
- A local resource-centred and integrated development strategy has played the key role in transforming the mountain economy from poverty to self-sufficiency and towards commercialisation.

The methodology adopted in the paper was designed to answer the following questions:

- what was the process of the economic transformation of Ningnan County?
- what are the indicators of transformation?
- what factors contributed to the transformation? and
- what lessons can be learned from Ningnan's experience?

¹ This study was carried out as part of the Mountain Farming Systems' (MFS) programme of the International Centre for Integrated Mountain Development (ICIMOD).

² We are grateful to Dr. N.S. Jodha, Head, MFS division, ICIMOD, who provided the guidance and Dr. Tej Partap who coordinated this study. We are also grateful to the Government and Leaders of Ningnan county who contributed to the work.

The study was undertaken in different stages. The study area was selected on the basis of a review of a number of indicators. Two rounds of field investigations were carried out to gain an in-depth understanding of the transformation process. Intensive discussions were then conducted with farmers, scientists, and local leaders.

2. Background of the County

Physical Environment

Ningnan is a relatively small county, covering an area of about 1,674 square kilometres. Topographically, Ningnan is in a mountainous area. About 8.1 per cent of the territory is comprised of steep mountains/hills, and only 16 per cent is lowland (defined as land with slopes of less than 25 degrees and below 1,300masl). The highest peak in the county has an elevation of 3,919masl. The lowest part has an altitude of 585masl. Heishui, the main river flows from northwest to southeast and runs into the Jinsha River in the upper reaches of the Yangzi. The drainage area of the Heishui River within Ningnan county covers 1,211sq.km., with a water discharge of 68.18 cubic metres/second. The two largest river basins, covering about 10sq.km. each, are located around Ningnan township in the lower reaches of the Heishui River. These are the most populated and better developed areas in Ningnan county.

The climate of Ningnan county can be characterised as subtropical monsoon. The warm season, coinciding with the monsoons, occurs from May to October. The mean annual temperature is 19.3°C, mean annual rainfall is 970mm, and the number of frost-free days in a year is 321. Four altitudinal climatic belts can be identified (Table 1). Diversified climatic conditions provide options in agricultural production.

Table 1: Vertical Climatic Belts, Ningnan

	Altitude Belts (area)	Climatic Condition	Vegetation	Land Use
1	585-1100masl. (160sq.km.)	Arid MAT 18-22 C MAR 700-1000mm	Semi-arid shrubs	Dry valley; 3 harvests/year - rice, sugarcane, tung, subtropical fruits
2	1100-1800masl. (640sq.km.)	Sub-humid MAT 15-18 C MAR 1000-1200mm	Pine, oak	2 harvests/year - rice, wheat, tung, tobacco, orange
3	1800-2500masl. (70sq.km.)	Humid MAT 10-15 C MAR 1200-1700mm	Pine, evergreen trees	1 or 1.5 harvest/year - maize, potatoes, buckwheat, apples, pears, peaches, etc.
4	> 2500masl. (405sq.km.)	Humid MAT < 10C MAR > 1700mm.	Pine, deciduous, trees, sub-alpine shrubs	1 harvest/year - potatoes, buckwheat, oats

Note: MAT: Mean annual temperature; MAR: Mean annual rainfall

Ningnan county is rich in water resources. The mean annual runoff within Ningnan amounts to 630 million cubic metres, equivalent to 52,000 cubic metres per hectare of cultivated land. According to the hydrological survey (1983), the hydropower potential in the county totals 38¹⁰ kilowatts, out of which, 7.0¹⁰ kilowatts (equivalent to electricity generation of 2.96¹⁰ kilowatts hours annually) is economically feasible. By 1989, only 3.73¹⁰ kilowatts hours or 12.6 per cent of its feasible hydro potential remained exploited. In the long run, hydropower resources could play an important role in development.

The biological resources' survey (1983) showed that indigenous plants in Ningnan county consist of more than 2,000 species, including more than 1,000 medicinal herbs, about 300 species of pastoral grasses, about 50 cultivated vegetables, more than 30 crops, many wild fruits, and other plants having economic value. Many species in Ningnan are more productive or are of better quality than in other areas. These abundant bioresources and their better quality provide opportunities for the further development of Ningnan's economy.

Socioeconomic Background

Ningnan is a remote county and agriculture is the leading activity. In 1989, the population of Ningnan totalled 150 thousand, with a population density of 89 persons/km². Of the total population, about 20 per cent are minorities (*Yi, Miao, Tibetan, Bai, Man, Tong, Boyi*, etc), and 93 per cent are rurally registered.

Before 1949, feudalism was rife among the *Han* and slavery among minorities. Landlords and slave owners, who were less than five per cent of the population, occupied more than 90 per cent of the land. Agricultural production was considerably primitive, most of the people suffered from hunger. After 1949, the land reform and "people's commune" movement led to some progress in agro-production, but due to poor back-up and irrational management, most of the rural population were still living below the poverty line. Since 1978, with the new policy of rural reform all over China, Ningnan county has undergone great improvements. It is one of the counties in Sichuan which is experiencing rapid development.

At present the economy is self reliant. Raw material production is still the major activity. Commercial production is picking up and shows signs of growing with time.

3. The Process of Transformation: History of Development in Ningnan

The development history of Ningnan since 1949 has basically two stages.

1950 to 1976

From 1950 to 1976, i.e., from liberation to the end of the Cultural Revolution, the development of Ningnan county was characterised by frequent changes of policy. Agriculture, especially crop cultivation, dominated the economy, the development process was slow, and the majority of people were poor.

Frequent Change of Policies and Institutions. From 1950-1952, "land reform" (in the *Han* nationality area), or "democratic reform" (in the minority area), was introduced. The major accomplishment of this reform was the redistribution of land ownership. The broad masses of peasants, 80-90 per cent of the rural population, and farm labour derived real economic benefits from the reform, and consequently the reform resulted in the creation of a system of small family farms.

With the start of the construction of a planned socialist economy in 1953, a new policy phase began that lasted until 1957. This was marred by rapid collectivisation. The production unit changed very rapidly from the "mutual aid team" to the "preliminary collective" and, further, to the "advanced collective". The production unit (mutual aid team) was very simple, even primitive, consisting of several farmers pooling their labour, animals, and implements to undertake agreed agricultural tasks. Under the preliminary collective, the production unit enlarged (normally, 10-15 households), members of the collective retained the titles of their land, and they received an income which reflected not only the amount of labour they contributed but also the amount of land they owned. By 1956, however, most of the preliminary collectives grouped further to make advanced collectives (mostly 1 to 3 collectives in one village) in which the productive activities were managed in a planned manner and where the members' income depended solely on the amount of work contributed, while property titles were maintained in the names of individual farmers.

Compared to individual farm management, the collective system had some advantages.

- (i) Public ownership of the land and the means of production enabled collectives to plan the use of land and carry out the necessary farmland capital construction for sustainable use of land. Also collectives could adopt larger-scale production through division of labour and introduction of improved farming techniques.
- (ii) Through planned use of labour and implements, rural industries could emerge and enlarge their scales.
- (iii) Because of the system of income distribution, more people, especially women, were brought into agricultural production.

Even before collectivisation had stabilised, the "Great Leap Forward" began immediately in 1958 and, during the next two years, almost all forms of private property were abolished and a system of payment according to need was introduced. The production unit was organised into very large communes in which unified management by command was adopted. Unfortunately, this bold exercise in changing the institutional structure of production failed and caused grave damage to the rural economy of Ningnan. To a great extent, the development path of Ningnan county was set back for several years.

The impracticality of this experiment was recognised in 1960. The production units were split from commune into production teams (based on village or group of neighbouring residential sites), and the commune became the essential (lowest level) government organ. From 1960 to 1976, a three-level rural production structure -- commune - brigade - production team -- prevailed. Farmers received income on the basis of work point systems

(payment depended on the ability of labour and working days contributed). The brigade was responsible for making links, from commune to production team, and for running small-scale industrial activities, as well as primary schools and rural medical clinics. The commune played the key role in resource allocation and mobilising seasonal unemployed labour for farm capital construction projects. Through the savings by commune activities, the commune facilitated the management of industries that required higher investments. The private sector was carefully controlled, about five to seven per cent of the land was allocated to households for private use. Although the sizes of private land were small, they were regarded as very important for ensuring the farmer's livelihood. Farmers gave sufficient input to their own land to produce vegetables, fruit, economic plants, or cereal crops. The household economy began to be attractive.

No sooner had agricultural production in Ningnan county begun to recover, then the "winds" of "cultural revolution" (1966-1976) began. Agriculture was forced into a one-crop dominated production system. Cereal crop production was treated as the major activity, while other activities, such as cottage industry, sideline activities, transportation, business, etc were considered to be "the tail of capitalism" which needed to be cut off. The diversified resources in mountain areas of Ningnan were misused. For example, in order to have more cultivated land for planting grain, many forests were cut down and many pasturelands were destroyed. Consequently the environment was damaged, neither did newly reclaimed land help increase crop output. From 1949-1976, the economy of Ningnan county, as a whole, developed very slowly (the output value of industry and agriculture grew at an annual rate of 4.8 per cent).

1977 to 1990

This stage started soon after the issuance of the new policies on rural economic development were issued. The following are the major features of the new policies.

Flexible Policies. A significant policy adopted after 1978 is the decentralisation of decision-making in rural production through the restructuring of production units. The management system of the rural economy shifted from a work-contract responsibility system, to an out-contract responsibility system, and then to a household responsibility system. From 1982 onwards, the household responsibility system policy stabilised. The county government has declared that - (i) the household responsibility system policy will not change for several decades; (ii) that private family lands can be maintained for a long time; and (iii) that the ownership of trees on mountain slopes can be kept by those contributing to their plantation. Under the "responsibility system", farmers are encouraged to derive more benefit from both their contracted land and private land through hard work. This has led to the emergence of a diversified rural economy.

The pricing policy for agricultural production has also been readjusted. Under this policy, not only has the purchase price of agro-products been raised, but also a purchase pricing system (including a quota purchase price, over quota purchase price, negotiated price, and market price) has been established. Once farmers sell a certain amount of their products at a quota price (the amount depends on the contract agreement) to the State, they can sell the rest of the surplus products at any price they like. Since then, rural markets have become animated. The rapid development of markets has played a very important role in

breaking the isolation of mountain areas. Enormous economic benefits can be gained by using the abundant resources and specific 'niche' of local resources found in the mountains. With this kind of stimulation, commercial development in Ningnan improved speedily.

Since 1980, priority has been given to the development of science and technology. While the government has created conditions to attract outside scientists and technicians to work in Ningnan, it has also encouraged local people to be involved in development programmes.

Rapid Development of Agro-based Industry and Commercialisation. A regional planning group (including leaders of the government, scientists from both inside and outside the county, and farmers) was organised in 1979. After three years of survey and analyses, a system of development strategies was formulated in 1983. Based on the "Agro-resources Survey and Agro-regionalisation of Ningnan County",³ an integrated development of agriculture and agro-based industry has been initiated. By 1990, besides grain production, sugar production, silk yarn production, tung oil production, and pig raising had become leading sectors in the county's economy.

In 1990, the output value of agriculture and industry doubled that of 1976, the average net income per capita reached 511 *yuan*, and more than 99 per cent of the households had been relieved from poverty.

4. Indicators of Transformation

Indicators in Terms of the Economy

Tables 1 to 6 give a general picture of economic changes in Ningnan county between 1950 and 1990. The key features of these changes are given below.

- i) The economy of Ningnan as a whole has grown very fast, compared to Yi Prefecture and Sichuan Province, particularly after the reforms of 1976.
- ii) Agriculture still plays the leading role in the economy, but agro-based industries have an increasing share in the county's economy. Also the growth rate in industry has been much faster than in agriculture. The rapidly growing, agro-based industrial activities include sugarcane, silkworm raising, tobacco, and vegetables.
- iii) Benefitting from the development of industry, the Ningnan government has been able to allocate more investment to agro-construction which, in turn, ensured the raw material requirements for the development of agro-based industries.

³ This work received the Science/Technology Achievement Award of Sichuan Province in 1986.

Table 2: Growth Rate in Gross Output Value

	1950-65	--1975	--1980	--1985	--1990
Ningnan County:					
Agriculture	5.94	1.85	7.90	7.25	3.65
Industry	7.50	13.76	22.08	11.70	11.26
Yi Prefecture:					
Agriculture	6.19	6.20	5.59	14.50	4.30
Industry	18.61	11.04	10.80	11.78	8.02
Sichuan Province:					
Agriculture	3.27	5.76	6.88	13.71	4.15
Industry	14.44	10.40	12.69	12.47	11.23

Note: Calculated at 1980 constant prices

Indicators in Terms of the People and Their Lifestyles

Reviewing changes in terms of people's lifestyle from 1950 to 1990 (Tables 3 and 4), we can draw the following conclusions: i) in the last 10 years, living standards in Ningnan county, on the average, have essentially improved; ii) foodgrain availability has shown tremendous improvement since 1980; iii) public facilities in Ningnan county have improved significantly; and iv) off-farm employment has become a stable and major source of absorbing rural surplus labour.

Table 3: Population and Economic Resources

	1950	1965	1975	1980	1985	1990
Ningnan County:						
Population (in 10,000)	7.21	8.95	12.86	13.50	14.23	15.20
% of rural population	97.40	92.90	94.20	93.40	92.60	92.80
Growth rate %	-	1.45	3.65	0.98	1.06	1.33
Net income per capita (yuan)	-	-	63	130	339	511
Grain available per capita (kg)	220	383	305	441	472	421
Per capita gross output value (yuan)	121	235	225	363	520	668

Note: the net income per capita of Ningnan county is calculated at current prices.

Indicators in Terms of Production

Since 1976, growth in agricultural production has more or less stabilised. Vegetable, fruit, sugarcane, and tobacco production have increased rapidly (Table 5). Agriculture is being modernised (Table 6). In industry, hydropower generation and production of sugar and its by-products have become leading activities. The improvement in agriculture is closely linked to the readjustment of land-use patterns. While land area under crop production has decreased, land under commercial crops has increased. Land reclamation and improvement of productivity have contributed to the increase in production.

Table 4: Public Facilities (Ningnan)

	1960	1970	1980	1990
Highways (km)	-	-	489	1319
Road density (km/100 sq. km.)	3.7	9	49	78
Subcounties linked with roads (%)	8.3	20	83	100
Villages linked with roads (%)	3.5	8.4	45	76
No. of post offices	5	8	8	7
No. of state markets	39	72	76	104
No. of hospitals/clinics	31	31	31	30
No. of medical doctors	117	158	434	372
No. of hospital beds	68	141	160	312
Govt. input to public health (10,000 yuan)	4.9	21.8	49.9	76.1
County broadcast coverage	-	-	51.1	58.0
Teachers in primary and secondary schools	350	628	1055	992
Farmers trained (*1,000)	5.1	1.3	13.7	87.4
Skilled labour in off-farm employment	-	-	2089	3606

Table 5: Agricultural Production in Ningnan

	1950	1960	1970	1980	1990
Grain crops:					
Production (T)	15445	22440	36800	55610	59430
Productivity (T/mu)	0.10	0.12	0.18	0.25	0.32
Vegetables:					
Production (T)	185.4	900	1650	2054	20792
Productivity (T/mu)	1.8	2.0	2.2	2.4	2.5
Fruit:					
Production (T)	84.6	92.0	154.3	308.5	1844.4
Productivity (T/mu)	0.10	0.10	0.11	0.51	1.00
Oil crops:					
Production (T)	284.9	709.7	47.9	488.0	365.0
Productivity (T/mu)	0.03	0.04	0.04	0.07	0.09
Sugarcane:					
Production (T)	3183	2152	21041	69510	213853
Productivity (T/mu)	2.41	1.35	3.90	4.50	5.03
Tobacco:					
Production (T)	11.1	84.3	6.8	1.0	700
Productivity (T/mu)	0.02	0.06	0.05	0.07	0.12
Reference productivity of Yi prefecture:					
Grain crops	0.09	0.10	0.14	0.20	0.29
Oil-bearing crops	0.02	0.03	0.03	0.04	0.05
Sugarcane	2.67	1.44	3.40	3.75	5.10
Tobacco	0.05	0.04	0.05	0.10	0.11

Note: 1 hectare equal to 15 mu

Table 6: Indicators of Agro-Modernisation

Sector	1950	1965	1975	1980	1985	1990
<u>Ningnan County:</u>						
% of land with guaranteed irrigation	7.8	21.5	34.7	40.0	42.0	45.0
Fertiliser use kg/mu	-	2.5	8.5	19.9	22.6	35.5
Electricity use kw/mu	-	-	6.6	17.3	21.4	18.9
Agro-machine kw	-	220	3200	8480	11860	16592
Agro-machines/1000 mu	-	1.0	13.9	34.8	53.3	67.0

In 1990 Ningnan produced 20,877 tonnes of sugarcane, 2,088 tonnes of industrial alcohol, 91 tonnes of reeled silk, and 40,500 tonnes of cement among its major industrial products.

Indicators in Terms of Environment

Economic growth and environmental protection are important principles underlying Ningnan's development strategy after 1976. With the promotion of biogas, solar energy, afforestation, terracing, irrigation, etc not only have the environmental conditions of Ningnan county improved but also the value of resources has been upgraded.

In terms of the environment i) conservation of water and soil has been perceived as the key link in environmental conservation in Ningnan; ii) programmes have focussed on the problems which cause environmental degradation - solar energy, biogas, and small hydropower developments are ways and means to reduce deforestation; and iii) environment and economic development are closely related - environmental protection provides enhanced inputs to economic development.

The achievements in water and soil conservation are shown in Table 7.

Table 7: Achievements in Water and Soil Conservation (1980-1991)

Achievements	Indicators
Drainage embankments	2 total length 3781 metres
Dams	3 protected 2077 mu of land
Terracing	3930 mu
Protected forest	93409 mu
Artificial grass cultivation	24960 mu
Drainage channels	163 km
Water tanks	115 water storage capacity, 255,000 cu.metre
Repairing channels	105 km
Investment	11.01 million yuan, out of which 82 per cent were invested by local government and collectives of farmers

Source: Office of Water and Soil Conservation, Ningnan County

5. Factors of Transformation

The key factors in the transformation witnessed in Ningnan after 1978 can be grouped into three categories: (i) policy and management; (ii) science/technology; and (iii) integrated environmental conservation.

Policy and Management

Policy changes after 1978 gave a free hand to the counties. Ningnan could therefore undertake reforms in its own way. After the policy changes, the county government decided to restructure the production system on the basis of the local situation, based on an intensive survey of resources by different levels of leaders and scientists. The strategic thrusts were as follows.

- a) Agricultural resources are the fundamental source of the county's economy, so with foodgrain self-reliance, multi-activities in agriculture should be encouraged.
- b) Sugarcane, mulberries, and tung oil trees are the promising cash crops and pig raising has substantial potential. These four components should be the leading sectors. In addition, tobacco production activities, subtropical fruit production, agro-production processing, economic trees, and animal husbandry should be given due emphasis.
- c) The county should move from a "natural economy" to a "commercial economy". In doing so, agro-based industries should grow more rapidly, because these can have comparative advantages in the commodity market.
- d) The introduction of the "responsibility system" notwithstanding, the management of development should be under overall planning. Major activities should follow the guidelines of development strategies.
- e) For sustainable development, while emphasising economic benefits, ecological impacts also need to be evaluated, and environmental conditions should be properly protected and conserved for future generations.

In the pursuit of an effective development strategy, management played a very important role. First, the leadership of the county government always supported the strategic plan. Between 1976 and 1990 county leadership changed four times. In spite of the changes, Ningnan was able to pursue a constant strategy. There are three principal reasons for this. One is that most of the governors and leaders were promoted from practical positions in which they had several years of experience in regional development. They not only knew the real meaning of the strategy, but also the ways to carry it out. The next reason is that leaders were able to draw lessons from past failures. They realised the negative impacts of frequent changes on policy and strategy (before 1976) and believed that the development strategy must be based on local background and knowledge. The third reason is that leaders in recent years have been selected based on both ability and knowledge and not solely on political criteria. Nowadays, most of the leaders at county level have at least 10 years of experience in Ningnan and have a college level degree.

Second, the contracting mechanism has made management more effective. Since 1976, and more particularly after 1980, the government coordinates integrated development programmes, and the county governor and related leaders are responsible for organising institutions participating in the projects. The project proposal needs to be discussed with related institutions before the project starts. Once the project is approved by the people's committee of the county, work is contracted to related institutions (conditions of the contract, including leadership, work, target budget, period, and quality of the work). During and after the project, monitoring and inspection are routinely carried out and an award/punishment system is implemented, depending on the work done, under the monitoring of the county (or sub-county) leaders. The contracted project becomes a yardstick for measuring the ability of leaders in different institutions and at different levels. Those who perform well in terms of project work continue to remain in leadership while others are replaced. As a result, new blood has entered the leadership at all levels. Third, development planning has guided the integrated exploitation of natural resources. An integrated resource survey was started in 1978, and a regional plan drawn in 1983. In the five years from 1978 to 1983, the development strategy and the goals to achieve it were gradually unfolded.

The Regional Plan drafted in 1983 set development priorities, identified spatial as well as sectoral areas of development, prioritised implementation, and charted a course for integration. Guided by this regional plan, Ningnan underwent a transition from extensive development to intensive growth. The major achievements are as follows.

In accordance with mountain environmental conditions, a diversified land-use pattern and agro-production bases were gradually established (Table 8). Economic plant cultivation increasingly contributes to both economic growth and ecological conservation.

Table 8: Altitudinal Production Bases in Ningnan

Altitude	Leading Sectors
585-1300masl	Rice, sugarcane, mulberries, subtropical fruit, vegetables
1300-1800masl	Grain crops, tung oil tree, mulberries, tobacco
1800-2500	Grain crops, economic trees, grass-fed animals
> 2500	Timber trees, grass-fed animals, medicinal herbs

This new production structure generated more off-farm employment opportunities and farmers benefitted from adoption of these planned programmes. This encouraged peoples' cooperation in programme implementation.

Science and Technology

The widespread application of science/technology has played a key role in the transformation of Ningnan county. In promoting science and technology, the county government adopted two measures. The first measure was to attract outside scientists and technicians to work in Ningnan. While absorbing outside scientists, new technologies were also absorbed. The second, and the most important measure, was to rely on local

scientific/technological capability and to develop programmes in accordance with the mountain environment. The living and working conditions of scientists/technicians were improved, an award system was instituted, and people were sent outside to study. This emphasis on science and technology brought about a remarkable rise in labour productivity and land productivity.

After 1978, with the adoption of the "household responsibility system" the production units have been quite small. As a result, extension has been more complicated. Also, due to varied environmental conditions, the extension of technology has also to be varied, but the constraint is that of limited manpower. With these problems in mind, Ningnan county has adopted a two-way approach. One way is to develop programmes at county or sub-county level in accordance with the regional plan and encourage production groups or households to implement them. Another way is to formulate programmes (including demonstrations) based on the interest of farmers.

Attempts were made to strengthen the science/technology service system by establishing agro-service stations manned by trained staff in all the sub-counties. To make the science/technology service effective, a contracting system, i.e., giving a certain payment to the service in accordance with the increment of output, as implemented. With the introduction of the "responsibility system", farmers have realised that the households' capability in improving technology is limited. Some farmers (households) started collectively contributing funds to improve production technology and set up associations. The county government has encouraged this kind of collective work. All of the sub-counties in Ningnan have science/technology associations, and rural collective foundations. Many specific associations, such as the vegetable, sugarcane planting, mulberry and silkworm raising, fruit, rural energy, and silk reeling associations have been the centres of information, experience exchange, and local training.

In Ningnan, the first priority was the promotion of labour-intensive technology and then, wherever feasible, the adoption of intermediate and advanced technologies.

To overcome the constraint of the inaccessibility of information, Ningnan established an information centre. The staff members of the centre are responsible for collection and dissemination of information from internal and external sources and develop proposals suitable to Ningnan's environment. In addition, the county hired 35 experts from universities and research institutes in big or middle-sized cities in Sichuan Province as information advisers. These advisers stay in their home cities, travel sometimes to Ningnan, and provide the latest information of relevance to Ningnan's development.

To overcome the weakness of technology in the county, Ningnan invites experts from outside to guide the improvement of technology in accordance with actual needs. For example, to improve the quality of silk reeling, Ningnan joint silk reeling mill invited eight experts from Chongqing, Chengdu, and Suining cities. In two years with the guidance of these experts, silk reeling was substantially upgraded. To develop the tobacco-processing technique, Ningnan invited 16 outside experts to give overall guidance. So far, about 70 per cent of the processed tobacco in Ningnan has a good market due to its high quality. Similar examples exist in other areas.

Extension through training and demonstration has been emphasised. Each technician at county and sub-county level is required to train five households in specific production areas. This regulation, aimed at strengthening the relationship between technicians and farmers, has proved to be effective. By 1990 there were more than 3,000 households that had become "specialised households". About 50 per cent played the role of "demonstration (or other activity) farms" influencing their neighbourhoods. Many farmers serve outside their villages or even outside the county in dissemination techniques. For example, many specialised farmers grouped together and went outside Ningnan to construct biogas tanks as an off-farm employment endeavour.

Basic Construction for Sustainable Development

It has gradually been recognised that the resource base, which ensures the sustainable supply of products, should be conserved. Construction and maintenance of basic infrastructure are important concerns in this regard. The emphasis has been on the following.

Agricultural Infrastructure and Land Management. When the "responsibility system" was adopted, farmers were enthusiastic about higher production, but the basic agricultural infrastructure was ignored. Several policies were then implemented. Under these policies, farmers were encouraged in land management, land reclamation, and environmental regeneration. These policies enabled farmers to undertake a wider range of land management activities. Between 1978 and 1988, 18 thousand *mu* of land was reclaimed and 300 thousand *mu* afforested in Ningnan county.

In 1988, the Department of Land Management was established. In addition, legislation on land management was also approved. A number of initiatives in the development of wastelands was taken through planned resettlement. Under planned programmes, between 1988-1990, more than nine thousand *mu* of land was reclaimed, more than 20 thousand *mu* of land was terraced, and the land/water conservation area increased to 117sq.km. in Ningnan.

Lack of funds is a key constraint in basic land development. In addition to providing financial support through government funds, agro-processing industries are required to provide a small percentage of their net profits for the construction of agricultural infrastructure. Villages and collectives are also required to share the costs.

Afforestation. Afforestation is a key measure for protecting the environment from soil erosion. Following the reforms an afforestation campaign was launched. The financial and material resources of both the State and the collective were directed to places where afforestation needs less investment but produces quick results, and a high survival rate is ensured by favourable natural conditions.

Since 1980, a two-system approach for afforestation has been adopted. One system is afforestation on State-owned land. Under this system, the funds came from the State and the forests belonged to the State as well. In another approach, State-owned lands were contracted to collectives for afforestation. On the contracted land, trees belonged to those

who planted them. By 1990, the forest cover in Ningnan hit the 23 per cent mark, which was higher than the average for Sichuan Province (19.7 per cent) and China (14 per cent).

Road Construction. Road conditions and the transportation capacity in Ningnan was extremely poor before 1976. About 80 per cent of the sub-counties, and more than 90 per cent of the villages were without highway connections. Roads were blocked very often by landslides. Sometimes Ningnan was isolated from the outside for a period of more than six months. After 1976, road construction was given priority. A large-scale road construction programme was started in 1987.

Investments for road construction were mobilised in a variety of ways: (i) subsidies from provincial and prefectural governments for constructing and maintaining roads within the county; (ii) contributions for road construction from development programmes: for example, the hydropower programme was required to allocate a certain budget for road construction in selected areas; and (iii) contributions from enterprises for road construction: for example, three of the sugarmills invested three million *yuan* for road construction in rural areas where sugarcane is produced.

In addition, a system of matching funds (between government construction investments and affected communities) has been instituted and taxation for road construction is also used to mobilise funds.

6. Lessons from Ningnan

Ningnan as a Transformation Model

The lessons emerging from the experience of Ningnan may be summed up as follows.

Basic Needs. In mountain areas, feeding the population has all along been a problem of primary importance. Self-reliance, especially in foodgrains, in mountain areas, is therefore the first priority of development. Only when cereal crop production meets the requirements of the people can further development be possible.

Technological Inputs for Integrated Agriculture. Mountains have limited cultivable land. With a rising population, increase in production requires a high technology input. By introducing high-yielding varieties, increasing the multiple-crop index, and adopting suitable technologies and management, it is possible to expand the sown area and to increase the yield. Besides foodgrains for survival, the next priority for mountain people is cash income. So, it is necessary to develop integrated agriculture by using diversified resources. In the mountains, labour intensive technology, indigenous methods, and small-scale approaches need to be emphasised in the early stages of development.

Ecological Conservation through Exploitation of Alternate Energy Resources. Natural resources are the foundation of mountain life. Conserving the mountain environment, to a great extent, is protecting the life of the people. In mountain areas, fuelwood collection is a serious problem causing environmental degradation. Solar energy, biogas, small hydropower, etc are very promising resources in mountain areas. Exploitation and

utilisation of these resources helps environmental conservation and also contributes to improvement in people's lifestyles.

Agro-based Industries. As mountain agriculture develops, agro-processing needs to be emphasised because it provides employment and contributes to value-added.

Stabilisation of Agriculture and Industry through Infrastructural Improvements. To stabilise the mountain economy, improvement of the infrastructure plays a very vital role. However, constructing infrastructure is more difficult and more costly, but it is worthwhile as long as it is possible. Construction is costly in the mountains, so it has to be linked to multiple-financing mechanisms.

Commercialisation. Products having a comparative advantage in mountain areas, such as silk, tobacco, tung oil, medicinal herbs, off-season vegetables, fruit, etc can compete effectively in the plains. In the process of commercialisation, the key issue is to realise the comparative advantages and link with the markets.

STRATEGY FOR DEVELOPING THE INDUSTRIAL ECONOMY IN THE DABIESHAN MOUNTAIN AREA

Zhu Kaihua
Zhang Guoping
Hang Xiaoshu

Dabieshan mountain area lies in the border region of the Anhui, Hubei, and Henan provinces and is one of the most poverty-stricken parts of China. The region has an area of 74,500 sq. km. and a population of 2.5 million. It also has a great potential for industrial development. This paper discusses the strategy for the development of the industrial economy in the Dabieshan area.

1. Analysis of the Regional Environment

Dabieshan mountain area has a unique geographical location. Surrounded by Hefei, Anqing, Jiujiang, Wuhan, Zhengzhou, and other cities, this area has access to markets and transport networks.

As far as transportation is concerned, the Beijing-Guangzhou railway line runs across this area from north to south through Beijing, Zhengzhou, Wuhan, Guangzhou, and other large cities and small towns. A highway network, consisting of national and provincial highways, links much of the Dabieshan mountain region.

In addition, the region has also the convenience of shipping transportation which covers more than 200 miles from Wuhan and Chongqing to Nanjing, Shanghai, and other cities. These provide favourable conditions for developing an open economy. Dabieshan mountain area also has a large pool of cheap labour.

In spite of these distinguishing features, Dabieshan mountain region has not been able to capitalise on its advantages. In 1986 the Chinese government singled this region out for focussed development assistance. As a result, an industrial development strategy was carefully formulated and implemented and a network of complementary industries was promoted to improve the economy of the whole area. Today Dabieshan mountain area has received aid and cooperation from a number of countries and international organisations.

2. Analysis of the Industrial Economy in the Dabieshan Mountain Area

The following are some of the major areas of industrial development in the Dabieshan Mountains.

1. Tea production and processing in Huoshan county of Anhui Province.
2. Production, supply and marketing of cocoons, and processing of silk yarn and silkcloth in Jingzhai county of Anhui Province. This is combined with mulberry planting, raising silkworms and production of cocoons, and a silk cloth firm, which

integrates silk cloth production with printing, dyeing, clothing, and embroidery. Two companies have cooperated and developed in a complementary fashion. Silk processing and production is the key industry in this county.

3. Production of artificial mushrooms in Yuexi county of Anhui Province.
4. Raising and production of white geese in Luan County in Anhui Province. West Anhui White Geese Industry Association, consisting of the peasants who raise geese, administrative cadres, technicians, factories processing geese products, and those related to scientific research, marketing, banking and trade, unifies geese reproduction, processing, and marketing into a network.

3. Measures Suggested for Further Development of the Industrial Economy in the Dabieshan Mountain Area

In order to further develop the industrial economy in Dabieshan, the following measures are suggested.

Management Reform

The present management system has to be reformed in order to bring about efficient and timely application of technology, capitalise on local resource advantages, and remain competitive in the market. Joint ventures and contractual joint ventures should be promoted. Emphasis should be placed on human resource development.

Policies Favouring the Growth of the Industrial Economy

The development of the key industries should be guided and supported through State policies. Policies with respect to credit, prices, tax revenues, manpower, and science and technology should be improved quickly. The credit policy should give preference to complementary investments. The pricing policy should help entrepreneurs bear the risks associated with market fluctuation, and the tax policy should encourage local capabilities in capital accumulation and investment.

Building Up Basic Infrastructure

Basic infrastructure (such as transport, water power, energy, and post and telecommunications) has a significant part to play in improving the production and living conditions of the masses in mountainous areas. These also determine the extent to which accelerated industrial development can take place. Basic infrastructure should therefore receive first priority.

Strengthening the Complementarity between Industries

Insufficient attention has been given to the planned development of complementary industries. It is therefore necessary to analyse and promote the relationship between key (or pillar) industries and basic industries, such as grain and forestry, and the relationship between industrial structure and technology packages.

SELECTION OF AN APPROPRIATE INDUSTRIAL STRUCTURE MODEL IN MOUNTAIN AREAS

Zhou Zhixiong

Tang Hepin

1. Comparing Economic Conditions in Mountain Areas with Those of the Plains

In comparison to the plains, a number of factors act as constraints to economic development in the mountains. The first constraining factor is the lack of transport facilities. Transport costs are high, which means that the competitive ability of products is reduced. Farm and sideline products lack access to markets. A commercial economy cannot thrive without good transport. No transport means delayed information transmission, no information on technology, and no market information.

The second constraining factor in mountain areas is the shortage of cultivated land. People in mountain areas usually dwell along river valleys because of access to cultivated lands. But, with the rise in population, cultivated land per capita is decreasing. The serious soil erosion situation in the Sichuan Basin, Taishang mountain area, and Luliang mountain area is closely connected to ecological degradation as a result of population pressure.

The third constraining factor is the shortage of trained people. Technical personnel are unwilling to go and stay in mountain areas. People educated in mountain areas are also unwilling to stay and work in mountain areas.

Mountain areas are also prone to natural disasters.

However, mountain areas also provide a number of advantages. First, relative closure and insularity may provide advantages in crop breeding because the possibility of impurity caused by hybrids is greatly reduced. Mountains can also be free of epidemic diseases. Even though transport costs may be a little higher, total benefits may actually be greater.

The second factor is the unique climate of mountain areas. Mountains have stereoscopic climatic zones. Diversity provides a comparative advantage in the production of a variety of crop, fruit, and vegetable products. Apples and pears in south China and citrus fruits in north China can all be produced in mountain areas. Differences in the day and night temperatures in mountain areas are great, although accumulated temperatures are relatively low. Because of adequate sunlight, plants there have long growth periods, fruits have rich nutrition, and they taste good. Compared to the plains, in the mountains farmers can take advantage of the season and produce off-season farm and sideline products for the markets.

The third advantageous factor is the relative richness in resources in mountain areas. Generally speaking, mountain areas are rich in mineral resources. Minerals can be the basis for the processing industry. A successful example is Zuoyon county in Shanxi Province. Good use can be made of rich water resources in mountain areas to build small hydroelectric stations. Also plant resources can provide the basis for developing the processing industry. Labour is cheap in most mountain areas and this lowers the price of goods and services accordingly.

2. Industrial Structure Model for Mountain Areas

Based on the superior advantages of mountain areas, two industrial structure models for mountain areas can be proposed.

The first model is to develop the local economy by exploiting mineral resources (including extensive processing), by processing famous and fine local products and by developing tourism. This strategy is suitable for places where there are rich mineral resources, a tradition of fine local products, and good scenic spots. Because of the transport problem, most mountain areas have no obvious superiority in mineral products. Mineral processing is capital-intensive and mountain areas are short of capital. The lack of transport makes outside inputs costly.

Therefore, new industrial projects to be set up in mountain areas must possess the following characteristics.

- (i) Raw materials should be available locally and processing should decrease the weight or the volume of industrial products.
- (ii) Industrial products should be saleable mainly in local markets.
- (iii) Superior traditional technologies and management capabilities.

The second industrial structure model suitable for mountain areas is one based on environmental regeneration and planting. Only those areas with convenient transport can go in for processing.

These two industrial structure models are exemplified in Dong Mao Wuan and Liu Chuan Zi villages.

Dong Mao Wuan and Liu Chuan Zi are villages in the north mountain areas of Huai Rou county. Dong Mao Wuan is located at the confluence of the Bai and Tang rivers. It has transport facilities. The average cultivated land per capita is one *mu*. Peasants there took the advantage of convenient transport to set up four small enterprises, namely, a brickyard, a processing factory for tin and steel, a chicken farm, and a comprehensive processing factory; in addition there is a hydroelectric station. They also sow maize and wheat in the river valley. The average income per capita was 1,600 *yuan* in 1991. It was higher than the average level of the rural areas of Beijing.

Liu Chuan Zi is located to the east of Bao Shon Shi Xiang. The average cultivated land per capita is less than one *mu*. Compared to Dong Mao Wuang, Liu Chuan Zi has poor natural and economic conditions. There are no enterprises. The average income per capita was 950 *yuan* in 1991. But the hills provide a comparative advantage in the production of fruits such as apples, chestnuts, apricots, etc. Liu Chuan Zi village has been able to prosper in recent years as a result of its emphasis on horticulture.

3. Promoting an Appropriate Industrial Structure in Mountain Areas

The second type of industrial structure model is more appropriate for mountain areas. A number of measures may, however, be required to promote this model.

First, with the adjustment of the industrial structure, the investment structure must be adjusted correspondingly. Cadres in mountain areas sometimes say "pay attention to the forest and fruit trees in the long term, pay attention to animal husbandry in the short term". This shows that the production period for forest and fruit trees is long and more capital is needed. In addition, forest and fruit trees occupy an important place in the second type of industrial structure model.

In terms of using capital investment efficiently, the principle of "unified management and centralised investment" is appropriate. The advantage of labour should be derived by substituting labour for capital wherever possible.

With adjustment of the industrial structure, the technology structure in mountain areas must be adjusted correspondingly too. In order to take advantage of abundant labour resources, a labour-intensive technology must be imported. Training local people must be a key concern. Because of poverty, talented people are unwilling to stay in mountain areas for long. Therefore, conditions must be created to attract professionals from outside.

Adjustment of the industrial structure in the mountains must be seen as part of a transformation process for mountain economies from closure to openness, from self-sufficiency to commerce. Therefore, not only ideas but also infrastructure such as roads, electricity, water, and the necessary service facilities all need to be improved.

THE UTILITY FUNCTION OF GRASSROOT CADRES IN POOR RURAL AREAS AND THE POSSIBLE IMPACT ON ECONOMIC DEVELOPMENT

Wu Guobau

The present paper discusses the utility function of township and village cadres and analyses the possible impact of cadre on economic development.

1. General Utility Function of Township and Village Cadres

There are some differences of utility function between township and village cadres and between different kinds of township cadre due to differences of position and the facilities, including pay, provided to the cadres.

For the purposes of this analysis, we make three basic assumptions. First, improvement of the social status of township cadres depends on their promotion. Second, cadres behave rationally. Third, appraisal standards for the promotion of township cadres by higher authorities are based on justice and equality.

The promotion of township and village cadres depends on three criteria. First, the index of task accomplishment. This includes how long and how fast the tasks assigned at different times are carried out. The contents of these tasks are usually stated very clearly, for instance, the popularisation area for a certain crop, numbers of women of child-bearing age who undergo IUD insertion, and so on. Second, the index of economic development, including net income per peasant in the entire township, the total output of food crops in a year, and the numbers of families and persons whose incomes are below the poverty line, etc. Third, the index of social development, such as rate of crime, social security, population growth rate, and the number of children attending schools. The second and third indexes, unlike the first one, are not stated clearly and directly.

The general utility function of township cadres, $f(U)$, is to maximise the index of task accomplishment, the index of economic development, and the index of social development or,

$$f(U) = (ax + bY + cZ) \text{ ---- max}$$

where,

Y and Z represent the matrix of the index of task accomplishment, the index of economic development, and the index of social development respectively. This general utility function mainly applies to the leading township cadres and the ordinary cadres whose family members are employed by government organisations. It does not apply to temporary cadres, contract cadres, and cadres whose family income mainly comes from non-government organisations.

Because of the backward economic situation and limited local revenue, there are a large number of temporary and contract cadres in poor rural areas. There are big differences in position stability and welfare between these cadres and regular government cadres. The actions of the temporary and contract cadres are subject to the same general utility function as regular government cadres. The improvement in their social status is realised through promotion (it is different from the promotion of other cadres. The temporary cadres are promoted to contract cadres. The contract cadres are promoted to regular government cadres).

2. The Impact of Cadres on the Economic Development of Poor Areas

The following analysis is based on field investigations of the relationship between the grassroots' cadres utility function and economic development.

Field investigation in the townships of three poor counties and a survey of township cadres reveal that the task fulfillment index is the first and primary element by which higher organisations assess township cadres in poor rural areas. There are three reasons for this: first, the various task items that higher organisations pass on to townships are generally concrete. Usually, after a specific task is assigned by county or district organisations to townships, a summing-up meeting will be held by the scheduled deadline to assess how a certain task has been fulfilled by different townships. Second, the time period is emphasised in fulfilling tasks. Usually a specific date is set for a task to be fulfilled. To fulfill the assigned task the cadres may even give up more significant economic development work. Third, township cadres in poor rural areas are kept busy all year round by various specific tasks. The regular workload of township cadres by season, in addition to incidental work, is shown in Table 1.

Table 1: Seasonal Arrangement of the Work of Township Cadres

Spring	Summer	Autumn	Winter
Arranging activities for villagers during the Spring Festival; distributing relief grain and materials; planting trees, birth control; distribution of relief money	Arranging for the the harvesting of spring crops and the planting of summer crops; urging villagers to sell contract grain; population issues	Arranging for the harvesting of summer crops and the planting of autumn crops; collecting deductions and unsold contract grain; and birth control	Collecting deductions and agricultural tax, basic farmland construction; land cultivation for afforestation for the next year; and birth control

Higher organisations assign a significant assessment coefficient to the task fulfillment index in township cadres' general utility functions. The result is that relationships between township cadres' behaviour and economic development depend on the township cadres' willingness and ability to turn specific tasks into measures that are favourable for economic development. Many of the specific tasks that higher organisations assign to townships are measures to develop the economy, e.g., afforestation, basic farm field construction, popularising new technology and agricultural systems, and economic development programmes to alleviate poverty. These specific tasks usually are what

higher organisations think to be the best measures to speed up economic development. Because higher organisations cannot really have a comprehensive understanding of actual situations in each township, economic development measures sometimes can have disastrous effects. For example, a county, in order to reduce its financial deficit, planned to build a cigarette factory which had a high tax rate of production. The county asked townships to use their special loans for the poor area in growing tobacco in farm fields in areas chosen by the county. The result, however, was that farmers suffered losses because of low production and the higher cost of tobacco production, and the factory itself fell through due to lack of raw materials. However, many of these economic plans and tasks which higher organisations pass on to townships can be turned into effective measures to develop the local economy, given reasonable decisions by township cadres.

Economic development measures and tasks, which higher organisations assign to townships, can be divided into three types: the first consists of measures that completely fit local situations and, which when implemented, will benefit the local economy. The second encompasses flexible measures. For example, in 1987, a higher organisation assigned a township the task of planting 100 *mu* (6.6 hectares) of apples, but township cadres thought that the local soil was better for haws and, after consulting the departments concerned, they planted 100 *mu* of haws. In addition to fulfilling the task of developing fruits, they provided local farmers with a better economic opportunity. In China's poor rural areas, production plans are supplemented by quotas for rare resources (such as fertilisers at fixed prices, diesel oil, etc). The third type consists of measures that do not fit local situations and which are not flexible. However, township cadres can try to reduce the number of such tasks. In poor areas, many tasks are assigned at meetings. When the assigned task does not fit the local situation, township cadres at the meeting may present reasons to prove so. This can influence higher authorities to reduce the number of such tasks. Therefore, setting the number of tasks is usually the result of bargaining between higher and lower authorities. Further, when tasks assigned by higher authorities do not fit local situations, cadres can implement them first on a small scale and ask the higher authorities to come for inspection in order to convince them of the unsuitability of such tasks.

Township cadres may take the initiative in developing the local economy by taking measures which are not within the scope of activities planned by the higher authorities. But, in doing so, there are two possible risks: on the one hand, implementing independent economic development measures may affect the accomplishment of tasks that are assigned by higher authorities and may adversely influence the position and promotion of township cadres. On the other hand, such measures may be risky and invite criticism from higher authorities as well as dissatisfaction from local farmers. This is what inhibits the cadres in poor areas from making independent decisions. The fact is, if township cadres simply carry out assignments given by higher authorities, they will not be punished even if these measures fail, but if they make independent decisions, they may be criticised and even punished if these decisions affect the fulfillment of other tasks (even those unsuitable for local situations), although they might have successfully accelerated local economic development. During our field investigations, we found that when township cadres took development measures independently they sorted out supporting evidence from the documents they had received from higher authorities so that they could use the documents to justify themselves in case their measures failed. The variety of policy sources in poor

areas (due to the existence of multi-leadership) provides township cadres with alternative policies on which to base their independent decisions. Evidently township cadres run fewer risks if they acquire the approval and support of departments at higher levels before taking independent action.

Another way to motivate and enable ordinary township cadres to carry out decisions is to develop township-run enterprises which can employ labourers from the cadres' families (thus increasing the household income of cadres). This is one way of ensuring development of the township and making sure that the benefits of development are shared by cadres' families. Such development can also have an adverse influence on the development of the township economy as a whole (for instance, when large investments do not yield profits and even incur losses).

While they are executors of specific tasks assigned by county and district organisations, village leaders themselves are also decision-makers. Because economic development in poor rural areas poses many difficulties, village cadres have to spend more time and manpower to implement their independent policies. This may even affect their family incomes. Since village cadres are the immediate beneficiaries of successful decision-making, they are likely to make more independent decisions than township cadres. However, village cadres can also confine these decisions/policies within their own families, unless implementation of these policies requires large-scale cooperation. Therefore, whether or not village cadres can develop the local economy, by making reasonable policies in accordance with local conditions, depends not only on their decision-making ability but also on their spirit of self-sacrifice.

3. Policy Implications

Although the rural institutional structure has changed to a great extent after the reforms, grassroots' cadres have been playing very important roles in economic development in poor areas. Village cadres have a dual position as cadres and farmers. This will continue to be a basic characteristic in future Chinese rural grassroots' institutions. The major conclusion that emerges is that, given the utility function of cadres and the way they behave to maximise their social positions as well as incomes, indicators of local economic development should be assigned more weight in cadres' evaluations for promotion than special tasks assigned by higher authorities.

VILLAGE ORGANISATIONS IN POVERTY STRICKEN MOUNTAIN AREAS: A CASE STUDY OF SHANGZHOU CITY, SHAANXI PROVINCE

Liu Wenpu

1. Introduction

Shangzhou is a county-level city in south Shaanxi Province. It has a population of 494,000, including 444,000 rural residents, or 89.9 per cent of the total. In 1988, Shangzhou city was divided into nine districts and 54 townships. When townships were established to replace the communes, village committees were set up to replace the production brigades. In 1988 there were altogether 633 members of the village committees. There were also production cooperatives at the village level.

According to the stipulation of the municipality, there are three paid cadres in a village. They are the party secretary, the director of the village committee (usually called village head), and a copy clerk. A village can have a deputy village head or a deputy party secretary. The cooperative account is concurrently maintained by the village clerk. Cooperative members are also members of the village committee. Almost all villages in the municipality adopt this organisational form.

2. Function and Major Tasks of Village Cadres

Besides the three leading cadres in a village, there are several others cadres with specific responsibilities: a mediation member (to mediate civil disputes), a public security member (to keep public order), a militia company commander (in charge of militia training and helping with conscription), a women's affairs member, and a Youth League secretary. These people have no fixed pay but receive some subsidies. At present these posts have become a mere formality. Most jobs are taken by the three leading cadres.

Village committees have a highly centralised mode of operation, although some division of work exists. The party secretary in Shupazi village of Kanshansi township, for example, was in charge of village industry, family planning, schools, examining and approving of residence land for farmers, granting funds for poverty alleviation, granting relief for families with material difficulties, and public order. The village head was responsible for production, afforestation, mediation of civil disputes, the militia, and conscription. The clerk was in charge of statistics and reporting forms, releasing certificates, and maintenance of the households' register.

In Shangzhou city, a village cadre's responsibilities include (i) relaying and publicising policies issued by higher authorities; (ii) mediating civil disputes; (iii) organising small-scale farmland capital construction such as river embankments and roads; (iv) management and operation of village industries and sideline activities; (v) family planning; (vi) allotting loans for the poverty relief fund (the quota is assigned by townships to villages and by villages to households); (vii) building village elementary schools and

collecting funds for the operation of schools run by the local people; (vii) collecting grains according to contracts and various other taxes and fees; (viii) carrying out production tasks assigned by townships, expediting planting and harvesting, organising the purchase of production inputs such as seeds, chemical fertilisers, and pesticide, organising unified production in some villages - such as harvesting and irrigation; (ix) public welfare - such as arranging facilities for households enjoying the five guarantees; (x) managing public property; and (xi) fulfilling other tasks ordered by higher authorities such as helping conscription, statistics, and report forms.

The above tasks are general and vary greatly between villages. Villages with more stable incomes have a wider range of work. They not only engage in construction of small-scale public production facilities, but also establish more public welfare facilities. For instance, some villages set up kindergartens, train and manage cultural groups, and manage drinking water schemes. Some villages near forests organise tree plantation on uncultivated slopes that are not distributed to households, or build terraced fields. Others organise villages for land reclamation. However, in most villages the village cadres carry out tasks assigned by township governments. It is rare to find villages planning, managing, and implementing programmes independently from the township. Most villages cannot work independently because of the lack of finances.

The chief cadres in the village spend 100 to 200 days in a year working on village affairs, other cadres spend about 10 to 20 days. Most of the time is spent on attending professional meetings held by high-level administrative departments. All the village heads and party branch secretaries we visited agreed unanimously that, compared to the work teams of the People's Commune, the functions of the village organisations have been diminished. In most villages, they act neither as independent and cooperative organisations, nor as farmers' self-governing organisations. Village organisations have simply become agent institutions of township governments.

3. The Dual Status of Cadres

Most of the village cadres had been cadres in production brigades or teams before the reforms were carried out, although there are many new and young cadres appointed who have higher education. A survey of 24 chief cadres (referring to village head and vice heads, party branch secretaries, and vice secretaries) in eight villages in four townships showed that 17 of them had been cadres in production brigades or teams before the reforms. Most of them do not have much experience, except in agriculture. And, as such, they had no idea of what was expected of them in the reform process.

Under the People's Commune System, cadres at the village level were actually isolated from production. Most of them were secretly nominated by the commune, but on paper they were shown to have been elected by the commune members. Their payment was at the same level or higher than those engaged in agriculture, because they were provided with subsidies for loss of farming time so that they could concentrate on implementing the policies of the government. This system ensured a powerful administrative system from the commune, to the production brigade, and to the farm household. But this has changed now. Village cadres now have a dual status. On the one hand, they are still quasi-

officials of the township government; on the other hand, they have to till their own land under the contract responsibility system much like other ordinary farmers. In addition, they may manage their own household sideline production. In the past, their payment and the economic situation of their families were completely dependent on their services in the local government, but now these depend more on the management of their own family economies.

The contribution of cadres' subsidies in family income varies considerably among different areas and villages. Generally speaking, they only account for a small proportion of cadres' family income. The more developed the areas, the less the proportion of cadres' subsidies in their incomes. In backward and remote isolated mountainous areas, the proportions are relatively high. Moreover, if the chief village cadres spend 150 days in village work, their payments are very low in relation to their work loads.

This change in the contribution of subsidies to family income has made cadres similar to other farmers. When certain policies or measures adopted by the government create conflicts between the government and the farmers, they are more likely to support the farmers. Meanwhile, as villages function more and more as agent institutions of township governments, the cadres become the target of conflicts between the government and farmers. Village cadres are often the target of the villagers' wrath.

As a result, it is becoming more and more difficult to carry the policies and measures of township governments to villages and down to farmers. And this is mainly reflected in the weakening of the functions of villages organisations.

At Yangqie town, which is relatively poor, 10 chief cadres were changed during the two years 1988 and 1989: (i) five of them resigned, because they themselves, or their relatives, were engaged in sideline activities, or were discharged because their engagement in sideline activities seriously affected their organisational work; (ii) two of them were transferred because they were too old or too weak to be village cadres; (iii) one was discharged because he was deemed incompetent; (iv) one resigned because he thought that there were too many contradictions in village work and it was difficult to be successful; and (v) one was transferred to an other place. In addition, the cadres worry about coming into conflict with the masses.

4. Position and Rights of Village Cadres

Village cadres in general still have higher social positions. In spite of the conflicts, the cadres still have better relations with the masses and are respected. Problems such as civil disputes and social and economic and public-work related issues fall in the domain of the village cadres.

After reform of the commune system, the economic power of the village cadres has weakened, but they still control the funds to a certain extent. Although cases of corruption, stealing public property, and embezzling public funds occur much less in rural areas than in cities, such instances still show that village cadres have a number of privileges. In the villages that have village enterprises and more income, village cadres usually have financial power. In other villages, the cadres and their relatives have more

opportunities. They are preferred for jobs, in joining the army, and in getting loans granted for poor rural areas. Moreover, the village cadres also have special positions and powers in the daily administrative work of the village and in solving civil disputes.

Most village cadres come from relatively well-off families, as they have more experience. According to an investigation of 23 cadre families in eight villages of the four townships, including Jinlingsi township, Kanshansi township, and Yangxie township, just one family had a per capita income under 200 *yuan*. Only four families among the 23 had a per capita income lower than the average for local villagers.

5. Village Economy and Finance

The village economy mainly refers to village enterprises which are managed or contract-managed by village organisations. Besides village enterprises, some villages also manage a piece of farmland, orchard, mountain forest, and reed pond which have not been shared out to households. Also there are some villages that undertake collective sideline production.

According to an investigation in the villages of Baiyangdian township and the villages of Kanshansi township, the average annual income of villagers in 1988 was 3,500 *yuan*, the highest being 13,500 *yuan* and the lowest 350 *yuan*. The breakdown of income was as follows: 10.6 per cent from village enterprises, 12.8 per cent from contract village enterprises, 53.2 per cent from per capita contribution from villagers, and the remaining 23 per cent from other sources. Most, or even all, of the income of the villagers in remote areas comes from contributions from villagers.

According to an investigation in four villages of Yangxie township in a remote area, the average income per village was 3,700 *yuan* in 1988. Of this, 25.7 per cent was from the rent of the villages' fixed assets, two per cent from village enterprises' income, two per cent from renting fields managed by the villages, 4.1 per cent from the sale of collective property, and 65.1 per cent from contributions. The rent of fixed assets means the rent of former production brigades, but this is limited to villages with markets.

The average expenditure of the villages mentioned above in 1988 was 2,841 *yuan*. The expenditure was used as follows (i) 7.2 per cent for production investment, including 1.3 per cent for agriculture; (ii) 48.8 per cent for management fees, which included subsidies for cadres, teachers' salaries in the schools run by local people, allowances to the family members of martyrs and army-men, and administrative expenses; (iii) 31.8 per cent for public welfare expenses (including living expenses for childless and infirm old persons and expenses for recreational activities); and (iv) 12.2 per cent for other purposes. The production investment of the villages mentioned above also had a disaster relief component. In 1988, Shangzhou city had a flood which destroyed a lot of fields, river banks, and roads, so production investment was much more than usual. The expenses of village funds show that, organisations at village level do not have the ability to construct productive equipment on a larger scale. Moreover, it is difficult for them to keep the existing production equipment. The limited income of village organisations can just barely manage to support the weakened but still working administrative organs at the village level.

6. Conclusions

ANNEXES

From the above study, the following conclusions can be made.

Before reform of the people's commune system, the village organisation - the former production brigade - had the function of organising agricultural production and distribution in the collective economic system and performed tasks entrusted by the government. After the reforms, the village organisation was transformed into an autonomous village committee. The function of organising production and distribution was handed over to the households. The function of providing productive and other services had not fully developed. As a result, farmers' organisations weakened.

Secondly, after rural reforms, although pluralistic power structures emerged in rural areas, no other force could compete with the quasi-official autonomous village committee, or production cooperatives. The latter is still the core of the rural power structure, and also the organisation which is relied upon by the Government to carry out State policies.

Thirdly, during the commune period there was an actual 'cadre class' in which the cadres were separated from routine production activities at village level; those cadres were especially responsible for carrying out government policies. In that system, the compensation for the cadres' loss in labour days was paid by the collective economy which supported the working of administrative institutions as an extension of the Government. Village cadres were chosen by the communes. This made village organisations more biased towards government interests. But the situation has now changed. Every village cadre engages in his/her household economy, and his household productive income constitutes his main income source. This makes village cadres' interests consistent with those of ordinary farmers. The system of providing compensation for cadres' lost labour days has been replaced by the cadres' fixed compensation system in which the subsidies for village cadres are few and not guaranteed. This has weakened the linkages of village cadres with the township government. Therefore, when government policies are in conflict with village farmers' interests, the cadres usually support the farmers. While this has provided autonomy to village organisations, it has also hindered the implementation of government policies at the village and household levels.