

## CHAPTER 3

### AGROSOCIO-ECONOMIC BACKGROUND, INSTITUTIONAL REFORM, AND ADVANCEMENT OF TECHNOLOGY

#### 3.1 A General Introduction to Guizhou Province

Guizhou province lies in the southwest China, in the watershed area of Yangtze and Zhujiang Rivers, it is a subtropical mountainous region with 1,100 meters of altitude on average above sea level, the two extreme values of altitude are 2,900 meters and 137 meters respectively. Total land area of the whole province is about 176,128 square kilometers which accounts for 1.8% of China's total land area. About 87% of land area is steep land, hilly area shares about 10%, while flat area only occupies 3% of the total.

##### 3.1.1 Demographic and climatic profile of Guizhou province

Guizhou province has rich culture, it contains 47 types of nationalities. Total population is about 32 million in 1989, minority people shares 26% of the total with population of around 7.4 million in 1982<sup>3</sup>. Of the 32.37 million population in 1990, agricultural population is about 28.4 million, accounting for 87.7%, the rest 12.3%, about 3.97 million people are non-agricultural population<sup>4</sup>.

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<sup>3,4</sup> Calculated based on report in *Guizhou Annual Report, 1991*. Guiyang: The People's Press of Guizhou, 1991.

Total rural labor resource is about 14.02 million which is 43.3% of total population. Dependency ratios for agricultural population were 1.35 in 1949, 1.47 in 1957. It decreased to 1.38 in 1964, increased to 1.79 in the year of 1978, declined back to 1.33 and 1.03 in 1985 and 1990 respectively<sup>5</sup>.

The characteristics of climate in Guizhou province are complicate. Diversity of environments creates a diversified nature of climate. The annual average temperature variation in the province ranges from 8°C to 20°C, mostly the average temperature is above 15°C. In relation to precipitation, annually, it is not less than 850 mm, ranging from 850 mm to 1600 mm across the province. More often than not, the rainfall is between 1,000 mm and 1,300 mm. Free of frost days are from 210 to 350, the duration varies with location. On average, there are 270 days which are free of frost<sup>6</sup>.

### 3.1.2 Land resource endowments

Large part of land area in Guizhou province is not arable, some of them with high degree of slope, Stony land is the major component of total land area. Four decades ago in 1949, the total agricultural land was about 26.97 million mu, ratio of paddy field to upland was nearly

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<sup>5</sup> Calculated based on data reported in *Guizhou Economic Manual*, Guiyang: The People's Press of Guizhou, 1984.

<sup>6</sup> Guizhou Annual Report Editing Committee. *Guizhou Annual Report, 1991*, Guiyang: The People's Press of Guizhou, 1991.

50%. By developing new land, arable land area expanded to 31.36 million mu in 1958 which reached the all-time high. After that, with the diversion of arable to other purposes, as well as the lost caused by soil erosion, plus various others, agricultural land has kept shrinking for the past 35 years. On the other hand, population is growing. As results, man-land and labor-land ratios have been quickly declining. During a 10-year period of 1956-1966, for instance, man-land ratio decreased 17% from 1.91 mu to 1.58 mu, it continued to decline to 0.86 mu per capita in the year of 1990. Labor-land ratio reduced to 1.98 mu in 1990 from 5.65 mu in 1958, decreased by 65% in 32 years period.

### 3.1.3 Change in structure of agricultural production of Guizhou province

Figure 3. illustrates the structure of agricultural production and its change in different time periods.

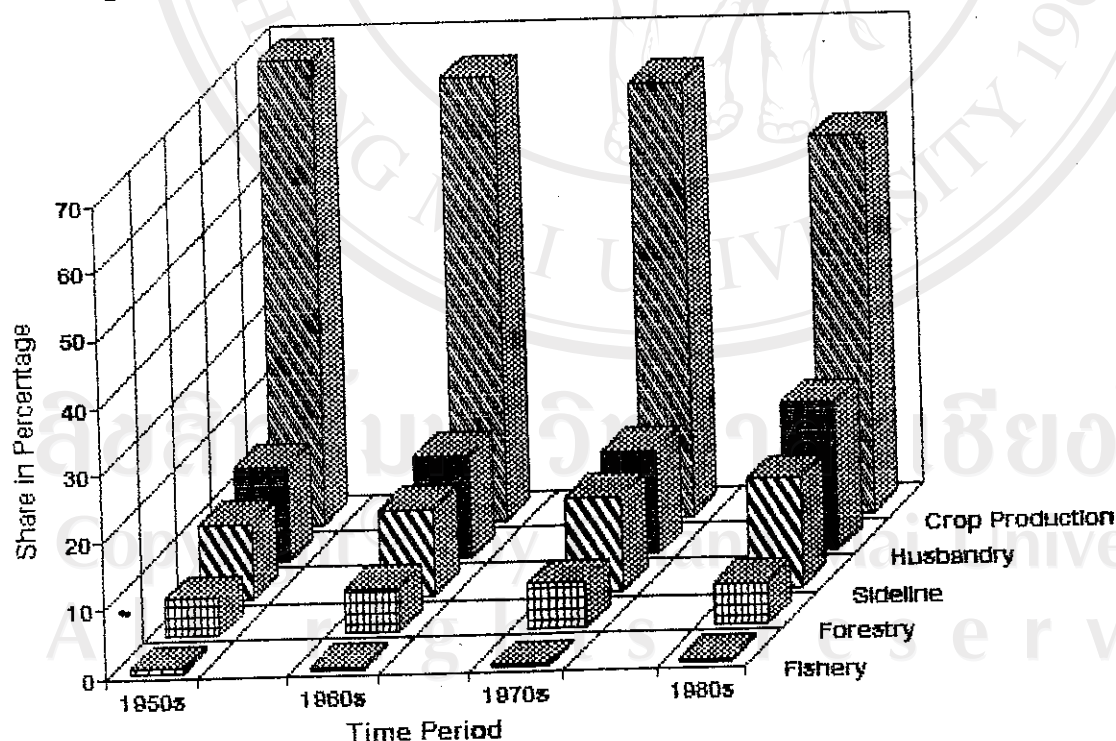


Figure 3. Shares of Each Sector in Total Agricultural Production

Crop and animal husbandry are the two major parts of agricultural production, in the third place is sideline, followed by forestry and fishery production sequentially. Crop production sector produced 69% of the total agricultural output on average in the period of 1949-1960, in 1960s, it accounted for 66%, this number was changed to 64.7% on the average for the whole 1970s, in 1980s, the 10-year average share of crop production was 56.4%.

The second biggest contributor to the total output is animal husbandry production. In 1950s, it shared 14% of the total, from 1960s to 1970s, about 15.2% of the total output was contributed by animal husbandry, in 1980s it accounted for about 21.6%.

However, the production structure of agriculture has been experiencing some changes in the past decades. Crop production for instance, had a decrease in share from 69% in the 1950s down to 56.4% in the 1980s, declined by 18 percentage points. On the contrary, animal husbandry got a big gain, its share increased by 53% from 14% in 1950s up to 21.6% in 1980s. Besides, sideline also had some increases, the weight went up to 15.6% in 1981-1990 period from 10.8% in the period of 1949-1960, increased by 5 percentage points. Other sectors--forestry and fishery had little change.

### 3.2 Institutional Reform and Production Growth

#### 3.2.1 The first economic reform (1949 - 1959)

This is the first fast growing period of agricultural production. Production incentives from land reform led to a rapid increase in

production. From 1949 to 1957, total cereal yield increased from 2.9 million tons to 5.4 million tons, the annual growth rate was 7.7%. Average grain available per capita was up to 318.7 kg from 209.4 Kg (Liao 1989).

### 3.2.2 Decreasing development period (1958 - 1978)

With the first fast development stage passing by, the growth rate of production declined. Later, even with the introduction of dwarf and semi-dwarf varieties which are widely believed to be of high yield, and extensive application of chemical fertilizer and pesticide, the

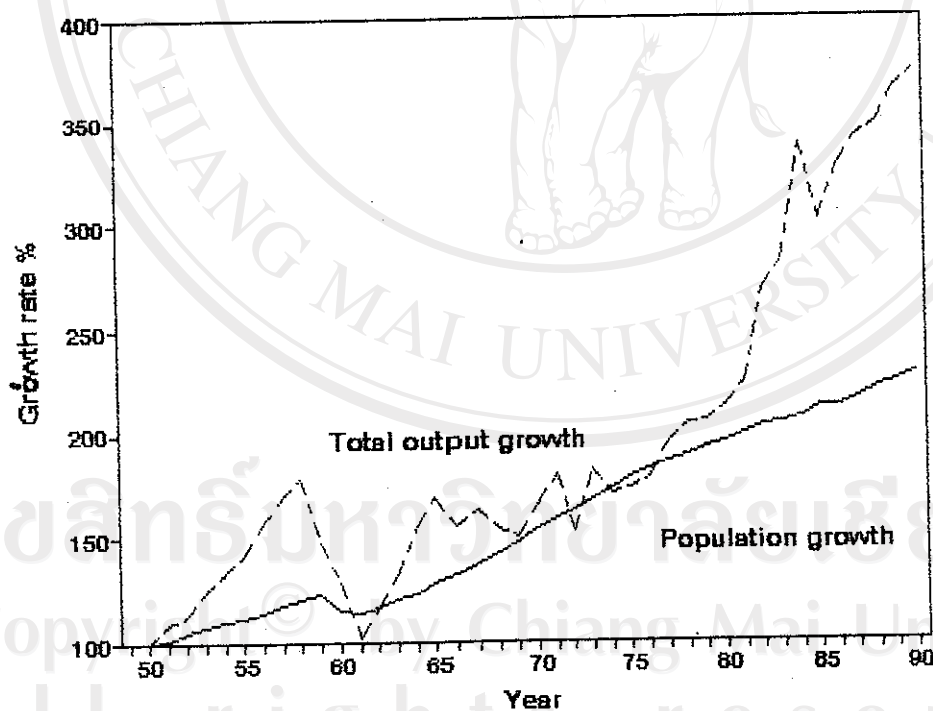


Figure 4. Population growth vs. output growth in 1949-1990

situation of production growth at a decreasing rate was still not changed. Agricultural production was hampered by unsuitable institutions. The average growth rate during the entire period was comparatively low. Yearly, the output of crop production increased by only 0.9%, which was lower than the population growth (2.1%) during the same period, total agricultural output growth, in some years such as 1951, 1972, 1975, was lower than population growth, too. (Figure 4.)

### 3.2.3 The second land reform and economic reform (1978 - 1984)

After 21 years of stagnant production in agriculture, institutions were commonly understood as the main constraints on production. However, in 1978 China instituted a series of socioeconomic reform, "Household responsibility production system" was adopted, the rural ownership institutions changed drastically.

After considerable change in institutions, policies encourage the reemergence of specialized production and marketing based on the principle of comparative advantage, supplies of some inputs increased significantly, agricultural productivity had a marked increase.

From 1978 to 1984, total grain yield in China rose from 300 million tons up to 400 million tons, increased by more than one third at an annual growth rate of 5%. Per capita grain availability was increased from 318.5 Kg to 395 kg. Compare the growth rate (5%) during 1978 to 1984 with that (2.4%) of the preceding period (1953-1978), it is more than two times higher (Fan, 1991).

In Guizhou province, value of total agricultural output increased by 38% in 1978-1983, 33.15% from 1980 to 1983 (Wu 1988), grain production in 1984 amounted to 7.6 million tons which is the highest in its record, annual growth rate was 3.99%. In this development stage, forestry, animal husbandry, side industry, and fishery enjoyed very high growth rates (Figure 5 and 6). Increase in value of fishery was substantial. In terms of average annual growth rate, forestry was 41.7%, animal husbandry, 57.1%, side industry, 53.9%, and fishery, 141.1%.

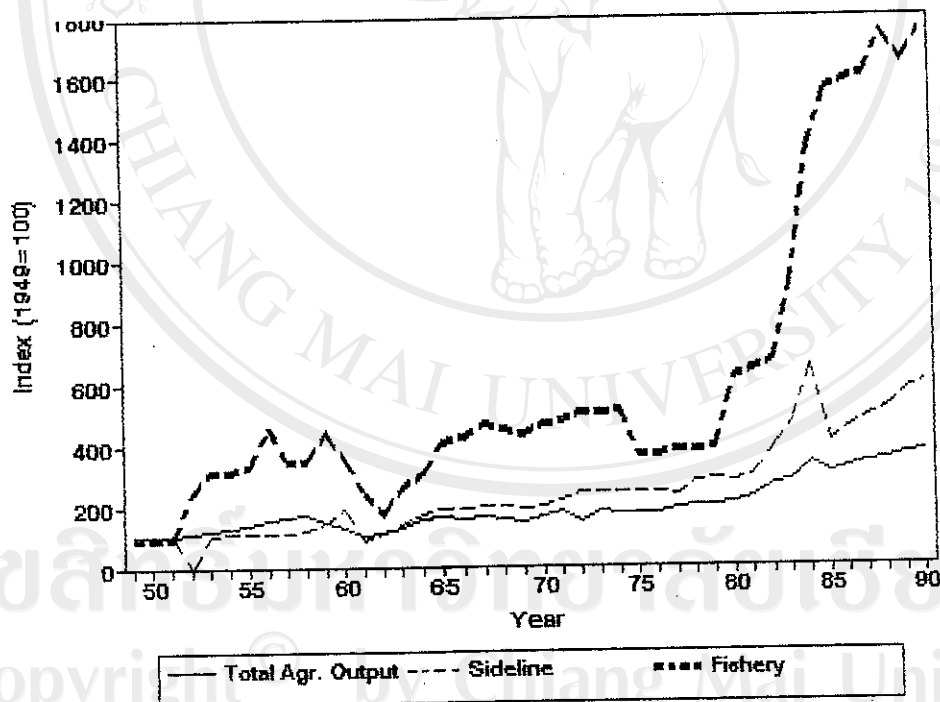


Figure 5. Increase in agricultural production in 1949-1990

However, agricultural production fluctuated in one sector or another after 1985. Figure 5. indicates that the annual growth rate of total value of agricultural production was slowed down to 11.9% from 19.1% in the former period, growth rate of crop production after 1985 was 8.56% lower than that in 1978-1984. In some years, the value of production even decreased (crop production in 1985, forestry in 1986, sideline industry in 1985-1987). However, production in some areas still kept increasing at very high growth rates (Fishery, and husbandry, for example) (Figure 5 and 6).

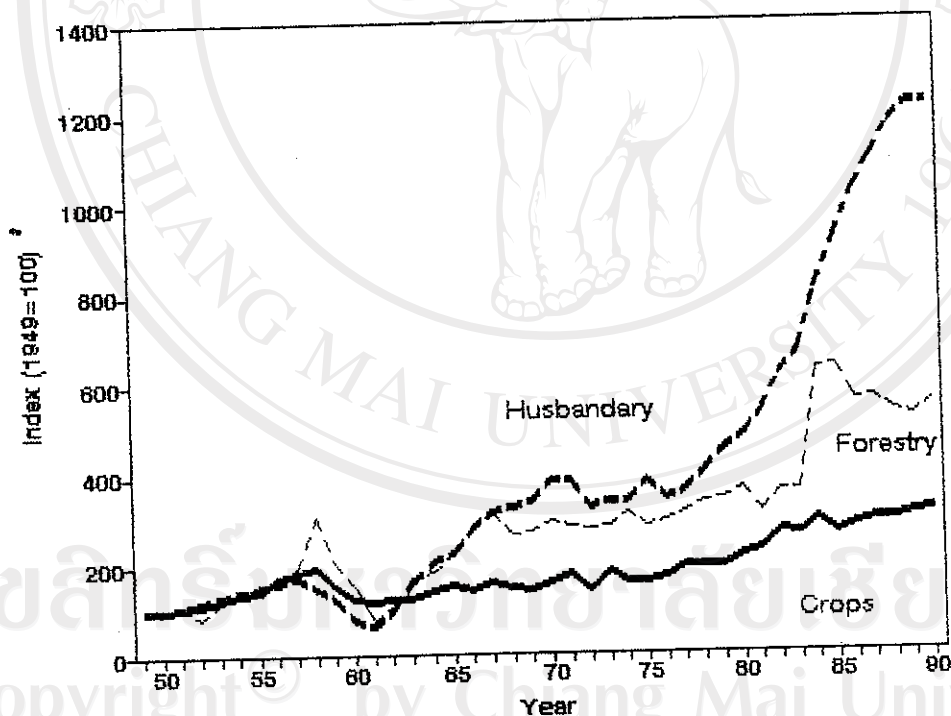


Figure 8. Increase in agricultural production



The major institutional reform in China is the one occurred in 1978 after 21 years' stagnation in production, which was induced by the increasing shortage of food supply for rapidly expanding population and land scarcity. Land reform, input and output marketing improvements, and price increase of agricultural products were the main contents. This reform has imposed pervasive effects on China's agriculture, concretely, there are three major effects: (a) farmers' income and efforts have been linked through improved incentive systems; (b) farmers may leave agriculture to engage in nonagricultural activities (mainly rural industry), thus improving the land-labor ratio; (c) farmers may allocate their time and resources to produce high-profit crops, which has improved allocative efficiency and full use of regional comparative advantages (Fan 1991).

Here briefly are the changes in major components of institutions after 1978.

#### **Land reform**

Before the reform, farm land was owned collectively, each household was given a small piece of land to grow vegetables for family consumption only. Farming decision was made mostly by government officers, individual farmer had little say in what crops to grow and how. After reform, land was allocated to each household, land contract between farmer and government is up to several years. Farming decision making was almost completely done by farmers themselves.

#### **Wage and distribution system change.**

In collective production era, distribution of harvest mainly based on the contributions and efforts each household made to crop production

during the passed year, contributions were only recorded by means of days farmer took part in production activities, which was referred as "work points" system. Work points were based upon the number of days instead of efforts farmer contributed to the production. Under this system, distribution of income was quite equal among the households within the same collective, since the time farmers attended had no much difference.

After 1978 farmers work on their own contracted land, enjoy the freedom of independent farming decision making. Income level of individual farmer no longer depends on the performance of other farmers which affects the average productivity as the former collective production. Instead, it is determined by farmer's production techniques, knowledge, and efforts directly. Of course, this change has brought change to the former even income distribution.

#### **Change in resource utilization patterns.**

Before 1978, collective controlled the utilization of land---the most important resource. Since the farming decisions were made mostly by government officers based on their superficial understandings of local environments, the comparative advantages of land utilization at certain location were not fully exploited.

Water resource was allocated by commune or collective, no water use conflicts among farmers were caused. In terms of labor use, it was under-used or used wastefully. After 1978, the second reform, in order to get higher income farmers have to make their decisions rationally to utilize their available resources fully, as a result the cropping systems and resources use patterns have been changed sharply.

### Technology extension system change.

China had quite a good agricultural extension network before 1980. At prefecture level, there was an agricultural research institute which was responsible for transmission of new technologies from the provincial academy and even from the national agricultural academy within its own region. From county level down to township level there were agricultural technique experimental and extension stations, new technology from the higher institution along the network down to collective or production team, meanwhile, feedback went along it up to the higher research centers. After the reform, agricultural research academy or institutes at both provincial and prefecture levels are still running, but the experimental and extension service stations at lower levels have already decomposed or not function well.

### 3.3 Advancement of Technology

As other Asian countries, China's agriculture has also been strongly influenced by the so called "Green Revolution". The successful introduction of dwarf and semi-dwarf rice varieties firstly led to a significant increase in both production and productivity, afterward, the adoption of IR series of high yielding varieties and the great success in hybrid rice variety breeding in China itself made a prehistoric contribution to the agricultural development in most parts of China. Accompanying the introduction and expansion of those modern varieties, machinery use in agriculture, increase in irrigation area, and the applications of chemical fertilizer, pesticide, and insecticide, have

been the important contributors to the agricultural production increase, too.

In Guizhou province, high-yielding rice varieties were grown initially in 1970s, in 1988 its growing area had expanded to a share of 78% of total rice growing area. Among them, hybrid rice varieties covered 4.48 million mu, accounting for 38.1 % of overall rice area. High yielding corn varieties occupied 62% of the entire corn planting area, hybrid corn was up to 3.5 million mu, sharing 39.2% of the total. Thank to the high-yielding cereal varieties, it was estimated that in 1988 total grain production increased by more than 500,000 tons in Guizhou province (Liao 1990).

Apart from high-yielding varieties, what were regarded as the equally important technology elements in agricultural sector in the past decades in Guizhou have been cropping patterns and field management, which included promotion of suitable cropping patterns to intensify land and other resources use, extension of plastic film mulching cultivation practice to create a good micro-climate for crops, reconstruction and improvement of low productivity cropland, timely chemical fertilizer application and its proper methods to increase effectiveness, etc..

Chemical fertilizer utilization, irrigated area in Guizhou province also experienced increase as other parts of China. Machinery use in crop production began to be seen. In 1957, the average level of chemical fertilizer use was only 0.1 kg per mu, it increased to 33 kg per mu on average in 1983. Effectively irrigated area increased to 23% of the total cropped land in 1983 from 13.3% in 1957.

### 3.4 Crop Production

#### 3.4.1 Crops planted

As mentioned earlier in part 3.1, crop production is the mainstay of agricultural production. Rice, corn, wheat, potato, sweet potato, soybean, are the traditionally grain crops planted. Economic crops are mainly oilseed, peanuts, sugarcane, tobacco, and small scale production of cotton.

Grain production was predominant over economic crop production from 1950 till 1990, sown area of grain was well above 80% of the total sown area from 1950 to 1980. In 1980s, the average share of sown area under grain however, declined to 74.5%. Rice is the most important crop in grain production, its cultivation area accounted for more than 30% of total grain sown area with the minimum share of 30.5% on average in 1960s.

Economic crops can be considered as supporting part of crop production. From 1950 to 1980, sown area devoted to economic crops was very small. The 10-year averaged share of cultivation area under economic crops was less than 10%, ranging from 7% to 9.1% with the lowest figure at 4.45% in the year of 1962. Hopefully, it was increasing steadily from 1980 onwards, in the years of 1987 and 1988, economic crop growing area was expanded to 20.5% and 20.9% of the total sown areas respectively, the 10-year average across the whole period of 1980s was 17.7%. Oilseed is the dominant crop in economic crop production, it shared around 60% of economic crop planted area.

### 3.4.2 Cropping patterns

Because of the complexity of ecological environments in Guizhou province, cropping systems are different from one location to another. Mainly, two types of cropping systems are practiced:

Rice based cropping systems. In the higher altitude regions, rice--follow is dominant cropping patterns, in the intermediate altitude area, rice-oilseed or rice-green manure is the major pattern, while in the lower altitude regions, double rice production system is available.

Corn-based cropping system in the upland is commonly in practice, wheat--corn--sweet potato, oilseed--corn--vegetable, and wheat--corn--vegetable as well as wheat--corn--soybean are the main cropping patterns. However, monoculture of corn, soybean, and other crops are also widely observed.