

CHAPTER 7

SUMMARY, CONCLUSION AND RECOMMENDATION

7.1 Summary

This study concentrated on pinpointing the effects of technological change, institutional reform, and input use in different historical periods, examining the institutions in the present crop production system in Guizhou province, moreover, and identifying the constraints on further crop production growth in this province. A multi-staged socioeconomic survey at three villages representing the whole province was conducted. Estimation of Restricted Translog frontier production functions by using Maximum Likelihood method, as well as average production function in Cobb-Douglas form by employing Ordinary Least Square method, was accomplished.

Socioeconomic survey demonstrates that, the third economic reform initiating in the late 1970s has contributed to the improvements in various respects in the crop production of Guizhou province, and the first several years of the economic reform provided a great incentive to farmers, and furthermore, led to an increase in production efficiency and finally, a substantial increase in crop production. However, with the further openness of the economy, and inadequate measures to stimulate crop production, the situation of crop production has become less encouraging, particularly, after 1985. Further improvement needs certain effective adjustments of institutions.

Highly fragmented farmland, widely-scattered plots, and incomplete contract system deserve the top priority for considerations. A well-defined policy on land tenure, ownership, transfer of land use rights should be formulated soon.

Deteriorating public facilities e.g. roads, irrigation canals etc., due to the improper care is another factor making it difficult to forge the crop production ahead.

In relation to markets for both inputs and outputs, short supply of material inputs, such as chemical fertilizer, plastic film for mulching, pesticide and insecticide, needs to be addressed.

In terms of technology extension systems in the crop production in Guizhou province. Results suggest that, less qualified contracted extension agents, which, perhaps is a direct reason leading to some unsuccessful introductions of new crop varieties and extension of new technologies, is worth paying attention to. Considering the strategy for agricultural technical extension in rural Guizhou, this study hints that promoting demonstration farms at villages level is an effective means in addition to face to face instruction and short training by technicians.

Above all, in this drastic reforming era, institutions once again are experiencing a dramatic change, with the fast pace of economic development in the whole society of China, crop production issues become more challenging than before. In this critical period, a bit less attention to agricultural production, particularly, in those provinces with less sound foundations for crop production such as Guizhou, crop production will be plunging rapidly. The undergoing policy of lifting

price control on some agricultural produces is expected to impose a strong impact on crop production in Guizhou province endowed with a less advantage for crop production in comparison with its neighboring provinces such as Hunan and Sichuan provinces. Meanwhile, the fast economic development in urban cities is creating a tremendous attraction to educated rural labors. Summation of all those factors makes crop production, for the time being, a very challenging issue to the governments. However, the selection of strategies for the future crop production requires an inside-out understanding about the past and the present situations of crop production, which can be helped out by the results of an econometric analysis.

The low production efficiency demonstrates that, a potential is existing in crop production systems in Guizhou province, and also, suggests some institutions in the crop production are constraints on crop production. During the period of 1952-1965, the average production efficiency was as much as 71.3%, in 1966-1970, it was 69.4%, in 1966-1977 it reduced to 68.8%, and in 1978 to 1990 periods, production efficiency increased to 75.1%. In the year of 1984, production efficiency was 80%, the highest ever by 1990. Production efficiency tended to decrease in recent years, in 1990 for instance, it was declined to 75.9%.

Technological change, with neutral technological change as the main component, occurred in the whole study period from 1952 to 1990. Biased technological change, with labor, land, and chemical fertilizer using bias as its major contents, was a minor part of technological change from 1952 to 1990.

Accounting for sources of crop production growth from 1952 to 1990 and in different institutional periods reveals that, material input use has been the dominant contributor in the past several decades to the growth of crop production. Labor, land, and manure fertilizer played the most important roles among material inputs. Respectively, labor explained 29.28% of total crop production growth and land contributed 22.67%. Chemical fertilizer was increasingly playing a role in crop production which shared 17.50% of the total increase in crop production. Technological change contributed 17.77% to the crop production growth, institutional factors shared 8.86% of the total production increase. For the impacts of technological change on crop production growth in the period of 1952-1990, neutral technological change contributed the most (17.45% of total crop production growth), against the 0.283% of contribution by biased technological change.

Moreover, in different time periods the impacts on crop production growth of technological change, institutional reform and input use vary.

In the period of 1952-1965, the primal time of the first economic reform, 90% of the total crop production growth was attributed to material input use, 0.255% of the total increase was due to the institutional factor, and 0.065% was thank to the change in technology.

In the "Great Cultural Revolution" period (1966-1977), input use increase had a contribution of 89.7% to the total crop production, technological change accounted for 13.77% of the total change in crop production, while, the institutions was hampering the development of crop production with a negative impact (-3.47%) on the crop production.

In the second economic reform starting from 1978 in which "Responsible Production Systems" was adopted, impact of material input use was declined to 72.1% of the total crop production growth, the economic reform, or in other words, the changed institutions contributed 18.9% to the growth of crop production. Technological change in this period however, shared 9% of the total production increase.

The average total factor productivity increase caused by institutional reform and technological change from 1952-1990 was 0.84% per year. In different periods the growth rate of total factor productivity were different. In 1952-1965 it was 0.32%, in the period of 1966-1977, it increased to 0.29%, and in 1978-1990, it increased to 0.94%. Productivity improvement however, is mainly based on the institutional change within every period of institutional reform, technological progress contributed less, except the period of 1966-1977. But compare the contributions to the productivity increase by institution and by technological change during the whole period running from 1952 to 1990, technological advance was dominant over institution.

7.2 Conclusions and Recommendations

Viewing outcomes of this study, the following conclusions and recommendations can be made:

i) The quicker and easier way to increase crop production in Guizhou province is increasing material input use. For the time being, an increase in chemical fertilizer application is a suitable and

effective solution to the increasing demand for agricultural products. With higher than price marginal value product (2.9 yuan in 1985, 3.04 yuan in both 1988 and 1989, and 3.12 yuan in 1990), and a lower chemical fertilizer use level than national average, the expansion of chemical fertilizer use in Guizhou province is feasible both economically and technically.

ii) Technology development and diffusion should be on the top of the schedule to increase the productivity of crop production. In the long run, a sustainable growth of crop production has to turn to technology progress. The low contribution to the crop production growth in Guizhou illustrates that technological progress was slow, and the extension systems has been working less efficiently compared with other regions. On the other hand, a small share of production increase by technology also means a great potential in crop production systems. However, technological progress requires a proper investment in agricultural research and development.

For technology research and development, apart from neutral technology, biased technology also deserves attentions. In the past, biased technological change contributed only a small portion to the crop production. Of the contribution by technological change, mostly, was from neutral technology. Biased technological change, the process of improving quality of inputs, needs capital investment. Increase in investments on land fertility improvement, construction of irrigation facilities, as well as on some relevant research projects will quicken the pace of biased technological change, hereafter, to increase the crop productivity.

iii) Institutional modification in the present crop production systems of Guizhou province is a necessary condition for crop production improvement. The top issues to be solved in the present crop systems are: fragmented farm land, widely-scattered plots, and lack of proper contract systems. Policy with clear definition of land use rights and land use rights transfer, and policy encouraging greater production specialization and development of industry in rural areas, are urgently needed to be formulated and implemented. Besides, marketing channels for both inputs and outputs to mobilize resources also have to be created and improved.

iv) At this reform period, formulation of price policies for input as well as output is essential. The formulated policies should have the functions of reducing input price or increasing output price or both, especially, the price of chemical fertilizer at this moment and in the coming future has to be set at such a level that it can produce incentives for farmers to increase chemical fertilizer use in order to increase crop production.

This study was conducting with the hope that, the findings from this study could be a valuable addition to the systematic understanding of the crop production systems in Guizhou province. The persistent purpose of this research is to determine the importance of technology, institution, and inputs in different time periods, to examine the constraints and furthermore to find out the areas where production potential exists. However, the following limitations should be cautioned while considering use of the results from this study:

1) This study was focusing on crop production in the whole province of Guizhou, crop production included both grain and economic crops. Therefore, the results are valid for only the whole crop production sector, which provides a macro-picture for the whole crop production. For particular type of crop production, the results may not hold.

2) The three villages chosen to represent the whole province to investigate the present institutions and constraints in some aspects, and to a certain degree, might exist biases more or less.

3) As mentioned earlier, this study is for the whole province, for the selection of crop development strategy for any specific jurisdiction areas under provincial level, the results can serve as only a reference.

4) In relation to the econometric analysis models, the assumption that technological progress is a function of time, though widely used, is not without its critics. Quite why the passage of time should of itself improve productivity is very difficult to explain and thus time must be a proxy for something which does not actually explain technological progress. Time trend is a weak proxy in that typically factor inputs have been growing over time and hence the scale of operation is highly correlated with time. It therefore, becomes very difficult empirically to distinguish between technological progress and returns to scale (Heathfield and Wibe, 1987).

5) Multicollinearity is a major statistical problem in estimating the average and frontier production functions. Intercorrelation was especially serious between draft animal and manure fertilizer. Hopefully, the omission of draft animal, the effects of which were partially reflected by manure fertilizer, did not change the coefficients of other variables significantly, this omission was also employed by Fan in 1991. However, the omissions of draft animal and irrigation area in the final frontier function estimation can cause bias of a certain extent for some other variables.

7.3 Further Areas For Research

This study was conducted at macro-level, assessment of technology impact on particular crop is beyond the scope of this study, further researches are needed to identify the effects of technology on specific crops, in order to work out policies and strategies for its development.

China is again having another drastic change in institutions, an update investigation on institutional impacts on crop production to monitor the effects of institutions for timely modification, is necessary. Aside from this, an understanding about impacts of specific aspects of institutions on crop production, also, remains to be done.

A complete set of policy analysis for crop production in Guizhou province requires the understandings of the price effects and factors demand in addition to the results from this study. Conducting studies on those issues are left for the future.