CHAPTER VII

CONCLUSION AND RECOMMENDATION

7.1 Summary and conclusion

Litchi is a dominant horticultural crop of Bacgiang province covering about 78 percent of fruit tree area. It plays a very significant role in the life of the local people who have been living in hilly and mountainous areas of the province since income from litchi accounts for about 68 percent of household income. Nowadays, litchi has been expanding rapidly throughout districts of the province in order to exploit the natural resources and to green bare hills and lands.

The study aimed to examine the existing litchi production system and its management practices to identify and to evaluate the factors affecting litchi productivity that consist of the factors of production process, technical efficiency as well as price efficiency using the stochastic frontier analysis approach. The stochastic frontier production function and technical inefficiency model were simultaneously estimated using the FRONTIER 4.1.

The stochastic frontier production function of litchi yield was estimated in the Cobb-Douglas functional form. Technical inefficiency scores were used as the dependent variable of determinants of technical inefficiency using linear regression model. The determinants included the criteria such as age, ethnic, education, experience, access to the information via supervised credit program of the household heads and farm size. Price efficiency was established for the purchased inputs that had a statistically significant influence on litchi yield, including labor use and fertilizer application.

Field survey was conducted in three representative communes of Lucngan district, Bacgiang province during Oct.-Nov., 2002. A sample of 80 litchi farm households was interviewed for the production year 2002. Both descriptive statistics and quantitative methods were applied to the study. The application of stochastic frontier production function approach to the study has brought the meaningful findings for litchi production in the province.

Results of the stochastic frontier analysis indicated that the main factors positively influencing litchi frontier productivity consisted of tree age, labor and fertilizer while irregular bearing had a negative effect on litchi yield. Two dummy variables, one for capturing the influence of production environment (e.g. soil structures) and another for reflecting the effect of manure (e.g. liquid manure watering), significantly affected litchi production frontier curve.

Chemical spray was found to be insignificant in the stochastic frontier model. This happened since litchi farmer had inadequate knowledge of using appropriate pesticides on timings or proper ways to control pests and diseases. However, lots of the respondents reported that although they used the same kind of pesticide to cure the same type of pest appeared at the time of about two weeks before the ripening that previous year it proved very efficient, it became inefficient the following year. It means that the pest had an anti-pesticide mechanism, so it needs to have a new efficient one to deal with this situation.

Tree density was also found to have insignificant effect on litchi yield. Since litchi are a perennial crop, the tree density needs to adjust by tree ages. At current density of 11 trees sao^{-1} with average tree age of 9.26 years, tree density had a negative influence but not significant on litchi yield. In the next years, the tree canopies will become bigger so the competition in nutrient and light among the population will occur and it will lead to difficulties in management as well as waste of resources use.

The finding of existence of the litchi stochastic frontier function throughout the significant ratio γ = 0.737, implies that 73.7 percent the discrepancies between the observed values and frontier values of litchi yield in the area unexplained by the model was due to one-sided error terms (technical efficiencies). Only 26.3 percent of the variation in litchi yield was caused by the random shocks.

The mean technical efficiency obtained by litchi farmers was 74.7 percent, implying that they had obtained only 74.7 percent of the potential output. In other words, they still have a chance to increase their litchi output up to 25.3 percent more, given the present production condition and their resource endowments.

The technical inefficiency model indicated that the factors which had statistically negative impacts on technical inefficiency of litchi production consisted of age, ethnic and access to information via credit program of household head. Meanwhile, farm size was a source of support for technical inefficiency with the positive influence.

Although, the number of years of litchi cultivation experience of household heads had a negative impact on technical inefficiency, the effect was not statistically different from zero. Surprisingly, the variable of education attainment had a wrong sign but it was not harmful to the model since it was not significant.

The results of input use optimization analysis indicated that at mean levels of inputs used and output obtained, the litchi farmers overused chemical fertilizer, however they underused labor. In general, litchi farmers allocated labor more efficiently than fertilizer in terms of allocative efficiency since the distribution of the ratios of MVP/P of labor were highly concentrated around the optimal point than those of fertilizer

In practice, litchi farmers had to cope with the disadvantageous situations of market with very low output prices during 2002 harvesting season as compared with those of the previous years.

7.2 Recommendation and policy implication

Given the results of this study, following recommendations can be given to improve current situations of litchi production in Bacgiang as well as other areas that have the similar conditions to Bacgiang.

1. At the observed market prices, labor input should be employed more for taking care of litchi orchards towards labor intensive from family labors if available or from hired labor to improve litchi farmer's income. Meanwhile, fertilizer application should be reduced at the observed prices in terms of allocative efficiency, since on the average the sample farmers overused this resource. If the fertilizer price was lower, then its application would be more efficient.

2. Training courses on pest and disease management, and use of chemical spray are necessary for litchi farmers since the lack of knowledge of this practice brought about inefficient use of this resource leading to low litchi yield.

3. Estimates on the extent of inefficiency indicated that improvement of efficiency at current state of technology is more necessary than the introduction of new technologies to those farmers to raise litchi productivity since the current level of technical efficiency is far from the fully efficient level.

4. Extension networks need to be enhanced to the rural areas, especially to the remote communes where ethnic minorities are living to transfer knowledge of litchi cultivation to them through training courses, credit programs, and study tours at the best practice farms.

5. Regarding the situation of tree density in the study area, it is suggested that tree density needs to be adjusted appropriately by taking weak and low developed trees out of litchi orchards, and pruning techniques, otherwise the competition of nutrient and light will cause more negative impacts on litchi productivity.

6. Irregular bearing is a common phenomenon in litchi trees that often cause a negative impact on the yield. Up to now, there has been no solution done yet on this problem. To limit effect of this, researches on this issue should be paid more attention by technicians.

7. Sustaining litchi production incorporates the development of swine herd size to have liquid manure source containing tanks that is used for watering litchi orchard in each household is strongly recommended. Since it will reduce using chemical fertilizer and degradation in soil quality (more credit is needed).

8. This study focused mainly on evaluation of the production aspects, so it is in need of exploring the market aspects for the future such as estimation of supply capacity and litchi price forecast as well.

9. Although, there were very few studies on the perennial crops, particularly fruit trees using quantitative methods, this study tried to apply them to this field. It is suggested that litchi is a perennial crop so the study would be better if the data collection was conducted for many years (time series data).