

## CHAPTER 6 CONCLUSION AND REMARKS

In this study, four rice based cropping systems are chosen to study farm size efficiency in the Chiang Mai Valley. Ordinary Least Squares or Generalized Least Squares methods are used to estimate homogeneous Cobb-Douglas production functions for individual crop of rice, soybean, potato, tomato and garlic. Tests of returns to scale show that there are constant returns to scale in these crops.

As an attempt to identify technical efficiencies of crop production in the study area, stochastic frontier production functions are employed. Half normal error terms are used to capture the inefficiency estimates of individual observations. A logit model is employed in estimating factors associated with technical efficiency in crop production. It is found that the model only explains a very small part of variations of technical efficiency and all of the coefficients are very close to zero, though some of them are statistically different from zero. It is therefore concluded that operation size and other hypothesized factors do not affect technical efficiency. Therefore, further study is needed to identify factors affecting technical efficiency.

In fact, the variation of technical efficiency across farmers are small. This may be a shortcoming of using frontier functions to estimate a homogeneous production environment and technology, since results of frontier estimates can only represent the "best practices" of the sampled farmers. However, these best practice farmers of the sample may not be the best ones of the whole area. So, even though the estimated sample mean efficiency of rice,

tomato and garlic are 92.6, 95.1 and 95.6 per cent, this estimate may be lower if sample size increases.

Since the price information of this study is poor, either because of a uniform chemical price and land rent, or because of the difficulty to "impute" wage value for family labor, it is unable to detect allocative efficiency across farmers. It seems that in the sample, farmers tend to over-utilize labor, chemical fertilizer, pesticide and herbicide, as the elasticity of these inputs are all small. In most cases, The marginal productivity of labor is almost zero. This is especially true for small farmers, as there is evidence that small farmers use more labor per unit of land area. Further study is also needed to see allocative efficiency of different farm sizes.

One problem in this study is the small variation of operation size for most dry season crops. This may lead to difficulties in detecting farm size efficiencies of the dry season crops. The small operation size for most of the dry season crops may be related to limited water supply. This can also be confirmed by the fact that all the observed farmers grow only a portion of their land in the dry season. In fact, these dry season crops provide additional income to farmers, and in this area, tenant farmers are not required to pay rent if they also grow rice in the rainy season.

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