CHAPTER I

INTRODUCTION

1.1 Statement of the problem

Rice is the staple food for over half of the world's human population. Thailand is an agricultural country where rice is also a staple food of Thai people. Thailand has also been the largest rice exporter in the world market since 1990s (Opastrakul, 1996) and the Northern region is the second largest rice producing area in Thailand (Office of Agricultural Economics, 2006b). Phayao province is one of the wet season rice producing northern provinces of Thailand. It covers an area of 6,335.1 km² and is subdivided in 7 districts. There are altogether 68 subdistricts 632 villages in the province. In 2005, it had more than 752,273 *rai*[1] of rice area, of which 608,058 *rai* were planted to wet season rice 1,654 *rai* were planted to dry season rice. The varieties grown are Khao Dawk Mali 105 (KDML105), RD15, and RD6 (Office of Agricultural Economics, 2006a).

There are many risks involved in rice production. Farmers are confronted by environmental risks as well as uncertainties in outputs and prices. Climatic factors limit crop production, which in turn affect output prices. Farmers' welfare is threatened by many factors such as rainfall, crop disease, sickness, fluctuating prices and so on (Pawasutipaisit, 1997). Poverty in the rural areas is usually associated with these risks and vulnerability (Rayner *et al.*, 2002). Poverty is persistent as farmers face these risks especially those dealing with market prices causing instability in income and revenue of farmers. In Thailand in some years, there are government price support programs which help stabilize prices and, thus farmers' income.

[1] 6.25 *rai* = 1 ha.

1.2 Rationale

Each rice variety has different properties and it is subject to different risks. For RD6 rice variety has high disease endurance and high yield but receives a low price while Khao Dawk Mali 105 rice variety (KDML105) has a high price but a low yield (Department of Agriculture, 1996). Furthermore, farmers have different risk aversion which affects decision making of farmers. Each farmer is willing to accept different states of risk. Those who are risk-taking will tend to take high risk to get high revenue.

A way to help Thai farmers to reduce risks and uncertainty is diversification of farm activities and types of crops. In view of climatic and physical conditions, the suitability of crops can be determined. Different crop combinations may reduce risks. To choose an optimal crop combination, risks and returns related to each crop or variety combination should be considered (Jeamsinkul, 1989). For this study, the focus of attention is what rice varieties farmers should grow to reduce risks and obtain maximum profit.

1.3 Objectives

The objectives of this research are

1. To determine variation in yields, and prices of different rice varieties in the past six years in the study area.
2. To obtain optimal farm plans for rice production using both market and government support prices.

1.4 Scope of this study

The study site is rice producing area of Phayao province. The study is confined to Phayao province, which is located in the northern part of Thailand. Rice production areas are focused on lowland area for analyzing the optimal rice production and trend analysis. The rice price and yield trends collected from provincial statistical report for the period 2000-2005, including data collection in the Phayao province in 2005/2006 (i.e. T=6).

1.5 Literature review

1.5.1 Trend analysis

Hafner (1998) studied trends in maize, rice, and wheat yields for 188 nations over the past 40 years. Results showed that linear growth in yields has been the most common trend over time. Daniel and Gustavo (1998) used regression analysis (linear, bi-linear or tri-linear fitted with an optimisation technique) to evaluate trends in yield in wheat for 21 countries. They found that yields were quite stable or at least did not change for most of the analyzed countries. The result in the study by Sittikul (1998) on price behavior of important agricultural commodities, namely, rice, rubber, cassava products, corn and black tiger shrimp found that price trends went upward in each series.

1.5.2 Risk aversion analysis

Not only risks are higher in poor rural economies, but poor people are also less able to deal with risks. Their low assets make it difficult to absorb shocks. Poverty is thus not only associated with higher ambient risks; it also reduces people's capacity to absorb shocks. In response, the rural poor have developed a variety of strategies for coping with risk (Fafchamps, 1999). Pawasutipaisit (1997) studied risk sharing and institutions in Thai villages. The principal smoothing device in the Thai Northeastern region was to sell livestock and equipments, and to work hard, while that in Central region was to use up saved assets, to borrow from the Bank of Agriculture and Agricultural Cooperation (BAAC), and to work harder. However, people in more than half of the villages in the sample from both regions, had to reduce consumption in the worst years.

Normally, farmers are averse to risk. Taksatpong (1984) found that the coefficient for the average risk aversion of farmers is equal 0.90. Farm plans with high risks and high returns were suitable for farmers with less risk averse attitude. More diversified farm plans were suitable for farmers with high aversion to risk (Jeamsinkul, 1989). Jeamsinkul (1989) studied risk and return trade-off of major upland crops farming: a case study of Amphur Khok Samrong, Changwad Lop Buri

found that there was a trade-off between risk and returns in farm planning. Farm plans with the highest gross margin also had the highest risk. It was frequently found that farm plans with high gross margin tended to have complete specialization in one or two crops. Diversification had a major impact on risk and return. As diversification increases, both returns and risk decrease. Selvarajan *et al.* (1997) studied tradeoffs between expected incomes where income risk and water use in a rice-wheat cropping system in a representative area in northern India was analyzed through a systems approach. The application of crop growth simulation models in conjunction with risk programming models captured both technical possibilities as well as socioeconomic context while evaluating risk-efficient production strategies based on their water-use implications on a district level. Tradeoff between water use and income risk was moderate (10:1) at the current water use levels due to favorable policy environment. Promoting efficient water usage in the rice-wheat system calls for rational water/energy pricing policies to reduce water use by 25 percent from the current level. Supportive water management technology and institutional policies would be more effective to economize water use beyond 25 percent wherein the water use-income risk trade off became acute.

Francisco and Ali (2006) studied resource allocation tradeoffs in Manila's peri-urban vegetable production systems. It was found that relative to the current production system, an entry of grafted tomato under rainshelter could increase farmers' income. These results showed that income would increase when capital constraint was relaxed. This increase in income, however, was made possible largely by the change in crop mix, with a relatively smaller increase in area planted to tomato. With regard to the level of risk, the change in production resulted in an increase in price-induced risk. The results seem to indicate that for a risk-averse farmer, the availability of capital will not guarantee a significant increase in the adoption of capital-intensive technologies.

1.5.3 Risk programming analysis

Rengma (2000) studied optimal plans, obtained from the results of risk programming analysis which showed that those plans were closer to the actual crop production in Chiang Rai province than the optimal plan obtained from linear programming analysis. The result revealed that farmers in Chiang Rai tended to be risk averse and were concerned with income risk in the selection of crop production. She suggested that risk programming modeling be recommended and developed as a guideline for an optimal farm plan. Besides, Sirijinda (1988) has applied linear programming and MOTAD (Minimization of Total Absolute Deviation) model as analytical tools to study an economic planning to study crop production planting under risk situation due to uncertain price and yield. The solution suggested that corn, mung bean and cassava production are included in the optimal plan and the risky production like cotton is excluded. In other hand, if considering with the production and price, the programming solution suggests to produce cotton.

Moreover Poonsup (1991) employed linear programming and MOTAD as a tool to study crop production under certain and risk situation. The results show that the optimal plan obtained from analysis very well reflected the existing production patterns. The production of wet and dry season, rice, cassava, maize, mung bean, groundnut and cotton were suggested. On the other hand, the use of linear programming results excluded ground nut and cotton from the optimal plan.

For the study of risks and agricultural systems in northern Cote d'Ivoire, Adesina, and Ouattara (2000) used MOTAD approach for the analysis to assess the effect of price and yield risk on the income of smallholder farmers in northern region of Cote d'Ivoire. The analysis showed that by considering price and yield risk, it would be possible for farmers to improve their income. Considerable evidence was gathered to show that smallholder allocative efficiency was common place in Cote d'Ivoire. This study also found that farmers were operating at a sub-optimal level. This could be due to several factors, including multiple market failures, lack of information on price, price and yield risk, labor market search costs or high transaction costs. What is more, MOTAD model was used to estimate effects of risk aversion on farmers. Under alternative risk aversion level (Φ) of 0, 0.1, 0.25, 0.5,

and 1.5, in the risk model solutions for oxen farms, the area in upland rice declined from 4.5 ha for the farm plan of a risk-neutral farmer, to 3.6 ha for the farm plan of a highly risk-averse farmer (Φ = 1.5). As the level of farmers' risk aversion increases, the area of maize in the risk model solution declines from 6.3 ha for Φ = 0 to 1.19 ha for all Φ > 0. This indicated that risk-averse farmers could reduce their risks by reducing crop area. Similarly, Runnapongsa (2005) used MOTAD model to find optimal farm plan in Chiang Mai province. The result of overall study provinde policy implications that in short term, farmers should produce onion, garlic and shallot at optimal levels corresponding to each risk averse coefficient from 0.00, 0.05, 0.08, to 0.12 which assure revenues above cash investments. In long term, farmers had to due to the effect of FTA. They should grow potato instead and should be done carefully by taking into account yield risk.