

# STUDY ON PRODUCTION EFFICIENCY AND AGRICULTURAL RISK MANAGEMENT: THE CASE OF MAJOR CROPS IN NORTHERN VIETNAM

ホ ヴァン バク

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Name : HO VAN BAC

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(生産効率及び農業リスクマネジメントに関する研究：北ベトナムにおける主要作物を事例として)

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### Thesis Summary

Vietnam has a favorable natural condition for agricultural production, with a large agricultural land accounting for 82.4% total natural area. The sector has contributed significantly to the economy in terms of employment (48%), GDP share (18.1%), and food security. Especially, agricultural production is essential income source for people living in rural area and the poor in the region with 75% and 90% respectively. However, the sector has been facing many challenges such as low productivity and quality, scattered and small scale production, food safety etc. Besides, the sector also is very sensitive and vulnerable to various kinds of risks. Improving production efficiency and risk management could be seen as feasible measures contributing to the improvement of income for local people in the context of limited production land expansion and inefficient used resources. In Vietnam there have been several studies on production efficiencies of main crops such as rice, vegetable, tea etc. However, understanding the risk sources and combination of efficiency and production risk are still limited. Moreover, there is not any comparison study on productive efficiency of farmers using propensity score matching approach to control the selection bias. Besides, the adoption of eco-friendly production practices such as VietGAP, organic methods are expected to increase household income and reduce concerns from food unsafety. But the study on evaluating impact of VietGAP adoption on farmer's livelihood in Vietnam is rare. Thus, the objectives of the study are: (1) to explore the production efficiency of rice and tea farmers and factors affecting inefficient levels; (2) to investigate the economics of adoption, source of risks facing by farmers and also understand their management response to the risks.

The study was conducted in northern Vietnam where agricultural production plays an important role in household's income sources. Tea and rice are two of major crops of the region and selected for this study because of their representative and dominant importance. While rice crop is mainly produced to serve household's demand or self-sufficiency, tea plantation is grown as a commercial crop and provide cash income for other daily demands of households. To achieve the purpose of the research, we apply several models to fit with specific objectives. Stochastic frontier approach (SFA) was used to analyze production and profit efficiency of farmers, while principal component analysis (PCA) and multiple linear regression were applied to determine the sources of risk and farmers' response to the risks. Farmers' decision to adopt new practice was analyzed using logistic regression model. The findings of the study were derived from analyzing cross-sectional data of rice farmers and tea farmers collected in the study area.

The findings of chapter 2 and 3, analyzing productive efficiency of rice and tea production, indicate that farmers did not operate their farms at fully efficient levels. There are still rooms for improving efficiency with given inputs and technology through the use of better practice production methods or more efficient decision. In details, technical efficiency based on the SFA analysis with average score of 88 percent indicates that rice farmers could improve their technical efficiency for about 12 percent with given inputs and technology by improving farmer's resource use efficiency.

The result also revealed that reducing technical inefficiency of rice farmers could be done by enhancing educational levels, and land consolidation. While tea farmers have the potential of increasing their profit efficiency for about 25 percent. Further analysis indicated that investing active irrigation system, joining cooperatives/production groups and good extension service are major factors for improving the tea farmers' profit efficiency. Notably, comparison the profit efficiency between two groups revealed that "safe" tea production practice (VietGAP) could achieve higher efficiency than conventional tea production practice.

Chapter 4 and 5 determine factors underlying the probability of tea farmer's decision to adopt the new production practice and economic effect of VietGAP tea production on households' income. In order to achieve the purpose, we analyzed two groups of sample, namely adoption and conventional one. The finding of these chapters shows that farmers with better or more advantageous production features are more likely to adopt new production practice. Positive incentives affecting both conversion decision and more farmland allocation of tea farmers include number of household members, tea farm size, ratio of tea income over total household income, access technical information on new production practice from extension agencies and using labor-saving machinery in tea production. Furthermore, with the aim of estimating the casual effect of VietGAP adoption on farmers' livelihood in Vietnam, PSM was employed. The result also indicates that farmers adopting VietGAP tea production received economic benefits with higher income in comparison with conventional tea farmers. This also implies that VietGAP tea production should be supported for diffusion. The premium benefit is attributed to better price and higher tea yield of farming practice under VietGAP standards.

Perception of farmers' risk sources and their management response are an important part of the study. And its detailed contents are presented in Chapter 6. Descriptive statistics, PCA, and multiple linear regression were applied to determine the risk sources and also find socio-economic factors influencing the farmers' risk perception and their management response. The result of descriptive analysis indicates that there are 17 sources of risk that perceived and listed by tea farmers in the study area. The analysis result indicates that price volatility, disease risk and an increase of production cost are the most serious in farmer's perception as single risks. Moreover, there are no differences existing in farmer's risk perception between VietGAP and conventional tea farming systems. Analyzing variables affecting on risk perceptions indicates that agricultural educated farmers were found to be related to lower worries and risk perception. Besides that, farmers with main occupation involving in farming activities worry more about production risk, yield and quality risk. For risk management response, farmers considered pest and disease prevention, production cost minimization as the most important measures to limit damages from risk sources above.

In short, the result of the study highlighted that tea and rice farmers in the study area did not operate at inefficient farming practices. More efficient resource allocation decision or better production management skills could lead to improve productive efficiency. Moreover, conversion in tea production was promoted by economic incentives and adopting VietGAP tea production practice also contributed to increase the profit efficiency and households' income of farmers. Thus, it is important that interventions and government support should aim at improving current production efficiency and expanding the conversion. Lastly, based on farmers' perception, agricultural production is exposed to various types of risks, in which variability of output price, disease risk and increase of production inputs are perceived as the most serious risks. They also selected pest and disease prevention, production cost reduction as measures to manage possible risks and damages. To reduce risks for farmers, stabilizing market price of output and production inputs, preventing disease risk with technical education programs that government should support for farmers would be meaningful.