

学位論文の要旨 (論文の内容の要旨)
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論 文 題 目

SUSTAINABILITY OF COMMUNITY-BASED RICE SEED PRODUCTION: A CASE STUDY IN THE
TARAI REGION OF NEPAL

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Summary of the Dissertation

Community-based seed production system is considered to supply diversified rice varieties in rural areas in a cost effective way. Development agencies have been promoting this concept to address poverty, food security and climate change adaptation issues. However, how this system could continue is a contested issue among the researchers and policy makers due to handling of seed production and marketing activities by resource poor farmers without business skills. Very limited studies have been published in this area. This study analyzed the sustainability of this system putting seed producers and seed consumers in the context, and considering three pillars of sustainable development i.e. economy, environmental and social in the analytical framework. How seed producers realize economic benefit and how that benefit continues is the major research question addressed in this study. Here, efficiency of farmers in production and marketing captures the economic issue, and the efficiency is analyzed at two levels: production and marketing. Since seed producers are small farmers, the environmental and social issues are analyzed linking them with economic issue because environmental and social benefits are not easily visible for this category of farmers.

Characteristics of seed consumers play important role in seed demand and thereby economic benefits of seed producers. The seed demand characteristics were analyzed from the perspective of types of rice varieties grown by consumers and their behavior in adopting different rice varieties. Result shows that consumers (farmers) grow both modern and farmers' varieties; however, majority of these varieties have not been registered in the government system.

Farmers buy these varieties from neighboring farmers, agrovet, seed producer organizations and development projects. Farmers' behavior in buying seed from the market was analyzed using binary logistic regression. Result shows that farmers with higher educated household head, access to irrigation facility and having membership in community-based organizations are more likely to buy seed from the market.

Efficiency of households in producing rice seed was measured for their ability to maximize rice seed yield in utilizing their most commonly used inputs: operational land, source seed, chemical fertilizer, livestock and human labor. Both allocative efficiency and technical efficiency were measured in this study. Allocative efficiency was measured as the ratio of marginal value product of their inputs to their price. The result shows that operational land and human labor are over utilized but source seed and chemical fertilizers are underutilized. The technical efficiency of farmers for utilizing the above-mentioned inputs was measured

through stochastic frontier production model. The result shows that households are 81% efficient in utilizing the above-mentioned inputs but there is a quite high variation in the efficiency level among the households. This variation is mainly explained by education of household head, households' experience in rice seed production, and land quality. Land quality is the proxy variable for soil fertility and irrigation facility.

Soil conservation practices contribute in enhancing the land quality by improving soil fertility, and it gives the basis for continuity of economic benefits for long time by minimizing the agricultural impact on air, soil, water and biodiversity. This study shows that farmers use animal manure, zero tillage, green manure and improved practice to conserve soil. There is positive linkage between these practices and rice yield as well as technical efficiency of farmers. Factors affecting the adoption of these practices (zero tillage, green manure and improved practice) were analyzed using multivariate probit model because these practices are not mutually exclusive with each other.

In this case, the selected conservation practices were simultaneously modeled with household level demographic, economic and institutional variables. Result shows that households with larger operational land, less family labor and having higher variety diversification characteristics are more likely to adopt zero tillage practice. The role of irrigation facility was found important for the adoption of green manure practices as farmers were growing green manure crop in spring (dry) season. Similarly, irrigation facility, training and variety diversification characteristics have significant positive influence on the adoption of improved practice whereas chemical fertilizer has negative impact on it.

In addition to realizing economic benefits in seed production phase by gaining efficiency through proper utilizing their resources, seed producers could also realize economic benefits by selling seed in the market. However, to gain efficiency in marketing seed producer organizations need to increase their economy of scale of their outputs. For this, members of their organizations need to supply maximum proportion of the produced seed to their organizations. The study shows that 65% of households sell 64% of the rice seed produced at households in the market. Households' behavior in selling rice seed in the market was analyzed by Heckman Selection model because this model captures the selection bias. The result shows that practice of collecting share by households in seed producers' organizations, livestock holding, and training motivate farmers for selling seed in the market whereas the operational land and irrigation facility motivates them selling higher amount of seed in the market. Seed price positively influence households' behavior in selling rice seed as well as its

quantity. Additionally, to see the influence of training on economic efficiency of seed producer organizations in rice seed marketing, return to investment of four organizations from Chitwan district was compared. The result shows that those spending on training for their members have better return to investment figure than their counter part, and also the efficiency of the former organizations is less sensitive to change in external factors.

In spite of the great potential of seed producers' organization in reducing marketing costs, these organizations possess risks from variability of socio-economic characteristics of their members, and risks from external factors such as market, climate and government policy. Governance issue of these organizations were analyzed from the perspective of the capacity of executive body in designing strategies to address the internal and external factors in line with enhancing efficiency of these organizations in rice seed marketing. These strategies are members' participation, implementation of business plan, development of incentive system, and linkage with service providers. The result shows that organizations are poorer in incentive and business plans as compared to participation and linkage, and organizations from Chitwan district are better off in these indicators as compared to the organizations from other two districts. There is positive impact of governance indicators on technical efficiency and proportion of seed sold by household in the market. It provides the evidence that if seed producer organizations improve their governance indicators, households will realize economic gain. Moreover, leaders' characteristics were compared with the governance indicators across these organizations, and it shows that leaders with higher education level and attended business planning training are better off in governance indicators.

Overall, the study shows that education and irrigation are the most important variables for the better performance of community-based seed production. It means higher educated households could enhance their efficiency by proper allocating their resources, and would be more accountable towards their organizations by participation in the market. It might be difficult to provide formal education to households considering their age; however, informal trainings and demonstrations about seed production and marketing would be useful for general members. It would be possible to include higher educated members in the leadership position considering existing members' education level. In such situation, development agencies could facilitate the organization in good governance with especial focus on incentive system and business plan. The facilitation might empower the executive committee to select their capable leaders themselves. If the selection of higher educated leaders from existing members is not possible, the seed producer organizations could invite the members having

potential leader characteristics in their organizations. Third strategy would be development agencies could support for organizations' leaders for higher education.

The study shows that access to irrigation facility motivates the consumers to buy seed in the market, and contributes in enhancing technical efficiency and motivation of seed producing households in selling seed in the market. Similarly, irrigation facility also motivates farmers in adopting green manure crop, and adoption of this practice is important for improving soil quality. It means extension agencies intended to promote sustainability of rice seed production system should integrate irrigation issue in their program.

Similarly, majority of the rice varieties grown in the study area have not been registered in the government system. So, farmers' might not get extension facility in the non-released/non-registered rice varieties, and it might contribute in inefficiency in seed production and marketing. So, proper mechanism should be developed for the registration/release of these varieties.

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