

学位論文の要旨 (論文の内容の要旨)
Summary of the Dissertation (Summary of Dissertation Contents)

論 文 題 目

Dissertation title Sustainability of Organic Farming Compared to Conventional Farming in Chitwan District of Nepal

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Agriculture is the source of food, income and employment for majority of the population in Nepal. The government prioritizes on commercialization of agriculture through conventional means for the overall economic development. But declining soil fertility, negative repercussions on environment and health of farmers due to use of agro-chemicals and market demand reinforced the organic movement in Nepal. Climate change and food insecurity are other important issues Nepalese agriculture sector should deal with. Organic farming is known to be the most sustainable method that claims to tackle these issues. However, sustainability needs to be assessed from three aspects (social, economic and environmental) and is very context-specific. This study compares the sustainability of organic and conventional farming method from two aspects; economic and environmental in Chitwan district of Nepal where group conversion to organic farming exists in three adjoining village development committees, the lowest administrative unit, namely, Phoolbari, Shivanagar and Mangalpur. The respondents were selected by stratifying individual households based on their membership in a group formed for the purpose of organic farming. From the field survey, it was realized that not all farmers belonging to such group are practicing organic farming. Likewise, not all farmers not belonging to such group are practicing conventional farming. Therefore, there are both kinds of respondents within and outside such group, although most of the organic farmers are group members. The final data of 285 households is used for the analysis.

First, the study analyzes impact of livelihood assets of a household on adoption of a farming method. In any adoption studies of agricultural innovation, livelihood assets are as important as agro-ecological variables and farmers' perception. For this purpose, this study uses bivariate probit model. The result shows that households having higher livestock holding and receiving higher number of organic farming related training are more likely to practice organic farming. Livestock holding still plays an important role because livestock manure is the main source of organic fertilizer. Training complements the technical knowledge required to practice organic farming, which is not just following the traditional way of farming but assimilating them with modern scientific knowledge as well. Thus, these two household characteristics should be emphasized for increasing the adoption rate of organic farming.

In order to evaluate environmental implication of these farming methods, adoption of organic means of crop management practices has been analyzed. It has been divided into two categories: soil fertility management (mulching, compost-shed, bio-slurry, plastic cover and vermicompost) and pest management (bio-pesticide) practices. The study uses multivariate probit model to analyze impact of livelihood assets on the aforementioned practices. The study shows that even though there is an influx of modern inputs like chemical fertilizers, pesticides and micronutrients; conventional farmers also incorporate all organic means of soil fertility and pest management practices analyzed in this study. Although adoption rate is higher among organic farmers, indicating that organic farmers are keener on adopting such practices. However in some instances the adoption of these sustainable but high investment requiring practices can be hindered by lack of fund in which case fund

assistance should be provided. Training also complements technical knowledge required to implement these practices. Farmers also tend to complement most of such practices, indicating that any additional organic means of soil fertility or pest management practices can be introduced to those households who are already adopting one of such practices. But sometimes these practices become substitutes because of their nature of relying on the same input, such as mulching and biogas that directly or indirectly relies on crop residue. Thus, any effort to enhance such adoption rate can consider these characteristics of various practices.

Economic benefit is probably the most important reason for smallholder farmers to undertake any practice. This study analyzes crop diversification, farm income, gross farm cash income, production and net return for this matter. For assessing crop diversification, this study uses Shannon Diversity Index that captures both richness (number) and evenness (abundance) of crops, and analyzes impact of livelihood assets on it using ordinary least square model. Organic farm in the study areas is richer in integrating more number of crop types (richness) but is poor in evenness, which resulted in having lower Shannon Diversity Index than conventional farm. Since crop evenness is better indicator of improved productivity than crop richness, it can be implied that farmers, especially organic farmers, should be made aware of this fact in order to improve their overall productivity. The socioeconomic variables that have significant positive impact on Shannon Diversity Index are education attainment, livestock holding, non-farm income, group membership and training. Clearly, educated farmers have more knowledge on the benefits of having various crops and its advantage to one's health. Non-farm income allows farmers to intensify diversification for own household consumption rather than having to specialize for increasing income. Membership in a group formed for the purpose of organic farming and training related to organic farming can improve Shannon Diversity Index because the purpose of such group formation and training is to make farmers aware of benefits of agro-ecological principles, resulting in improvement of soil fertility and the production. Finally farther the distance to the market, it encourages farmers to have better Shannon Diversity Index because they will prioritize on being self-sufficient and avoid buying or selling in the market to save the transportation cost.

Differences in farm income between the two farming methods is evaluated using ordinary least square model. For the farm income, which is the monetary valuation of overall farm output whether self-consumed or sold in the market; education of household head, farming as primary occupation of household head, livestock holding, farm size, farther distance to market and Shannon Diversity Index have a positive contribution. The second step involves assessing the livelihood assets' impact on household's decision to market the crops and to analyze only those households who have actually sold crop/s in the market to see the extent of gross farm cash income farmers belonging to two different farming methods are able to earn. For the former analysis, bivariate probit model is used while ordinary least square model is used to assess the intensity of gross farm cash income earned. Household's decision to sell crops in the market is influenced positively by farm size, farm income, credit and knowing final price at which the consumer buys; while tenant farmers, labor availability, livestock holding and group membership decreases its probability. Conventional farmers earn higher gross farm cash income than organic farmers because at present, the production per hectare, commercialization rate and price per unit for almost all the crops is higher for conventional crops. In addition to that, access to the premium market is very limited and has not been able to make any significant contribution to farmers' income. Since monetary benefit can attract farmers to divert their labor force in farming activities and specifically making monetary return from organic farming more competitive, making access to premium market should be very effective to boost the adoption rate of organic farming. For this, organic farmers should be linked with potential sellers not just in other cities but an effort should be made towards making market linkage in strategic places of the local area. Doing so will give farmers more control over price and can quality check their products, which is one of the issues they are facing as a result of selling organic products through middlemen in the premium market existing in other cities.

This study compares production and net return from carrot cultivation, which according to key informant is the most commercial non-staple crop in the study areas. To analyze the differences in the cost of production and the net return under two farming methods, t-test is utilized while to evaluate impact of livelihood assets' on the carrot production, again ordinary least square model is applied. The result finds that conventional carrot production is a high cost investment method while organic carrot production is characterized by requiring higher labor, providing lower production but needing lower investment as well. The net return is also higher in conventional carrot production though not significantly different than organic carrot production. Currently, only 6% of total organic carrots produced by the organic farmers could be sold through a cooperative in the cities at 9% premium. Thus, if access to premium market can be improved, it would also significantly improve the net return from organic carrot production. This study also uncovers that among Phoolbari, Shivanagar and

Mangalpur village development committees, the latter two should be prioritized more for increasing the adoption rate of organic farming or improving farming performance in general because farmers in these two areas have lower organic farming adoption rate, Shannon Diversity Index and gross farm cash income. Overall, by assisting to strengthen the economic and environmental sustainability of a farming method will in turn support the livelihood assets of the households.

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