Published by: **Asian Economic and Social Society**
ISSN (P): 2304-1455, ISSN (E): 2224-4433
Volume 5(1)2015, www.aessweb.com

Asian Journal of Agriculture and Rural Development

journal homepage: http://aessweb.com/journal-detail.php?id=5005

FACTORS IMPACTING ADOPTION OF ORGANIC FARMING IN CHITWAN DISTRICT OF NEPAL

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Abstract

Organic farming provides social, economic and environmental benefits but it still occupies a small share of the overall agriculture sector. The objective of this study is to assess factors identifying the underlying issues leading farmers to adopt organic farming. The study was conducted in Chitwan district where indiscriminate use of agro-chemicals is very much existent but the concept of organic farming is also emerging especially in three village development committees within the district; namely Phoolbari, Shivanagar and Mangalpur. Based on field observation, the farming system is categorized into organic, partial organic and inorganic farming. Data from 285 purposively selected households were analyzed using Multinomial Logit model in Stata 13. Results show that older farmers are reluctant to change and thus has lower tendency to adopt organic farming. On the other hand, livestock holding is very crucial as it supplies the much needed manure for fertilizing the soil. More significantly membership in a group formed for the purpose of organic farming and the extent of activities such as training conducted through it has been very much successful in encouraging farmers to convert to organic or at least partial organic farming. Thus, formation of such groups in other areas could be the most effective tool for large scale conversion to organic farming.

Keywords: Organic, partial organic, inorganic, multinomial logit, marginal effect, Chitwan district

1. INTRODUCTION

Agriculture is the major sector of Nepalese economy that accounts for 39% of the Gross Domestic Product (GDP) and employs 66% of the population (MoAD, 2015). Despite this significant contribution, about 1/3rd of its population are food insecure and agriculture is primarily subsistence in nature (Nepal *et al.*, 2011). Since this sector holds an immense significance for the overall development of an economy and alleviating poverty, the government highly prioritizes it through various support, although it can mainly be reflected in the path of commercialization (Samriddhi, 2011). Supplying sufficient amount of chemical fertilizers, pesticides and high yielding varieties are the overriding issues mentioned in 20 years Agriculture Perspective Plan (1995-2015) with very limited reference to organic inputs (AICC, 2006). Accordingly, national education, research, extension and communication systems are also directed towards high input agriculture system in Nepal (Tamang *et al.*, 2011). Regardless of such efforts, agricultural productivity growth rate remains lower compared to other countries (Samriddhi, 2011). Moreover, such input-intensive farming system will degrade the soil quality and stagnate or decline yield overtime due to intensive and mono-cropping pattern system (Samie *et al.*, 2010). The issues of declining soil

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fertility and yield in certain parts of Nepal, which have the history of long-term use of chemical fertilizers and pesticides are now emerging (Bhatta and Doppler, 2010; Weiss, 2004; Shrestha and Neupane, 2002). The negative impact of modern inputs on not just environment but human health as well have prompted the movement of organic farming in Nepal (Bhatta and Doppler, 2010; Weiss, 2004) which seems to be in a growing phase (Adhikari, 2011).

Organic agriculture is conceived to be a sustainable approach to food production system, an alternative to ecologically unsound practices of conventional agriculture. Specifically in Nepalese context it has a huge potential as it is endowed with ecological diversities which allows growing various crops suitable for different climatic and geographic condition, has high labor supply for this labor-intensive farming system, and excludes imported and costly agro-chemicals (Pokhrel and Pant, 2009). The burgeoning issues of climate change which is already impacting the food productivity (WFP, 2009) also makes this practice more reliable as it is known for being resilient with higher capacity of mitigating and adapting to such changes (Singh *et al.*, 2012). In spite of providing such benefits, organic agriculture in Nepal is still considered to be in its initial stage lacking data, market information and research based activities (Bhatta *et al.*, 2009; Pokhrel and Pant, 2009). One of the key areas where information in this sector is immensely inadequate is at the household level (Bhatta, 2010) which has a huge significance as farmers are the key players that determine its continuity. Thus, this study has been conducted to find out the issues pertaining to organic farming at the household level for policy implication and stimulate the necessary action through various stakeholders leading to the expansion of this sector.

2. METHODOLOGY

2.1. Study area and sample selection

This study was conducted in Chitwan district which lies in the southern part of Nepal, also known as Tarai region, with elevation below 300 m and accounting for 20.1% of the total land area. Even so, 34% of the total cultivable land lies in this part as it has the most fertile soil compared to other parts of the country (FAO, 2013). Indiscriminate use of agro-chemicals in Chitwan district is very much existent but in some areas the concept of organic farming has also been emerging with the initiation from few enthusiast farmers who started organic farming for health benefits and reinstating soil fertility that had been affected from long term use of inorganic inputs. At present group conversion of organic farming is visible mainly in three VDCs, i.e. Phoolbari, Shivanagar and Mangalpur. The support from various non-governmental and government organizations has also deepened the activities enriching the movement of organic farming. For instance, farmers are provided training related to organic farming from general to more specific ones such as preparation of bio-fertilizers and pesticides, market promotion and network development; distributed pamphlets on Plant Health and Clinic Initiative; set up hoarding boards for raising awareness; develop resource center; operate Farmer's Field School (FFS); technology development and transfer; and other extension services (SECARD-Nepal, 2011). Thus, these three VDCs were chosen as research sites.

There has been a number of organic farming related studies conducted in our research areas. Adhikari (2009, 2011) studied cost-benefit analysis of organic carrot and rice production system, respectively; Bhat and Ghimire (2008) focused on controlling major diseases and enhancing yield of organic vegetables, thus implying the scope of using biopesticides; and Organiconepal (2006) studied marketing system of organic agriculture goods with focus on farmers' cooperative. Only Kafle (2011) has captured the issues of socioeconomic factors differing among adopters and non-adopters of organic farming in Phoolbari VDC. This study, on the other hand, is expected to be more inclusive than the previous studies in terms of geographical coverage and variables selection.

The survey was conducted for two months from February till March, 2013 using small-scale sample survey and researcher's observation. The follow-up survey to gather additional information

through participatory methods such as focal group discussion and key-informant interview was done from October till November, 2014. A sample of 300 individual households (initially to choose equal number of organic and inorganic farmers) were selected using purposive sampling method and household heads or those responsible in their absence were interviewed through semi-structured questionnaire. In all three VDCs, a group has been established particularly for the purpose of organic farming. In Phoolbari VDC a cooperative has been formed with currently 125 members whereas in rest of the two VDCs, an informal group has been formed with 44 members in Shivanagar VDC and 90 members in Mangalpur VDC. The members of such formed groups thus became our potential respondents, under the hypothesis that all farmers belonging to such group would be organic farmers. However, during the field survey it was realized that not all the farmers belonging to such group are actually practicing organic completely. Thus, this study divides farming system into three different categories based on the ground reality: organic, partial organic and inorganic farming.

Organic farming, in this study, implies a system in which use of agro-chemical is completely excluded. On the other hand, partial converters are those who segregate their farmland for organic purpose. This is generally true for vegetable farming which farmers grow organically only for home consumption and is mainly done on a small portion of their land but use chemical fertilizers and pesticides on cereal crops which is rather produced on a larger area. For some it was difficult to grow certain crops, at least during the time of the survey, without the use of pesticide. For example, most farmers faced the problem of late blight disease in potato for which using pesticide was inevitable. For others, they chose to grow commercially viable crops like carrot through inorganic means for easier management of weeds and pests as well as to intensify productivity. Likewise in inorganic farming system, farmers would rely on chemical fertilizers and pesticides on various crops without separating the farm land as such or without being crop-specific.

Respondents from outside such group were selected randomly based on close geographical proximity with those belonging to a group. On the whole, the number of respondents, both group and VDC wise were taken based on the total number of group members within a VDC. After eliminating incompletely filled questionnaires and outliers, the final sample for the study reached 285 respondents in total. For the field survey, university students and local people who were competent were employed, trained properly and monitored on a daily basis by the researcher. As for the participatory methods, focal group discussions were conducted three times in Phoolbari VDC because of the comparatively higher number of member farmers, once in Shivanagar VDC and again three times in Mangalpur VDC (once for each group established for the purpose of organic farming) to get collective opinions. Key-informant interviews also helped to generate other relevant information.

2.2. Empirical model

The collected data is analyzed using multinomial logit (MNL) model in Stata 13. MNL is considered to be an appropriate tool when there are more than two dependent variables with no such ranking or ordering with independent variables that can be continuous as well as categorical in nature (Hamilton, 2009; Wooldridge, 2002). Since our study uses three different farming categories: organic farming, partial organic farming and inorganic farming, MNL model is applicable to assess to what extent farmers adopting each of these farming system differ in terms of their characteristics.

Following Ayuya *et al.*, (2012), the MNL model with 'j' categories of dependent variables can be expressed as:

$$P\left(y=\frac{j}{x}\right)=\frac{\exp\left(x\beta_j\right)}{[1+\sum_{n=1}^{J}\exp\left(x\beta_n\right)]} \quad \ldots\ldots \quad (1)$$

Where, y is a random variable based on values j = 3 (namely organic farming, partially organic farming and inorganic farming system), x is a set of conditioning variables which in this case is farming households' characteristics, *exp* indicates exponents and β is unknown parameters to be estimated. The probabilities for choosing each alternative will sum up to 1 ($\sum_{j=1}^{n} P_j = 1$) In order to estimate, one set of the coefficients is normalized to zero or is taken as a base category (in this case, inorganic farming system = 0) so there are (j-1) sets of coefficients to be estimated. The coefficients of other two alternatives are interpreted with reference to the base outcome. We assume to have Independence of Irrelevant Alternatives (IIA) so that the parameter estimates of the MNL model in equation (1) will be unbiased and consistent. This means that the possibility of choosing one farming system is independent of the possibility of choosing another farming system. This assumption is based on the independent and homoscedastic disturbance terms in the above model.

MNL model however only gives the direction but not the actual magnitude of change or probabilities of explanatory variables' effect on dependent variables. This is why the study incorporates marginal effects to measure to what extent the amount of change in dependent variable will be produced by a unit change in explanatory variables (Ayuya *at al.*, 2012). The marginal effect can be expressed as:

$$\frac{\partial P_j}{\partial X_k} = P_j(\beta_{jk} - \Sigma_{j=1}^{J-1} P_j \beta_{jk}) \ldots\ldots. (2)$$

Where, k represents explanatory variables (Table 1) used for the empirical analysis. The empirical specification is as follows:

Table 1: Measurement and summary of explanatory variables and their hypothesized relation to practicing organic farming

Dependent variable	Definition and Measurement	Mean± Standard deviation/%	Min	Max	Expected sign
Farming system	Organic Partial organic Inorganic (base category)	31% 32% 37%	-	-	-
Explanatory variables					
ageHHH	Age of HHH; Years (discrete)	49.64 ±11.56	26	84	+ve/-ve
eduHHH	Education of HHH; Years (discrete)	6.73±5.45	0	17	+ve/-ve
occuHHH	Primary occupation of HHH; 1=farming, 0 otherwise (dummy)	58%	-	-	+ve
labor	Labor force available in HH; Labor force unit (LFU[1]) (continuous)	4.28±1.84	1	11	+ve
livestock	Livestock available in HH; Livestock unit (LSU[2]) (continuous)	1.94±1.73	0	13.7	+ve
farm_size	Operational farm size; hectare (ha) (continuous)	0.5±0.4	0.01	2.7	+ve/-ve
farm_income	Income from farming activities; Nepalese Rupees (NRs[3])	193988.5± 181015.7	1820	1014 245	+ve

	(continuous)				
non-farm_income	Income from non-farm sources; NRs. (continuous)	202107.9 ±200702.4	0	1080 000	+ve
membership	Membership in a group formed for the purpose of organic farming; 1=yes, 0 otherwise (dummy)	47%	-	-	+ve
training	Organic farming related trainings received; in number of times	1.21±2.02	0	12	+ve
VDC:	Phoolbari as base category, (categorical)				
Phoolbari	Belonging to Phoolbari VDC	50%	-	-	+ve
Shivanagar	Belonging to Shivanagar VDC	18%	-	-	-ve
Mangalpur	Belonging to Mangalpur VDC	32%	-	-	-ve
agri_center	Distance to nearest agriculture center; km	3.74±3.56	0.01	20	+ve/-ve
livestock_center	Distance to nearest livestock center; km	3.44± 2.47	0.01	12	+ve/-ve
agrovet	Distance to nearest agrovet; km	1.73±.1.73	0.01	15	+ve/-ve
mkt_distance	Distance to nearest market; km	2.84±3.4	0.01	15	+ve/-ve
credit	Credit taken for farm related activities; 1=yes, 0 otherwise (dummy)	10%	-	-	+ve
commercialization	Commercialization rate (continuous)	0.71±0.69	0	4.76	-ve

Source: Own elaboration based on literature review

$$Y_{j-3} = \beta_0 + \beta_1 \text{ageHHH} + \beta_2 \text{eduHHH} + \beta_3 \text{occuHHH} + \beta_4 \text{labor} + \beta_5 \text{livestock} + \beta_6 \text{farmsize} + \beta_7 \text{In} - \text{farmicome} + \beta_8 \text{In} - \text{nonfarmicome} + \beta_9 \text{membership} + \beta_{10} \text{training} + \beta_{11} \text{VDC} + \beta_{12} \text{agricenter} + \beta_{13} \text{livestockcenter} + \beta_{14} \text{agrovet} + \beta_{15} \text{mktdistance} + \beta_{16} \text{credit} + \beta_{17} \text{commercialization} + \mu \quad \text{..... (3)}$$

where, ln is natural log and μ is an error term.

As per the regression rule, diagnostic tests were carried out to check the problem of multicollinearity and heteroskedasticity in the data. Variation inflation factor (VIF) test was carried out, which according to Pindyck and Rubinfeld (1981) is better than correlation coefficient method that fails to yield conclusive results. VIF gave a value of 1.60, which is below 10 suggesting that multicollinearity among the variables does not exist. Likewise, both Breusch-Pagan/Cook-Weisberg and White's test did not show significant p-value implying that there is no problem of heteroskedasticity, i.e., the variance of the error term is constant. Table 1 provides the summary of explanatory variables used in the analysis along with their measurement unit and hypothesized relation to organic farming system. Among the 17 variables considered, primary occupation of head of household (HHH), group membership and credit are taken as dummy variables; VDC as categorical and the rest as either discrete or continuous variables.

2.3. Variables selection

Farmers' socioeconomic characteristics have a major role to play in farm-related decision making and therefore its implication on adoption of organic farming is also discussed in various studies. Among others are HHH's age and education; the relation of which resulting in adoption of organic practice varied according to different studies. For instance, Adesope *et al.* (2011) assumes that those who have been farming for a very long time are usually old, less educated and thus are more reluctant to change to organic farming. Contrastingly another study shows that older farmers with larger farms, for better privileged relationship with extension services, are more likely to adopt organic system. They also tend to be more experienced in farming and are better educated (Alexopoulosa *at al.*, 2010). Again Khaledi *et al.* (2011) suggested that educated and younger farmers allocate lesser share of their cultivated area to organic practice and those with older age allocate higher share. This study also takes primary occupation of HHH as one of the indicators resulting in adoption of organic farming because it is believed that a farming decision may vary with the extent of its contribution to one's livelihood. It is assumed that farming as primary occupation is expected to have positive impact on adoption as farmers would be concerned about practicing it in a more sustainable way for a long-term benefit.

Khaledi *et al*. (2011) also opined that increase in farm area will result in higher chances of not following complete adoption of organic practice because of higher labor demand. It furthermore limits the complete adoption of organic practice when farmer's wage increases. Another reason could be economies of scale that can be achieved more effectively in larger conventional farms than smaller ones and therefore for financial gain farmers are less likely to consider a switch to organic farming. Again contrastingly Kafle (2011) found farmers with large farm size to be better adopters than small farmers, probably because it signifies being resource-rich and thus suggested that organic production first be promoted to the large-scale farmers followed by small farmers. But labor is probably one of the major defining factors among others as organic farming is labor intensive and farmers' families have been the major source of labor in all agricultural systems irrespective of the fact that there has been increasing role of hired labor in farm practices (Pattanapant and Shivakoti, 2009). Like labor, livestock holding is also an important component of organic farming as it relies mainly on manure for fertilizing. Thus, higher livestock holding is expected to result in higher propensity to adopt.

Non-farm income and social network relating to the adoption of organic farming could also be observed in various literatures. Since organic farming is usually riskier in terms of yield loss during initial years of conversion (Halberg *et al.*, 2006), farmers with no source of income other than farming, which might have worked as a safety net, could feel hesitant to convert as they tend to be more risk averse. Not just non-farm income, but overall household income is an important factor in terms of adoption decision as it indicates higher financial leverage to undertake risks associated with new technology. Social network is another important component that leads to participation in community activities which could provide benefits to farmers, specifically in the form of labor exchange, information sharing and knowledge gain on production, marketing, and even possibility of getting funds (Pattanapant and Shivakoti, 2009; Sarker *et al.*, 2009). Such activities could also in turn make farmers participate in training and can impact to what extent farmers adopt organic practice (Kafle, 2011). Based on field observation, group formation in Phoolbari VDC is the oldest and has conducted more trainings and thus is expected to have more organic and/or partial organic farmers compared to the other two VDCs (Annex I).

Like training, access to relevant institutions like agrovets (an exclusive store for agriculture related products), agriculture center, livestock center and market are expected to provide farming related information and access to pre and post-production services, although its impact on adoption of organic farming could be positive or negative. For example, if there is premium market for organic products, farmers would be encouraged to practice organic farming if they are closer to the market but in the absence of it, the case would be otherwise. One of the reasons farmer practice inorganic

farming is for higher profit. Thus, it is expected that higher the extent of commercialization, less will be the tendency to convert to organic farming. Finally credit is expected to have positive impact as it can provide with necessary financial accessibility for the adoption of organic farming.

3. RESULTS AND DISCUSSION

3.1. Descriptive analysis

The respondents in this study consists of 31% organic farmers, 32% partial organic farmers and 37% inorganic farmers. HHHs are those who are responsible for making key decisions in the family matters. The age of HHHs range from 26 to 84 years old with an average being about 50 years. Some 7% of HHHs do not have any educational background or in others words are illiterate[4] and 30% of them identify themselves as having only a basic[5] education. Only 3% of them have master's level education. On average HHHs have received about 7 years of formal education. The majority (58%) of HHHs still recognize farming as their primary occupation which means that farming is still the major source of occupation. In this study, labor excludes the HH (household) member/s who have migrated whether temporarily or permanently and reflects only those who are available in the household. As a result, 2 HHs have only 1 LFU and the highest is 11 LFU, all of whom are doing partial organic farming. Likewise 13% of the HHs did not have any livestock. Cow, buffalo, goat and poultry are the major livestock species raised by the HHs. On the whole, each HH has 4.28 of LFU and 1.94 of LSU. With the minimum of 0.01 ha and maximum of 2.7 ha, farmers have 0.5 ha of farm land on average. Income from farming includes the monetary value equivalent to the production from farming of vegetables, oil crops, pulses, cereals, trees and livestock (both self-consumed and those traded in the market) as well as farming wages. In this study, about 21% of the HHs derives their income only from farming and the rest 79% have non-farm income as well from sources such as service, business, rent, remittance and pension. On average HHs have NRs.193988.5 and NRs. 202107.9 of farm and non-farm income, respectively. Some 47% of the respondents are group members and 44% of them have received organic farming-related training at least once. The highest number of training taken (12 times) is by an organic farmer. The distribution of respondents across VDCs is 50% in Phoolbari, 18% in Shivanagar and 32% in Mangalpur VDC. The average distance to nearest agriculture center, livestock center, agrovet and market is 3.74 km, 3.44 km, 1.73 km and 2.84 km, respectively. Only 10% of the respondents have taken credit for the purpose of farming. The average commercialization rate is 0.71 which is calculated as a ratio of total quantity of crops sold to total produced.

3.2. Result from multinomial logit model

The probability of the model chi-square (154.76) is highly significant at 1% which supports the existence of a relationship between explanatory and dependent variables. The Pseudo R^2 suggests that almost 25% of the total variation in the values of dependent variable is explained by the independent variables in this regression equation (Table 2).

Table 2: Result from multinomial logit model

Variables	Organic		Partial	
	Coefficient	P-value	Coefficient	P-value
AgeHHH	-0.06	0.005***	-0.05	0.004***
EduHHH	-0.02	0.571	-0.03	0.439
OccuHHH	0.34	0.498	-0.08	0.860
Labor	0.05	0.622	-0.001	0.990
Livestock	0.24	0.066*	0.09	0.452
Farm_size	-0.32	0.573	-0.42	0.388
ln_farm_income	-0.03	0.907	0.31	0.203
ln_non-farm_income	0.06	0.242	0.02	0.548
Membership	1.16	0.018**	0.96	0.033**
Training	0.79	0.000***	0.32	0.140

VDC_Shivanagar	-0.72	0.176	-1.17	0.021**
VDC_Mangalpur	-1.88	0.001***	-0.55	0.212
Agri_center	-0.09	0.334	0.07	0.418
Livestock_center	0.02	0.865	-0.12	0.307
Agrovet	-0.24	0.171	0.03	0.805
Mkt_distance	0.04	0.542	-0.01	0.837
Credit	-0.9	0.203	-1.38	0.045**
Commercialization	-0.59	0.076*	-0.57	0.051*
Constant	2.35	0.427	-0.67	0.806

*** 1%, ** 5% and * at 10% level of significance Number of observations = 285
LR chi2 (36) = 154.76 Prob > chi2 = 0.0000***
Log likelihood = -234.93514 Pseudo R2 = 0.2478

The directions of responses of most of the socioeconomic variables are as per the hypothesis. Some exceptions are farm income and credit. The results deviate from the findings by Khaledi *et al.* (2011) which showed positive relation of farmer's age with practicing organic farming. The findings suggest that age has a highly significant negative impact on practicing organic and partial organic farming. It could be because with age, one's capacity to supply labor diminishes which is very much required in the case of organic farming. As benefit from organic farming materializes only after few years of conversion, it could also be that older farmers are less willing to try new technologies because of their diminishing enthusiasm given that they will be retired soon in the near future, thus leaving less time to enjoy the benefit. From Table 3, which shows result from the calculation of marginal effect of variables on adoption of a farming system, it could be observed that a year increase in age will decrease the probability of organic farming by 0.62% but increase that of inorganic farming by 1.13%.

Table 3: Calculation of marginal effect of socioeconomic variables on adoption of a farming system

Variables	Organic		Partial		Inorganic	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
AgeHHH	-0.01	0.088*	-0.01	0.147	0.01	0.001***
EduHHH	-0.002	0.821	-0.004	0.577	0.01	0.442
OccuHHH	0.08	0.359	-0.06	0.510	-0.02	0.801
Labor	0.01	0.566	-0.01	0.742	-0.01	0.796
Livestock	0.04	0.061*	-0.01	0.767	-0.03	0.166
Farm_size	-0.02	0.859	-0.06	0.552	0.08	0.398
ln_farm_income	-0.04	0.377	0.08	0.119	-0.03	0.465
ln_non-farm_income	0.01	0.300	-0.001	0.914	-0.01	0.312
Membership	0.13	0.115	0.09	0.292	-0.22	0.012**
Training	0.13	0.000***	-0.02	0.619	-0.11	0.004***
VDC_Shivanagar	-0.04	0.703	-0.19	0.034**	0.22	0.036**
VDC_Mangalpur	-0.29	0.000***	0.06	0.536	0.24	0.013**
Agri_center	-0.03	0.097*	0.03	0.105	0.0002	0.989
livestock_center	0.02	0.423	-0.03	0.187	0.01	0.591
Agrovet	-0.05	0.117	0.03	0.188	0.02	0.407
Mkt_distance	0.01	0.411	-0.01	0.525	-0.002	0.837
Credit	-0.06	0.587	-0.21	0.046**	0.27	0.056*
Commercialization	-0.06	0.358	-0.07	0.283	0.12	0.029**

Note: *** at 1%, ** at 5% and * at 10% level of significance

With higher livestock holding (which are the fundamental components of organic farming), farmers would be encouraged to take up organic farming. A unit increase in LSU will increase the probability of adopting organic farming by 3.93%. Membership in a group formed for the purpose of organic farming also increases the prospect of adopting full or partial organic farming, significant

at 5%. Being a member of such group, farmers are provided with various learning platforms such as training, knowledge generation and information gathering as a result of an interaction with various stakeholders. These members meet on a monthly basis to update with their saving and loan activities. Besides, these group also meet on other occasions that are irregular in nature such as meeting with NGOs, organic certifying inspector or other outside parties; for study trips; and while selling organic products through a cooperative[6]. Membership decreases probability of practicing inorganic farming by almost 22% compared to non-member households. But membership does not alone effect farmers' decision to convert as not all farmers are practicing organic farming or engaged in related activities with the similar keenness. That is why training plays a major role in adoption of organic farming which is highly significant as well. Taking one more training will increase the probability of organic farming by 13% and decrease inorganic farming by 11%.Training is provided by academicians, non-governmental and government organizations. One of the regular trainings conducted is FFS. The group usually meet on a weekly basis for FFS where they learn-by-doing by assessing one crop at a time from as early as its plantation period till the time of harvest. Farmers usually divide groups to be in charge of growing a certain crop through various organic means such as using farm yard manure, bio-pesticides, mulching and so on. They discuss about the amount of inputs that are required, problems related to pests and diseases and its management and finally the amount harvested. Such learning process can take up to 16 weeks for each crop. Through such learning, farmers then try to replicate the most successful method in practice as well.

Compared to inorganic farming, there is less probability of practicing partial organic farming, significant at 5% in Shivanagar VDC and organic farming, significant at 1% in Mangalpur VDC. Farmers of Shivanagar VDC have almost 19% less and 22% more chance of practicing partial organic farming and inorganic farming, respectively, compared to farmers of Phoolbari VDC. Similarly, farmers in Mangalpur VDC has 29% less and 24% higher chance of practicing organic and inorganic farming, respectively, compared to farmers of other Phoolbari VDC. Thus, it can also be suggested that the number of years these groups have been into existence and how vibrant they are into learning through programs such as FFS also has positive impact on more farmers practicing organic farming or partial organic farming.

Access to credit actually decreases the adoption of partial organic farming, significant at 5%. Those who have taken credit for farming purpose will decrease the probability of adopting partial organic farming by 21% and increase inorganic farming by 27%, significant at 5% and 10%, respectively. This suggests that farmers have been using credit to have access to inputs used for inorganic farming. Higher the commercialization rate is, less will be the likelihood of practicing both organic and partial organic farming, significant at 10%. This means that market oriented farmers are less likely to practice organic farming or even partial organic farming. A unit increase in commercialization rate will increase the probability of practicing inorganic farming by 12%, significant at 5%.

4. CONCLUSION AND RECOMMENDATIONS

Even though the initial assumption was to survey equal number of organic farmers and inorganic farmers, large numbers of partial organic farmers are also identified due to which the subject of this study is divided into three categories. The study uses multinomial logit model to assess the factors influencing the decision of farmers adopting one of these farming systems and marginal effect to analyze to what extent these factors can impact their decision. From this study it can be recommended that while introducing organic farming, households with higher livestock holding should be taken into account. Most importantly establishment of a group for the purpose of organic farming and the training provided through it plays crucial role in knowledge generation and information dissemination among farmers. Being a member of this kind of group alone does not guarantee that all farmers will undeniably end up practicing organic farming but it certainly has

positive impact on more farmers following organic farming or at least partial organic farming. Additionally, the longer these groups exist with more learning programs such as Farmers' Field School, higher will be its impact which is also visible across three village development committees. Thus, forming such group could be an efficient tool to introduce organic farming on a larger scale.

End note

[1] Labor force unit (LFU) is the standard unit of labor force which takes people aged 14-59, irrespective of their sex, as 1 and those below 14 and above 59 as 0.5

[2] Livestock unit (LSU) is aggregate of different types of livestock kept at household in standard unit which is calculated as: 1 adult buffalo = 1 LSU, 1 immature buffalo = 0.5 LSU, 1 cow = 0.8 LSU, 1 calf = 0.4 LSU, 1 pig = 0.3 LSU, 1 sheep or goat = 0.2 LSU and 1 poultry = 0.1 LSU (CBS, 2003)

[3] NRs. stands for Nepalese Rupees, US$1 = NRs. 98.56 (Source: Nepal Rastra Bank, March 31, 2013)

[4] Illiterate: Cannot read or write at all

[5] Basic: Can do simple reading and writing

[6] Selling to other cities is only done through a cooperative in Phoolbari VDC and is only limited to cereal crops such as rice, wheat, buckwheat, paddy, beans and lentils. Vegetables, as of present, could not be exported due to its easily perishable nature and lack of other facilities to maintain its quality.

Acknowledgement

The authors would like to thank Strategic Center for Global Internship (G.ecbo) Program, Hiroshima University and the Fuji Xerox Setsutaro Kobayashi Memorial Fund for their generous financial support to undertake this study.

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Annex I: Groups formed for the purpose of organic farming in each VDCs

Features of group / VDCs	Phoolbari	Shivanagar	Mangalpur (a)	Mangalpur (b)	Mangalpur (c)
Group type	Cooperative	Informal	Informal	Informal	Informal
Established (year)	2005	2010	2010	2011	2011
Members:					
Male	42	9	1	1	4
Female	83	35	29	29	26
Total	125	44	30	30	30
Farmers Field School (times conducted)	13	6	2	1	1
Certified	Twice	Never	Never	Never	Never
Member saving and loan facility	Yes	Yes	Yes	Yes	Yes

Source: Field survey (2013, 2014)