Socioeconomic Analysis of Organic and Inorganic Farmers in Chitwan District of Nepal

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Abstract

Organic farming is an emerging concept in Nepal but its share to total agricultural area remains much smaller. The objective of this study is to assess socioeconomic factors to identify the underlying issues that led some farmers to adopt organic while some to practice only partial organic or inorganic farming system. 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 (VDCs) within the district; namely Phoolbari, Shivanagar and Mangalpur and thus were selected as study areas. The survey was conducted using purposive sampling method to select 300 individual households and were interviewed through semi-structured questionnaire. Other methods applied were researcher's observation and participatory methods. The collected data was analyzed using multinomial logit model. Results show that male headed households, age and education of household head, farming experience, and those with bigger farm size and having intention to increase farm income are more inclined towards inorganic farming. Farming as main occupation of household head, labor availability, livestock holding and non-farm income source encouraged farmers to shift to organic farming. Thus, these factors should be taken into consideration while introducing organic farming. 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 and has indirect impact on neighboring non-member farmers. 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, group membership, Chitwan district.

1. Introduction

Agriculture sector plays an important role in Nepalese economy with 34.9% of the total gross domestic product (GDP) being accounted for and providing employment for 73% of the 26.6 million people. Therefore, recognizing the magnitude of benefits it provide for the overall economy, the growth and development of this sector is very much prioritized by the Nepalese government (WTO, 2012). However, improving agriculture productivity through increased use of chemical inputs has been very much highlighted in this plan, with very limited reference to organic inputs (AICC, 2006). Developing this sector through modern inputs could be reflected in national education, research, extension and communication systems which are mainly inclined towards high input agriculture system in Nepal (Tamang et al., 2011). Such input-intensive farming system is known to degrade environmental services and stagnate or decline yield overtime due to intensive and mono-cropping pattern system (Samie et. al, 2010). The problems related to this kind of farming system is now emerging through declining soil fertility and yields in those areas of Nepal which have the history of long-term use of chemical fertilizers and pesticides (Bhatta & Doppler, 2010; Weiss, 2004). As a result, organic farming is an emerging concept which has been gaining recognition as a more sustainable form of production system. Organic farming is growing gradually in Nepal (Adhikari, 2011) and it is considered to be appropriate especially in Nepalese context for its exclusion of costly agro-chemicals, ecological diversities and high labor availability in agriculture sector (Pokharel & Pant, 2009).

According to the survey by International Federation of Organic Agriculture Movements (IFOAM) and Research Institute of Organic Agriculture (FiBL), the area under organic farming and market share has been increasing gradually throughout the world. Its area increased by 55% in 2011 (37.2 million ha) compared to 2004, one of the major reasons for which however is contributed to better access to information and data collection. But growing demand for organic products can also be reflected in its share in the global market which reached 62.9 billion US$ in 2011 compared to only 17.5 billion US$ in 2002. However, the share of organic farming in the global context still remains minimal. As of 2011, the total share of organic farming to overall agricultural land remains only 0.86%. Nepal shares much smaller rate than the global average which stands at 0.23% (FiBL & IFOAM, 2004; FiBl & IFOAM, 2006; FiBl & IFOAM, 2013). This suggests that organic farming does possess certain difficulties that holds farmers back from taking it on a large scale. Thus, it is necessary to identify such factors for better understanding the underlying issues which could contribute in policy implications or stimulate the necessary actions by various stakeholders leading to expansion of organic sector. The objective of this study is to assess socioeconomic factors that led some farmers to adopt organic while some to practice inorganic farming system. There has been a number of organic farming related studies conducted in our study areas. Adhikari (2009) and Adhikari (2011) finds that organic carrot and rice production system, respectively, results in higher benefit cost ratio. Study by Bhat and Ghimire (2008) has focused on controlling major diseases and enhancing yield of organic vegetables, implying the scope of using biopesticides. Another study by Organiconepal (2006) focuses on making successful marketing system of organic agriculture goods and the importance of farmers' cooperative. Only Kafle (2011a) and Kafle (2011b) has captured the issue of socioeconomic variables differing among adopters and non-adopters of organic farming in Phoolbari village development committee (VDC, lowest administrative unit in Nepal). Hence, this study will provide a ground for verifying previous findings and add to the limited number of literatures on this issue at particular place and time.

Various socioeconomic characteristics of farmers have been observed in numerous studies to examine its relation to the kind of farming practice they follow. In this regard, head of household (HHH)'s gender, age, education and their experience in farming are often discussed; the relation of which resulting in adoption of organic practice varied according to different studies. For instance, Adesope et al. (2011) found that farming experience is negatively correlated with adoption of organic farming practices which implies that those with less farming experience have higher adoption level. It is assumed that those who have been farming for a very long time are usually old, less educated and thus are more reluctant to change. Contrastingly another study show that organic farmers who are older and own 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, Koutsouris, & Tzouramani, 2010).

As for the education, Khaledi et al. (2011) had a different opinion. He suggested that farmers with higher education and younger age allocate lesser share of their cultivated area to organic practice and those with older age and more experience allocate higher share. He also suggested that increase in farm area will result in higher chances of not following complete adoption of organic practice. One of the reasons is labor factor and 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 economic reasons farmers are less likely to consider a switch to organic farming. Again contrastingly Kafle (2011a) and Kafle (2011b) found large farmers to be better adopters than small farmers, probably because they are comparatively resource-rich and thus opined to promote organic production first to the large and resource-rich 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 & Shivakoti, 2009). Similarly the issue of gender has also been mentioned by Kallas et al. (2009) by referring to young and highly educated women to be more likely to adopt organic farming.

Besides these other socioeconomic variables such as non-farm income and social network relating to the adoption of organic farming could also be observed in various literatures. It is usually believed that organic farming is riskier in terms of yield loss during initial years of conversion (Halberg et al., 2006) which suggests that farmers who are risk aversion might feel hesitant to convert if they have no other source of income as a safety net. Social network is also believed to be another important component. Such network will lead to participation in community activities which could provide some 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 & Shivakoti, 2009). Such activities could also in turn make farmers participate in trainings and can impact to what extent farmers adopt organic practice (Kafle 2011a; Kafle, 2011b).

2. Methodology

2.1 Study area and sample selection

This study was conducted in Chitwan district which lies in the southern part of Nepal. Geographically, Nepal is divided into three ecological zones in which southern part is basically a plain area, 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 a non-governmental organization (NGO), group conversion of organic farming is visible mainly in three VDCs, i.e. Phoolbari, Shivanagar and Mangalpur (Annex I). Farmers are provided training related to organic farming from general to more specific ones such as preparation of bio-fertilizers and pesticides, insect/pest management, 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 study sites.

The survey was conducted for two months from February till March 2013 using small-scale sample survey, researcher's observation and participatory methods such as focal group discussions and key-informant interviews. A sample of 300 individual households (initially to choose equal number of organic and inorganic farmers) were selected using purposive sampling method and 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 have been practicing organic completely.

Organic, in this study, implies a farming system in which use of agro-chemicals are 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 large area. Another reason why farmers are able to practice only partial organic is because for certain crops it was simply not possible, at least during the time of survey, to grow without the use of pesticide. For example, most farmers faced the problem of late blight disease in potato for which using pesticide was inevitable. Likewise in inorganic farming system, farmer would rely on chemical fertilizers and pesticides on various crops without separating the farm land per se or without having a strong reason of using such inputs as those given by farmers providing the example of late blight disease in potatoes. As a result, 47% of respondents interviewed from such group include 75% of total organic, 53% of partial organic and 17% of inorganic farmers (Table 1). Similarly, 53% of those interviewed from outside such group were selected randomly based on close proximity with those respondents belonging to a group. In total, half of the respondents were interviewed from Phoolbari, 17% from Shivanagar and remaining 32% from Mangalpur VDC; which was based on the number of group members in a particular area.

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 9. 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 dummy in nature (Hamilton, 2009; Wooldridge, 2002). Since during field survey, farmers converting to partial organic farming were also found in a significant number, the farming category is divided into three groups: organic, partial organic and inorganic. Therefore, MNL has been used to assess to what extent farmers adopting each of these farming system differ in terms of their socioeconomic characteristics.

Following Ayuya, Kenneth and Eric (2012), the MNL model with 'j' categories of dependent variables can be expressed as:

$$\mathbf{P}\,(\mathbf{y}=\mathbf{j}/\boldsymbol{x}\,)=\frac{\boldsymbol{exp}\,(\boldsymbol{x}\boldsymbol{\beta}_{\boldsymbol{j}})}{\left[1+\sum_{n=1}^{j}\exp(\boldsymbol{x}\boldsymbol{\beta}_{\boldsymbol{n}}),\ \boldsymbol{j}=\mathbf{1},\mathbf{2},\ldots\boldsymbol{j}\right]} \quad \cdots (1)$$

where, y is a random variable based on values j = 3 (namely organic, partially organic and inorganic farming system) and x is a set of conditioning variables. Let X be the first element unity with 1xK vector and β_j a K×1 vector with j = 1, 2. In our study, y is a farming practice and x is various socioeconomic characteristics of farmers. Since the response probabilities P(y = j/x) must sum to unity, it can be determined only when the probabilities for j = 1, 2, 3 are identified. 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, i.e., Pj/Pk should be irrelevant to the remaining possibilities. 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, Kenneth, & Eric, 2012). The marginal effect can be expressed as:

$$\frac{\partial \mathbf{P_j}}{\partial \mathbf{X_k}} = \mathbf{P_j}\,(\boldsymbol{\beta}_{\mathbf{jk}} - \sum_{\mathbf{j=1}}^{\mathbf{j-1}} \mathbf{P_j}\,\boldsymbol{\beta}_{\mathbf{jk}}) \quad \cdots (2)$$

where, k represents 13 explanatory variables (Table 1) used for the empirical analysis. The empirical specification is as follows:

$$Y_{j=3} = \beta_0 + \beta_1 genHHH + \beta_2 ageHHH + \beta_3 eduHHH + \beta_4 occuHHH + \beta_5 exp + \beta_6 labor + \beta_7 livestock + \beta_8 farm_{size} + \beta_9 ln\_farm_{income} + \beta_{10} non - farm\_income + \beta_{11} membership + \beta_{12} training + \beta_{13} VDC + \mu \quad \cdots (3)$$

where, ln is 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 1.33, which is below 10 suggesting that multicollinearity among the variables does not exist. Likewise, Breusch-Pagan/Cook-Weisberg test did not show higher chi-square (0.04) thus implying that there is no problem of heteroskedasticity, i.e., the variance of the error term is constant. Table 2 provides the summary of explanatory variables used in the analysis along with their measurement unit and hypothesized relation to organic farming system. Among the 13 variables considered, gender and primary occupation of HHH, group membership and VDC are taken as dummy variables; age and education of HHH and training have discrete values; and the rest are continuous. Similarly, based on the literatures reviewed, only gender of HHH and farm size are expected to have negative relation to the adoption of organic farming practice. Based on field observation, group formation in Phoolbari VDC is the oldest and has conducted more trainings compared to other two VDCs. Thus, Phoolbari VDC is expected to have more organic and partial organic farmers compared to other two VDCs.

3. Results and discussion

3.1 Descriptive analysis

Table 1 and 2 are the descriptive analysis of socioeconomic variables of the respondents.

Table 1. Explanatory socioeconomic variables related to farmers of different farming categories

Variables	Farming system				
	Organic	Partial	Inorganic	Total	P-value
Gender of HHH					
Male	79 (89.77)	92 (92)	105 (93.75)	276 (92)	0.589
Female	9 (10.23)	8 (8)	7 (6.25)	24 (8)	
Age of HHH					
Below 50 years	42 (47.73)	59 (59)	47 (41.96)	148 (49.33)	0.044**
50 years & more	46 (52.27)	41 (41)	65 (58.04)	152 (50.67)	
Education of HHH					
Illiterate[1]	3 (4.17)	12 (13.19)	6 (6.67)	21 (8.30)	0.380
Basics[2]	26 (36.11)	26 (28.57)	38 (42.22)	90 (35.57)	
Secondary and below[3]	20 (27.78)	30 (32.97)	25 (27.78)	75 (29.64)	
Higher Secondary[4]	10 (13.89)	12 (13.19)	11 (12.22)	33 (13.04)	
Bachelors	9 (12.50)	9 (9.89)	9 (10.00)	27 (10.67)	
Masters	4 (5.56)	2 (2.20)	1 (1.11)	7 (2.77)	
Primary occupation of HHH					
Farming	50 (56.82)	53 (53)	72 (64.29)	175 (58.33)	0.236
Others	38 (43.18)	47 (47)	40 (35.71)	125 (41.67)	
Farming experience					
Less than 30 years	31 (35.23)	45 (45)	30 (26.79)	106 (35.33)	0.022**
30 years and more	57 (64.77)	55 (55)	82 (73.21)	194 (73.21)	
Labor force unit (LFU[5])					
5 and less	67 (70.53)	69 (73.40)	83 (74.77)	219 (73)	0.787
More than 5	28 (29.47)	25 (26.60)	28 (25.23)	81 (27)	
Livestock unit (LSU[6])					
None	6 (6.32)	14 (14.89)	17 (15.32)	37 (12.33)	0.292
1 and less	18 (18.95)	18 (19.15)	22 (19.82)	58 (19.33)	
More than 1	71 (74.74)	62 (65.96)	72 (64.86)	205 (68.33)	
Farm size					
1 ha and less	83 (87.37)	83 (88.30)	94 (84.68)	260 (86.67)	0.728
More than 1 ha	12 (12.63)	11 (11.70)	17 (15.32)	40 (13.33)	
Farm income					
NRs.[7] 100000 and less	26 (27.37)	33 (35.11)	39 (35.14)	98 (32.67)	0.412
More than NRs. 100000	69 (72.63)	61 (64.89)	72 (64.86)	202 (67.33)	
Income source					
Farming only	20 (21.05)	14 (14.89)	27 (24.32)	61 (20.33)	0.242
Farming + Non-farming sources	75 (78.95)	80 (85.11)	84 (75.68)	239 (79.67)	
Group membership					
Yes	71 (74.74)	50 (53.19)	19 (17.12)	140 (46.67)	0.000***
No	24 (25.26)	44 (46.81)	92 (82.88)	160 (53.33)	
Training					
Yes	72 (75.79)	42 (44.68)	14 (12.61)	128 (42.67)	0.000***
No	23 (24.21)	52 (55.32)	97 (87.39)	172 (57.33)	
VDC					
Phoolbari	64 (67.37)	46 (48.94)	41 (36.94)	151 (50.33)	0.000***
Shivanagar	15 (15.79)	10 (10.64)	27 (24.32)	52 (17.33)	
Mangalpur	16 (16.84)	38 (40.43)	43 (38.74)	97 (32.33)	

Source: Field survey (2013)

Note: Figure in parenthesis indicate percentage; *** 1% and ** at 5% level of significance

It is found that only 8% of the households are female-headed which is comprehensible as Nepalese society is mainly patriarchal-based. 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 average being about 50 years. Some 8% of HHHs do not have any educational background or in others words are illiterate and 36% of them identify themselves as having only a basic 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. When asked how long have they been into the currently practiced farming system, both the new entrant (1 year) and the longest experienced farmer (55 years) are found to be organic farmers. On average farmers are following the existing form of farming for 14 years.

Table 2. Measurement and summary of explanatory variables and their hypothesized relation to practicing organic farming

Explanatory variables	Definition and Measurement	Mean± Standard deviation	Expected sign
genHHH	Gender of HHH; 1=male, 0 otherwise (dummy)	0.92±0.27	–ve
ageHHH	Age of HHH; Years (discrete)	49.89±11.67	+ve
eduHHH	Education of HHH; Years (discrete)	6.74±5.46	+ve
occuHHH	Primary occupation of HHH; 1=farming, 0 otherwise (dummy)	0.58±0.49	+ve
exp	Farming experience; Years (continuous)	14.42±13.02	+ve
labor	Labor force available in HH; Labor force unit (LFU) (continuous)	4.35±1.94	+ve
livestock	Livestock available in HH; Livestock unit (LSU) (continuous)	2.87±10.57	+ve
farm_size	Operational farm size; hectare (ha) (continuous)	0.53±0.45	–ve
ln_farm_income	Income from farming activities; Nepalese Rupees (NRs.) (continuous)	217442.2±250491.7	+ve
ln_non-farm_ income	Income from non-farm sources; Nepalese Rupees (NRs.) (continuous)	216875.9±240314.9	+ve
membership	Membership in a group formed for the purpose of organic farming; 1=yes, 0 otherwise (dummy)	0.47±0.5	+ve
training	Organic farming related trainings received; number of times (discrete)	1.33±3.45	+ve
VDC	Belonging to VDC; 1=Phoolbari, 0 otherwise (dummy)	0.50±0.5	+ve

Source: Own elaboration based on literature review

In this study, labor force unit (LFU) excludes the HH (household) member/s that have migrated whether temporarily or permanently and reflects only those who are available in the HH. As a result, 2 HHs have only 1 LFU and the highest is 11.5, all of who are doing partial organic. Likewise 12% of the HHs did not have any livestock and the highest one with 171.5 mainly rely on livestock farming. On the whole, each HH has 4.35 of LFU and 2.87 of LSU. With the minimum of 0.01 ha and maximum of 3.38 ha, farmers have 0.53 hectare (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 20% of the HHs derive their income only from farming and the rest 80% have non-farm income as well from sources such as service, business, rent, remittance and pension. On average HHs have NRs.217,442.2 and NRs. 216,875.9 of farm and non-farm income, respectively. Group membership, organic farming-related training and VDC-wise comparison have a significantly different relation across the three farming systems. Some 47% of the respondents are group members and 43% of them have received organic farming-related training. The highest number of training taken (60 times) is by an organic farmer. Similarly, Phoolbari VDC has 67% and 49% of organic and partial organic farmers, respectively, which is fairly higher than in other two VDCs.

3.2 Result from multinomial logit model

The probability of the model chi-square (147.22) is highly significant at 1% which supports the existence of a relationship between explanatory and dependent variables. The Pseudo R^2 suggests that 22% of the total variation in the values of dependent variables is explained by the independent variables in this regression equation (Table 3).

Table 3. Result from multinomial logit model

Variables	Organic		Partial	
	Coefficient	P-value	Coefficient	P-value
Gender of HHH	–0.63	0.388	–0.47	0.483
Age of HHH	–0.02	0.238	–0.01	0.386
Education of HHH	–0.01	0.857	–0.02	0.591
Primary occupation of HHH	0.04	0.932	–0.27	0.492
Farming experience	–0.05	0.004***	–0.04	0.004***
Labor	0.12	0.217	0.07	0.414
Livestock	0.03	0.229	0.03	0.211
Farm size	–0.38	0.424	–0.52	0.208
Farm income	–0.11	0.632	0.14	0.478
Non-farm income	0.05	0.229	0.04	0.326
Group membership	0.89	0.067*	0.95	0.03**
Training	0.66	0.001***	0.21	0.298
VDC	1.35	0.001***	0.7	0.04**
Constant	0.85	0.755	–0.91	0.71

*** 1%, ** 5% and * at 10% level of significance
Number of observations = 300
LR chi2 (26) = 147.22 Prob > chi2 = 0.0000
Log likelihood = -255.07832 Pseudo R2 = 0.2240

The direction of response of most of the socioeconomic variables are as per the hypothesis. Some exceptions are age and education of HHH and farming experience of both organic and partial organic farmers. The farm income in case of only organic farmers and primary occupation of HHH in case of only partial organic farmers also gave contrary outcomes. The results deviate from the findings by Khaledi et al. (2011) which showed positive relation between age and experience with practicing organic farming. The findings suggest age has a negative impact on practicing organic or partial organic farming which could be because with age one's capacity to supply labor diminishes which is very much required in case of organic farming. Also, with higher farming experience farmers are less likely to adopt organic or partial organic practice compared to inorganic farming, both of which have 1% level of significance. This partly complies with Adesope et al. (2011) which suggested that those farming for a long time are more reluctant to change because of their age and less education. Contrastingly this study shows education has negative but insignificant influence on the adoption decision. Farming, being the primary occupation of HHH, has negative impact on possibility of adopting partial organic which is difficult to justify as it also shows positive impact on organic farming adoption. It could be said that when farming is the main occupation, farmers would care more for its sustainability and thus would prefer organic farming. As expected male-headed households and farm size both have negative impact on adoption of organic farming. This implies that males, for reasons of producing more and being competitive, would prefer to venture on new technologies by adopting modern inputs of farming. As organic is labor-intensive, it is evident that those with large farm size would prefer practicing inorganic instead. It is also understandable that with more supply of labor and livestock holding (which are the fundamental components of organic farming), farmers would be encouraged to take up organic or partial organic farming as is indicated by this study as well.

In this study, farm income also show lesser chance of adopting organic practice. It could be because in order to increase income from farm, farmers choose inorganic system which is known for producing more than organic system. Khaledi et al. (2011) advised that since economies of scale can be achieved more effectively in larger conventional farms than smaller ones, farmers will choose inorganic farming over organic for economic reasons. On the other hand, those with higher non-farm income has a higher probability of choosing organic farming with respect to inorganic. Non-farm income could have acted as a financial security for organic farmers, if they are to face yield loss during the conversion period.

Membership in a group formed for the purpose of organic farming also increases the prospect of adopting full or partial organic, significant at 10% and 5% level, respectively. 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 that 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. Further, they also meet separately 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 produces through a cooperative[8].

Receiving organic farming related training which is mainly provided through such groups has a highly significant relation at 1% on adoption of organic practice. Thus, it could be said that such groups formed for the purpose of organic farming and the training provided through them have positive impact on changing farmers' behavior in adoption of organic or at least partial organic farming system. Even though after almost 8 years, 3 years and 2-3 years of the establishment of such group in Phoolbari, Shivanagar and Mangalpur VDC, respectively (Annex I), not all farmers could practice organic fully but it did increase the number of farmers practicing it, whether fully or partially. It can be observed in Table 1 that number of organic and partial organic farmers belonging to a group are higher which stands at 75% and 53% compared to non-group members at 25% and 47%, respectively. Similarly, inorganic farmers are less within a group (17%) compared to non-members (83%). Those 25%, who despite having no such association with the group, are also practicing fully organic because they are still continuing with traditional farming (as were the reasons given by some member farmers also) or are influenced by nearby organic farmers. Thus, it can be indicated that to some extent individual decision on practicing organic farming is also influenced by the outlook of their neighborhood. Overall, it shows that farmer's interest in organic farming can be stimulated in affirmative manner through the formation of such group and the trainings provided through it. Table 3 further shows that Phoolbari VDC has higher probability of having organic and partial organic farmers, significant at 1% and 5%, respectively. 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 or partial organic farming.

3.3 Result from calculation of marginal effect of socioeconomic variables on adoption of a farming system

Table 4 shows result from the calculation of marginal effect of socioeconomic variables on adoption of a farming system. Male headed households have 8% and 3% less, and 10% more probability of choosing organic, partial and inorganic farming, respectively. With one more year increase in age, farmer's chances of adopting organic farming reduces by 0.3% and partial organic by 0.1% but increases by 0.4% for inorganic farming. Additional year of education received will increase the prospect of adopting both organic and inorganic practice by 0.1% and 0.3%, respectively, but reduces by 0.4% for partial converters.

Farming as a primary occupation of HHH will increase the chance of practicing organic by 4% and inorganic by 3%, but decreases by 7% for partial converters. One more year of farming experience means 1% less possibility of converting to organic and 1% high possibility of choosing inorganic farming, which are significant at 10% and 1%, respectively. It also means abandoning partial organic by 0.4%. Added unit of LFU will increase possibility of choosing organic and partial organic farming by 2% and 0.2%, respectively. One unit of LSU increases prospect of both organic and partial organic by 0.3%. Additional unit of LFU and LSU provides the possibility of discarding inorganic by 2% and 1%, respectively.

Increase in a hectare of farm land has negative impact on adopting organic by 2%, partial organic by 8%, but positive impact on inorganic system by 10%. Farm income decreases adoption rate of organic by 4% and inorganic by 0.6%. Somehow it will increase adaptation rate of partial organic by 5%. One more unit of increase in non-farm income means higher chances of doing organic and partial organic farming and lower chances of doing inorganic farming, by 1%, 0.2% and 0.9%, respectively. In the same way, group membership decrease the probability of choosing inorganic by 19% and training by 9%, both of which are significant at 5%. On the contrary, membership and training increase chances of practicing organic by 8% and 12%, respectively, with training being significant at 1%. The membership increases rate of partial organic by 11% but surprisingly training has negative consequence by 3%, but without any significance.

Farmers belonging to Phoolbari VDC increases the probability of practicing organic by 20% and decreases inorganic practice by 21%, both being highly significant at 1%. In addition, there is 0.4% of likely conversion to partial organic farming as well compared to other two VDCs. This again shows that a cooperative in Phoolbari VDC, having an advantage of earlier establishment accompanied by dynamic group activities, has successfully induced more farmers to take up partial or full organic, compared to other two VDCs.

Table 4. 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
Gender of HHH	–0.08	0.56	–0.03	0.843	0.1	0.33
Age of HHH	–0.003	0.372	–0.001	0.837	0.004	0.244
Education of HHH	0.001	0.916	–0.004	0.599	0.003	0.679
Primary occupation of HHH	0.04	0.61	–0.07	0.382	0.03	0.716
Farming experience	–0.01	0.072*	–0.004	0.265	0.01	0.001***
LFU	0.02	0.319	0.002	0.9	–0.02	0.248
LSU	0.003	0.394	0.003	0.391	–0.01	0.193
Farm size	–0.02	0.836	–0.08	0.391	0.1	0.221
Farm income	–0.04	0.327	0.05	0.244	–0.006	0.878
Non-farm income	0.01	0.398	0.002	0.776	–0.009	0.206
Group membership	0.08	0.366	0.11	0.165	–0.19	0.025**
Training	0.12	0.000***	–0.03	0.278	–0.09	0.014**
VDC	0.2	0.002***	0.004	0.958	–0.21	0.002***

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

4. Conclusion and recommendations

Even though the initial assumption was to survey equal number of organic and inorganic farmers, large number of partial organic farmers are also identified due to which the subject of this study is divided into 3 categories: organic, partial organic and inorganic farmers. The study uses multinomial logit model to assess the socioeconomic 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. Study shows that male headed households and age of household head has positive impact on choosing inorganic farming. It may be because of their need to produce competitively more and being unable to supply more labor which further intensifies with the age. Education of household head impacts negatively in choosing organic farming, but is insignificant. Similarly, farming being primary occupation of household head also leads to adopting organic farming, suggesting that farmers would care more about sustainable farming when it is their foremost occupation. The study also reveals that farming experience and farm size have less chance of choosing organic or partial organic farming. Experience could be related to old aged farmers who are more reluctant for a change. Organic farming requires more labor and thus farmers having bigger farm size would prefer less to do organic farming. Farm income has lower rate of organic farming adoption. It is considered that to produce more in order to increase farm income, farmers would prefer inorganic farming in which economies of scale could be achieved well than in organic farming.

Labor supply and livestock holding have a positive impact on organic and partial organic farming adoption as these are important components for this system. Non-farm income source could act as safety net at least during initial years of conversion when production is known to be less and thus it has positive relation to adopting organic and partial organic farming. Group formed for the purpose of organic farming does not ensure that all of its members will convert to organic farming but it definitely has changed farmers' behavior to some extent as can be observed from the higher number of organic and partial organic farmers and lower number of inorganic farmers from within the group compared to non-group members. Likewise, how long such group has been into existence and how vibrant it is in educating the farmers through trainings and meetings also matter for increasing the number of organic or partial organic farmers. Moreover, the marginal effect is higher in case of group membership and training for reducing inorganic and increasing organic practice, all of which are significant. Thus, these two factors play a major in increasing the rate of organic practice.

Thus, from this study it can be recommended that while introducing organic farming, certain socioeconomic characteristics of the target farmers should be taken into account such as smallholder and young farmers with abundant labor supply and livestock holding. Farming as a primary occupation of household head also increases probability of practicing organic. Farmers competing to produce more to increase farm income tends to practice inorganic which is why it is better to target those households which has non-farm income source as well, as is verified by this study. Most importantly establishment of a group for the purpose of organic farming and the training provided through it plays crucial role in encouraging more farmers to take up organic farming. Being a member of this kind of group alone does not guarantee that all farmers will undeniably end up practicing organic but it certainly has positive impact on more farmers following organic or at least partial organic farming. Additionally, the longer these groups exist with more learning programs such as FFS, higher will be its impact. Moreover, it can also have indirect impact on neighboring farmers. Thus, forming such group could be an efficient tool to introduce organic farming on a larger scale.

Endnotes

[1] Illiterate: Cannot read or write at all

[2] Basic: Can do simple reading and writing

[3] Secondary and below: Attained formal education of 10th grade and below

[4] Higher Secondary: Attained formal education of 11th and 12th grade

[5] 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

[6] 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)

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

[8] 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.

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Appendix 1. Information on formal/informal groups formed for the purpose of organic farming

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)