

Farmers' perception on transitioning to organic agriculture (OA) in Tsirang district, Bhutan

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Abstract

Organic agriculture (OA) has its roots in traditional agricultural practices. By trial and error, local farmers passed their best results from generation to generation. In Bhutan, given the importance and the country's commitment to convert fully to organic, it is imperative to investigate how farmers feel on this matter as they are the principal implementers of the plan on the ground. Accordingly, this study was conducted to (i) identify the drivers and deterrents of transitioning to OA and (ii) assess farmers' perception on transitioning to OA in Tsirang Dzongkhag. A total of 326 farmers were randomly selected from five Gewogs and interviewed using semi-structured questionnaires. Results of binary regression indicated that farmers who were aware of OA and its benefits were more likely to convert organic ($p \leq .001$). Farmers who received training were more likely to go organic compared to those who did not receive any training ($p \leq .001$). Non organic farmers were still reluctant to convert organic ($p \leq .001$). An independent sample *t*-test indicated that young farmers were more likely to convert to organic compared to older farmers ($p \leq .05$). Mann-Whitney *U* test suggested that large households had positive influence on farmers' perception to convert to organic ($p \leq .05$). The main drivers influencing OA were (i) traditional method of farming, (ii) health benefits of OA, (iii) environmental benefits and (iv) low cost of production with (46.9%), (41.4%), (18.5%) and (14.2%) respectively. Farmers also identified some major challenges such as (i) labor shortage (90.9%), (ii) labor intensity (43.2%), (iii) low yield (36.4%) and (iv) pest and diseases (36.4%). Majority (53.40%) of respondents were not in favor of Bhutan converting to 100% organic just yet. The study shows that most (64.8%) of the respondents following organic practices supported going organic while only 90.8% of non-organic respondents were not in favor of the idea.

Keywords: Deterrents, drivers, organic agriculture, perception, transition, Tsirang.

Introduction

Conventional agriculture (CA) has been dominant in previous decades and contributed to increased agricultural productivity and improved farmers' living standards¹. Though CA provides maximum yield in most cases, concerns about environment, economic and societal impacts of CA have led many farmers to pursue alternative practices that can make food production more sustainable².

Organic agriculture (OA) is one widely used method that is thought of as a viable alternative to avoid the ill effects of synthetic agro-chemical use³. Low external inputs with sustainable strategies have emerged as viable alternative and OA appears to be more successful in marginal areas where agro-chemicals have not been extensively used such as in Bhutan⁴.

OA was launched in Bhutan in 2003. The philosophies of Bhutan's development concept based on Gross National Happiness (GNH) and the principles of OA share common concepts.

With the whole world into the organic movement, Bhutan in 2010 also announced to the world, at Rio+20 summit that it will

become a 100% organic nation by 2020⁵. As of today Bhutan has around 56,118 acres under organic management⁶. Gasa in the and Samdrup Jongkhar in the south were declared as organic districts in 2004 and 2012 respectively.

However, given the acute labor shortage and the potential of SAC's in yield elevation, farmers may be tempted to pursue CA or continue CA, if already into it. The biggest barrier most farmers face when switching to organic production is the change in their mindset. Farmers adopting OA are deterred, by challenges such as shortage of labor, pest and diseases, limited land holding and often lower yield^{7,8}.

On the contrary promoters of OA argue it to be better in all aspects or at par to CA⁹. As Bhutan has not been affected much by agro-chemicals due to the age old traditional farming practices which have been dominant, transitioning to OA will not be a problem¹⁰.

Therefore, transiting to a fully organic country will largely depend on farmers and their perception/choice. We are yet to know the basis of their choice or preference of what factors would encourage farmers to embrace OA or conversely discourage them.

Given the importance of OA in Bhutan, and the governments serious commitment on transitioning to 100% organic, it is also necessary to investigate the factors that would either encourage or deter farmers from adopting OA. The core objectives of this study are to assess farmer’s perception on transitioning to OA and identify the drivers and deterrents in adopting Organic Agriculture in Tsirang district.

Methodology

Study area: The study was conducted in Tsirang Dzongkhag with assistance from the concerned agriculture extension agents.

Data collection and sample size: From 12 gewogs in Tsirang Dzongkhag, five were selected randomly. Stratified random sampling was used to select households (hh) for the study from respective gewogs. Non-farming households were excluded from all gewogs. The size of sample was determined by using Yamane’s formula with 95% confidence interval. Data collection was carried out using semi-structured questionnaires. There were 326 sample households from a total of 1,727 households¹¹.

Data analysis: The data was analyzed using International Business Machines Corporation-Statistical Package for the Social Sciences (IBM-SPSS), v.23.0. Data were checked for normality and homogeneity prior to analysis. Mostly the data were analyzed using descriptive statistics. Variable scales were measured using Likert’s scale score varying from 1 to 5. Independent sample t-test and Mann Whitney U test were used to analyze farmers age and farm labor size with two groups of respondents - those who were in favor and those who were not on Bhutan shifting to fully organic. A binary logistic regression was used to find farmers perception on transition to organic agriculture with awareness, training received, method of farming and gender.

Results and discussion

Respondents profile: A total of 326 households were selected for the survey intended for this study. The results show that 67.1% of the respondents were males and the remainder females, indicating that the respondent selection is mixed, but in favor of males by more than one fold. It shows that majority of the respondents who are actively engaged in agricultural activities were males. The majority of respondents (47.5%) were uneducated while less than 1% of the respondents had university degree. A total of 248 (76%) respondents practiced OA while 78 respondents practiced CA.

Respondents age: The minimum age of respondent was 18 years old while the maximum age was 89 years old. From grouping of respondents according to their age groups, majority of them (47%) fell in 41-60 years’ group indicating decline in youths taking up farming (Table-1). Bhutanese farming comprises relatively less mechanized farming, so youth are

considered as the backbone of OA farming but it is observed that more and more youth are migrating to urban areas¹². In age group 41-60 years, it was observed that out of 154 respondents, 77% of them were more than 50 years old indicating aging labor force (M = 49.5).

Table-1: Respondents’ age profile.

Age	No of respondent	Percentage (%)	
		Male	Female
Below 12	0	0	0
13-18	3	0	1
19-40	124	26	12
41-60	154	31	17
Above 61	45	10	3
Total	326	67	33

Crop Information: Yield comparison: The study found that there was a considerable yield gap but constricted to important cash crops such as paddy, potato and chili while other crops such as mustard, broccoli, cauliflower and cardamom had negligible yield gap between organic and non-organic farmers (Figure-1).

In this study non-organic farmers were found to have 8.45% higher yield in paddy compared to organic farmers, with 21.98% and 21.49% higher in potato and chili respectively.

Crop Management: Usage of Synthetic agro-Chemicals: About 23.93% respondents reported that they use synthetic agro-chemicals (SACs). About 44% of the respondents have seen negative impacts related to use of synthetic chemical fertilizers (SCFs) whether they use it or not. From the study it was found that 22.10% of respondents use fertilizer (urea) for soil nutrient management. Urea was used at the rate of 38kg/ac mainly for paddy cultivation (Table-2). Only 5.3% of respondents used herbicides (butachlor) for weed management. Herbicide particularly Butachlor was used mainly in paddy at an average rate of 10 kg/ac.

Table-2: Usage of SACs.

Variables	Yes (%)	No (%)	Mean value of SACs used.	
			Urea (Kg/ac)	Butachlor (Kg/ac)
Do you use synthetic Chemical fertilizers	22.1	77.9	38	10
Do you use SCP/H?	5.3	94.7		

SCP/H= Synthetic chemical pesticides / Herbicides, SACs = Synthetic Agro Chemicals.

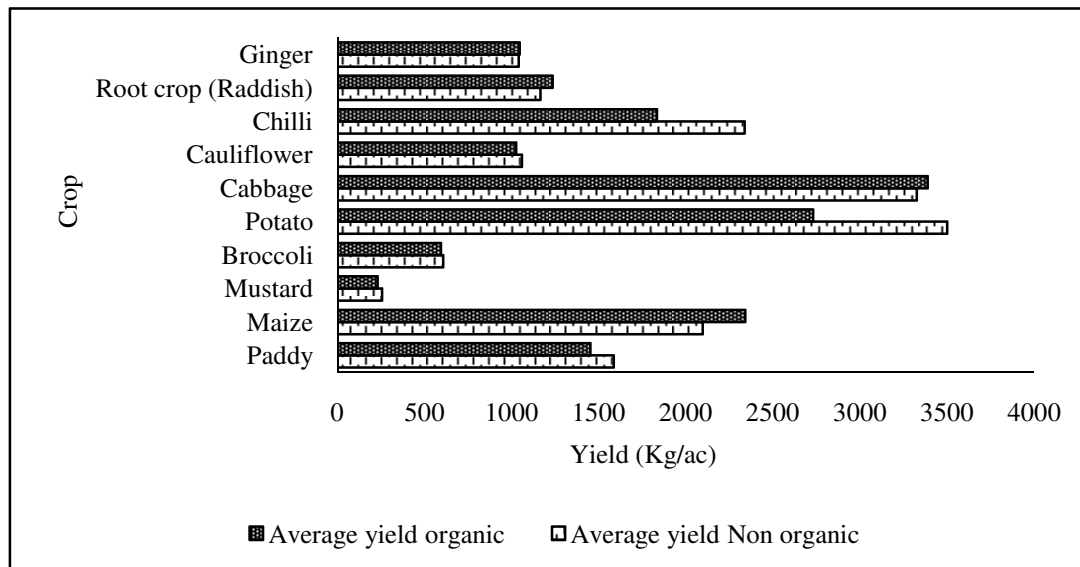


Figure 1: Yield comparison.

Usage of Organic Manure: The study found that organic manures were obtained through integrated system of farming to maintain soil fertility and health. Organic manures were applied at an average rate of 911.20kg/ac for paddy, 835.16kg/ac and 693.61kg/ac for maize and vegetables respectively. This is comparatively low compared to recommended 4-5ton/ac. This could be due to limited source of organic manure as most farmers do not have livestock integrated in their farming systems.

For soil nutrient management, 34.40% of respondents used cow dung, 24.50% cow dung with poultry (CDP) and 18% used cow dung and leaf litter (CDL). Cow dung was found to be the main source of organic nutrient management in respondents’ farms.

No other sources of nutrient management such as vermi-compost or compost were used by farmers’ which was related to having no knowledge of the process to make such organic fertilizers.

Awareness on Organic Agriculture: 7.67% of the respondents attended training on OA compared to 92.33% who did not (Figure-2). Majority of respondents (58.90%) were not aware of OA, while only 41.10% responded “yes” to the knowledge and understanding of OA (Figure-3). Despite frequent awareness and trainings given by extension agents in Tsirang, majority of the farmers are still unaware of OA, which could be due to the remoteness of their dwellings from the gewog center.

Understanding of OA: Majority of farmers (47.5%) understand OA by defining it as traditional method of farming followed by 27% and 25.5% defining it as having more pest and diseases and organic production to be healthy respectively. Only 2.8% of the respondents defined OA as a sustainable method of farming (Figure-4).

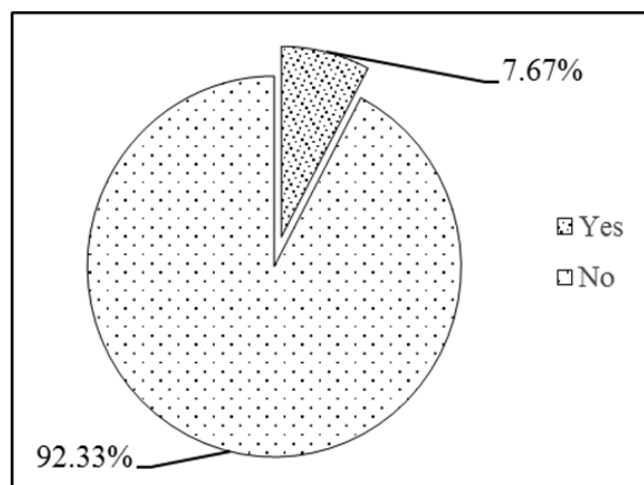


Figure-2: Training on OA.

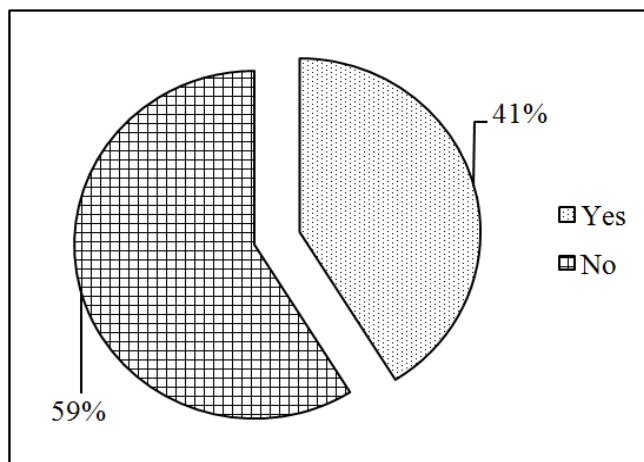


Figure3: Awareness on OA(n=326).

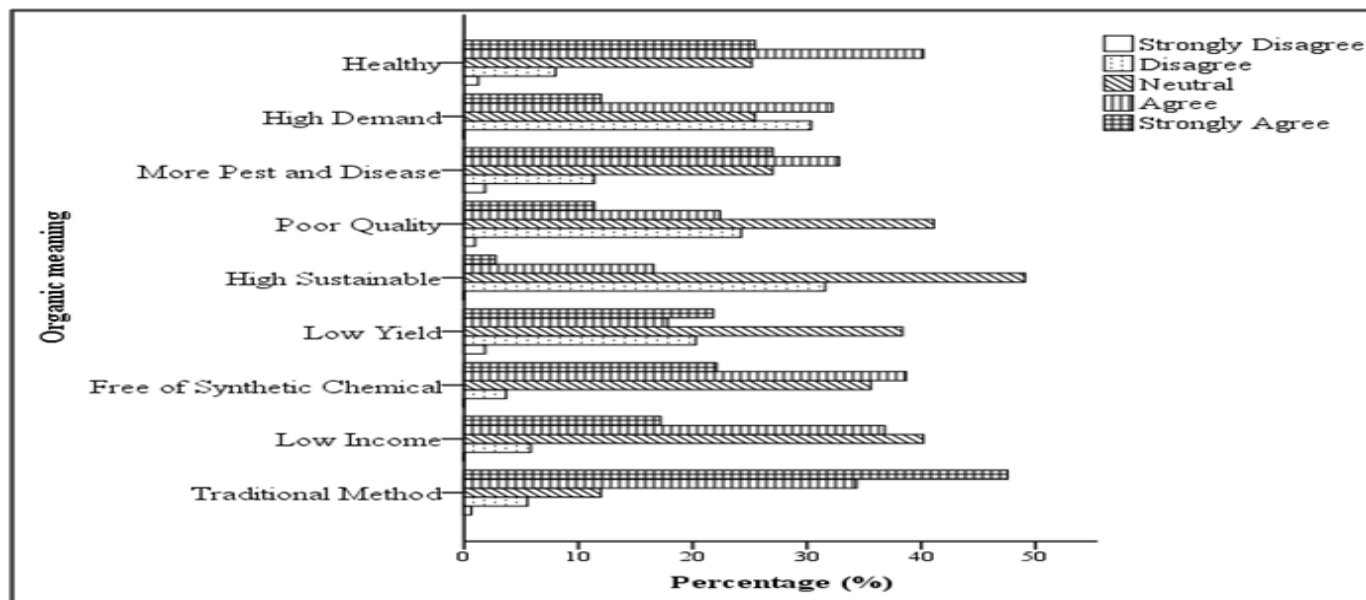


Figure-4: Respondents' understanding of OA.

The results show that respondents' concept of OA is restricted more towards their age old traditional method of farming which has similar practices to OA of having an integrated system using locally available resources free of SACs. Their concept of OA is close to definition given by the NOP that OA is an approach to agriculture where the aim is to create integrated, humane, environmentally and economically sustainable agricultural production systems, which maximizes reliance on-farm derived resources¹³.

The respondents' idea of OA is also influenced by the deterrents of OA such as high occurrences of pests and diseases which they relate it to having low yield and poor quality reducing the demand and income of farmers. Their idea of OA takes least consideration on the sustainability provided by practicing organic farming. This could be due to low awareness among farmers on the actual concept of OA.

Drivers of Organic Agriculture: Table-3 shows the major factors that encourage respondents to continue or adopt OA. Majority of the respondents (46.9%) felt that they want to continue or are encouraged to adopt OA because OA resembles traditional way of farming. Similarly, 41.4% of respondents were in favor of health awareness being a major driver, followed by environmental benefits (18.5%) of OA. Only 0.6% of the respondents related experiencing illness due to use of SACs. Even strong policies from the government was rated as a low driver in taking up OA.

Bhutan is bestowed with its age old method of agriculture production which by default share the same principles of an organic production¹⁴. Bhutanese farmers heavily depend on traditional knowledge that advocates the use of organic materials such as cattle manure, leaf litter, poultry manure and

crop residues as organic fertilizers¹⁵. Their indigenous knowledge on farming is compatible to organic farming methods which can be a huge driving factor that ultimately lead to farmers accepting and promoting the idea of OA.

Among majority of rural and poor farmers who make their living through agriculture, one of the main causes of health issue is due to exposure to SACs. Comparative analysis of nutritional value of the two systems reveal considerable difference in favor of organic¹⁶. On average organic foods are said to contain 10-60% more healthy fatty acids, 5-90% higher vitamin C content and 10-50% more secondary metabolites with higher mineral content and dry matter¹⁷.

Farmers were aware of some environmental benefits of OA such as utilization of local renewable resources, improved soil fertility and low water pollution. The continuous use of large quantities of synthetic nitrogen, potassium and phosphorus fertilizers to elevate yield in CA leave toxic residues, which penetrates into groundwater, as well as flows, into water bodies leading to eutrophication, anoxia and consequently to the gradual decrease in biodiversity¹⁸. As the current global movement is in-line with clean environment and natural products, Bhutan could easily become a pioneer in organic farming¹⁹.

Deterrents to adopt OA: Organic farmers: Table-4 shows the factors that deterred farmers from continuing or adopting OA. Majority of respondents felt that labor shortage (90.9%) was the most deterring factor followed by labor intensity (43.2%), low yield and pest and diseases (36.4%). This could be because respondents' had a mean of 3 members living in their household and working in the farm resulting in labor shortage.

Labor shortage has become an important issue, particularly because OA is labor intensive⁸. Organic farming was found to be labor-intensive which requires additional labor ranging from 7% to a high of 75% based on requirements during each intercultural operations²⁰.

Only 3.4% of respondents felt that poor soil fertility in organic farms to be a deterring factor in taking up OA. This could be due to the nature of organic farming which includes sustainability through nutrient recycling compared to CA which includes mono cropping depriving the soil of organic matter as well as various macro and micro nutrients apart NPK in longer run. Addition of organic manure rich in organic matter also

helps to stabilize the soil pH in OA, which is missing in most CA practices leading to acidification, deterioration of soil structure and texture.

Non-Organic farmers: Table-5 shows the factors that deter non-organic farmers from adopting OA. Similar to organic farmers, majority (82.6%) of the respondents felt that labor shortage is the main deterrent. Low yields (43.5%) from organic farms and small land holding (36.2%) were other major deterrents for non-organic farmers from adopting OA. Even low support from the government was rated as a low deterrent in taking up OA.

Table-3: Main drivers for adopting OA.

Drivers	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)
Traditional way of farming	0.0	0.6	8.6	43.8	46.9
Health Benefit	0.0	0.0	17.9	40.7	41.4
Environmental benefits	0.0	9.3	34.0	38.3	18.5
Government policies	4.9	45.7	30.9	17.3	1.2
Experienced ill health	66.0	8.0	15.4	9.9	0.6

Likert scale: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree.

Table-4: Factors that deter farmers from continuing OA.

Deterrents	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
Labor shortage	0.0	0.0	1.1	8.0	90.9
Labor intensive	0.0	0.0	9.1	47.7	43.2
Low yield	0.0	1.1	6.8	55.7	36.4
Pest and diseases	3.4	6.8	30.7	22.7	36.4
Poor soil fertility	22.7	40.9	26.1	6.8	3.4

Table-5: Factors that deter farmers from converting to OA.

Deterrents	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
Labor shortage	0.0	0.0	4.3	13.0	82.6
Low yield	0.0	5.8	15.9	34.8	43.5
Small land holding	8.7	2.9	20.3	31.9	36.2
Low governmental support	0.0	13.0	39.1	44.9	2.9
Poor soil fertility	0.0	18.8	47.8	33.3	0.0
Low market value	8.7	39.1	40.6	11.6	0.0

Similarly, labor shortage was found to be a major factor during conversion to OA as Bhutan has the highest internal migration rate in Asia, which should be a big concern to the policy makers²¹. Espousing organic way of life and practices undeniably require additional labor inputs, especially in managing soil fertility and pest compared to conventional farming¹⁹.

A similar study²² reported that one of the main constraints of organic- based farming is the yield gap that has been evident which comes to around 9-25% higher in conventional farming. Farmers’ income will only increase if organic crops out-yield conventional crops²³. Though organic yields may increase beyond current productivity but it may not become as high as in systems using chemical inputs.

Results from this study also showed that small land holding proved to be a deterrent among farmers to convert organic. Farmers having large farm holdings and higher income can easily take the risk to practice organic cultivation methods²⁴. Conversely it can be very difficult for farmers with small farm holding to compete with its counterparts as most farmers in Bhutan are not even self-sufficient and are not ready to take the risks involved.

Perception on Transitioning to OA: When asked if Bhutan should convert to a fully organic country and upon explaining the country’s unprecedented aim of converting to fully organic by 2020, irrespective of being organic or not majority (53.40%) of participants were not in favor of transitioning to organic.

We found that 64.8% (n=248) of organic farmers were in favor of converting to organic. This could be due to various drivers of OA. Traditional farming methods which share similar principles as OA was found as a major factor which enabled farmers to continue OA. Health benefits and knowledge on harmful effects of chemical usage was also reported to be a major driving factor⁸.

Conversely 90.8% (n=78) of respondents following CA were not in favor of converting to organic. This could be due to various deterrents discussed above. Labor shortage was reported by 82.6% of respondents. Similarly, a large number of non-organic respondents (43.5%) complained of lower yield in organic farming to be a deterrent for them converting to OA.

Age and perception: An independent sample t-test was conducted to compare respondents’ age with two groups of respondents; those who were in favor of transiting fully organic and those who were not. There was a significant difference in the score between those who were in favor of transitioning to fully organic (Mdn=43.2, SD=13.5) and those who were not (Mdn=47.4, SD=13.1); $t(324) = -2.87, p = .004$.

These results suggest that farmers’ age does have a significant effect on their perception. Specifically, our results suggest that younger farmers respond positively to going fully organic compared to older farmers (Table-6).

In a similar study conducted in Nigeria, it was found that young farmers were more likely to practice OA than old farmers as older farmers exhibited more aversion to various risks related compared to younger farmers²⁵. Age predisposes a supportive factor of an individual’s strength to physically demanding work which is required in organic practices especially in a country like Bhutan where farm mechanization is very difficult.

A similar study conducted in the United States of America (USA) also found that young farmers, or those having less experience with organic farming, were drawn to organic farming relating to the healthy lifestyle offered by OA, relative to profitability when compared to older or experienced farmers²⁶.

Household size and perception of farmers: A Mann-Whitney U test was conducted to compare respondent household size with two groups of respondents; those in favor of transiting organic and those who were not in favor. The result suggested that respondents having larger family members living and working on the farm/labor force (Mdn= 178.76) were more positive on going organic compared to those having less family members living and working on the farm (Mdn=150.17), $U = 10904.5, p = .004$ (Table-7).

Farmers having large number of household members adopted organic farming practices than those having comparatively smaller number of household members^{25,27}. This could be because of more labor required in organic practices throughout the cultivation season. This also confirms that large household size reduces labor constraints amongst farm families.

Table-6: Comparison of farmers’ age with their perception on transitioning to OA.

	Levene's Test for Equality of Variances			t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	MD	Std. Error Dif.
Respondent Age	EVA	.48	.48	-2.87	324	.004	-4.25	1.48
	EVNA			-2.86	315.82	.004	-4.25	1.48

EVA= Equal variances assumed, EVNA= Equal variances not assumed.

Table-7: Comparison of household size and perception.

	Family members living and working on the farm
Mann-Whitney U	10904.500
Wilcoxon W	26129.500
Z	-2.877
Asymp. Sig. (2-tailed)	.004

Awareness, training, gender, method of farming and perception: Results of the binary logistic regression indicated that there was a collective significant difference between two groups of farmers; who thought Bhutan should convert to fully organic and those who thought Bhutan should not convert to fully organic with farmer’s awareness ($p \leq .001$), training received ($p \leq .001$) and method of farming ($\leq .001$).

The data indicated that farmers respond positively on converting to organic as awareness increases. Organic farmers are more ready to continue OA despite various deterring factors while non-organic farmers are still reluctant irrespective of the harmful effects of SACs. The data also indicated that farmers who received training on OA were more positive than those who did not avail training (Table-8).

Table-8: Binary logistic regression to compare awareness, training, gender and method of farming with perception on transitioning to OA.

Variables	B	S.E.	Wald	df	Sig.	Exp (B)
AWR	1.509	0.308	24.006	1	.000	4.523
TRN	3.471	1.046	11.009	1	.001	32.178
Gender	0.525	0.32	2.693	1	.101	1.691
ONO	-1.652	0.411	16.187	1	.000	0.192
Constant	-6.605	2.275	8.431	1	0.004	0.001

Likelihood ration test: $\chi^2 = 297.554$, (d.f. = 4), $n = 326$, Cox & Snell $R^2 = .37$, Nagelkerke $R^2 = .50$, AWR = Awareness, TRN = Training, ONO = Organic or not, GN = Gender.

The results of logistic regression analysis indicated that the regression model containing all four predictors was statistically significant ($p \leq .001$) indicating that the predictor variables significantly predicted the outcome.

Awareness showed strong relationship to respondents’ perception. It recorded an odds ratio of 7.874 suggesting that a person who is aware of organic farming practices is 7.874 times more likely to respond positively ongoing organic.

Farmers’ awareness on the environmental, economic and health benefits of organic method of cultivation are important factors that motivate farmers to practice OA²⁸. Awareness is encouraging, in particular, for a developing country like Bhutan where farmers have low level of formal education.

In a similar study conducted adopters of OA had a higher mean level of education relating to awareness when compared to non-adopters as education on organic method of farming is a helpful tool for farmers in analyzing choices and making decisions of anticipated benefits²⁷.

Non-organic farmers developed a “lukewarm” attitude towards organic farming systems as it required more organic fertilizers with tedious procedures for soil treatment and the thought that non-organic farmers have to enrich soil conditions by utilizing only organic enrichers and natural resources for at least three years during conversion left them apprehensive about income stability and related uncertainties²⁹. Organic farmers on the other hand having experienced the hardships and benefits are more willing to continue organic agriculture.

Despite various training given on OA by extension agents farmers are reluctant to adopt OA. Farmers tend to have higher trust in experience based knowledge from self and other farmers than in information given by governmental agencies or professional experts of OA²⁸. This could be one reason farmers are still reluctant to participate even though various training programs are conducted.

Conclusion

The study shows majority (58.90%) of farmers are not aware of OA. This is despite frequent trainings and awareness programme conducted by the government. From a total of 326 respondents in Tsirang Dzongkhag, only 41.10% of respondents are aware of OA.

Drivers of OA include (i) Traditional method of farming, (ii) health awareness, (iii) environmental benefits, (iv) low cost of production and (v) market opportunities.

The study also identified several deterrents which discouraged farmers from converting to organic. Detering factors for organic farmers from continuing OA were (i) labor shortage, (ii) labor intensive/ laborious nature of organic farming, (iii) low yield and (iv) pest and disease occurrences. Factors that deterred non-organic farmers from adopting OA were found to be similar to organic farmers. These include (i) labor shortage, (ii) low yield, (iii) lack of awareness and (iv) high pest and disease occurrences.

Binary logistic regression showed that awareness, education and method of farming to be significantly related to farmers’ perception. Awareness and increasing literacy level of our farmers can greatly help change this perception.

Mann-Whitney test showed significant relationship between total number of people living and working on the farm and farmers' perception on shifting to organic. As per the study larger the farm household size, farmers were more positive to going organic.

Independent sample t-test showed significant relationship between age and farmers perception. Specifically, the result suggested that younger farmers respond positively to convert to fully organic compared to older farmers.

Farmers' perception on converting to organic agriculture is negative. Majority of the respondents felt that Bhutan should not convert to fully organic or not just yet with 53.40% supporting the idea. We suggest that it is time for the government to equip our farmers with the right knowledge on OA through awareness and trainings. Minimizing rural urban migration or providing better on farm opportunities to youth could greatly benefit farmers from problems of labor shortage.

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