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Recent Trends in Adoption of Organic Farming in Pakistan: A Case Study

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Abstract

Organic farming is not only a sustainable farming systems but also have a great potential to provide the world with healthy, high-quality food. However, several factors like low yield and increased production costs may halt the adoption of natural farming style. The current study was planned to investigate the adoption of organic farming and its profitable factors in Pakistan. A survey was conducted in this perusal, where six different administrative units of Pakistan were considered. Interviews were conducted from 150 individuals per region using specifically developed questionnaire. Farmers were asked to respond regarding variables like education, farming land, organic market place, annual gross income (organic) etc. Descriptive statistics and regression modelling (linear) were applied to understand data trends and correlations. Nine out of 16 variables found significantly different among regions. The results depicted that farmers doing organic farming in peri urban areas like Islamabad Capital Territory (ICT) spend more money in terms of irrigation, hence increasing investment loads in the region. However, opportunities of market access helped these farmers to gain increased annual income. The data reflected small land holing by organic farmers as most of them owned < 5 acres. This could be one of the important factors in adoption of organic farming in Pakistan. Only 44% of the farmers sold their products at premium prices, which indicates lack of specialized market structure dedicated to organic products. Therefore, it could be concluded from our results that markets should be developed in order to boost the adoption of organic farming.

Keywords: Organic farming, Premium price; Farmer Economy; Livelihood; Certified Farming

1. Introduction

Agriculture is considered as the ancient practice done by human being to feed their population. Being innovative by nature, man always strived to explore new ways to improve the production of their agriculture produce so that they can earn more and live a better life. The earliest improvements in agriculture were the selection of better/high yielding plants and mechanization using conventional tools. They used to apply animal/plant debris to fertigate crops for better and healthy growth. These practices continued till the advent of industrial age. Chemical fertilizers and pesticides were developed and their widespread use continued to grow till now. The use of these chemicals improved crop yield significantly from limited land resources especially after green revolution where main focus was made to improve fertilizer use efficiency of crops (Jarosch, et al., 2017). However, the extensive use of chemicals polluted the environment as well as exerted negative impact on human health (Carvalho, 2017, Clark and Tilman, 2017). Therefore, ecologists and environmentalists suggested to limit the use of these chemicals and laid foundation of the concept of organic farming in 1940s (Heckman, 2006). Organic farming is referred to an environment friendly farming approach where the use of synthetic chemicals (fertilizers, pesticides, weedicides etc.) is limited to ensure biosafety (Huang, et al., 2015).

The organic movement was first started in 1950s, after recognition of the concept of organic farming (Vogt, 2007). Consequently, IFOAM (International Federation of Agriculture Movements) was established in France in 1972 with initial participation five countries (U.S.A, U.K, France, Sweeden, South Africa) (Paull, 2010). The founders expected that the federation would fulfil the necessities of an integrated/organized voice and create harmonious understanding regarding practices of organic agriculture across national and semantic boundaries. The IFOAM is a membership-based organization that develops standards for organic agriculture and implements specific projects that facilitate the adoption of organic agriculture, particularly in developing countries. In the meantime, Food and Agriculture Organization (FAO) and World Health Organization (WHO) co-established the Codex Alimentarius Commission (CAC) in 1963 to construct a global food standards and regulations and published guidelines in 1999 to prevent false claims. However, it was a non-mandatary, voluntary regulation (Schwindenhammer, 2017).

Individual governments nominate bodies to develop standards regarding organic farming. These bodies are involved in body approval/accreditation of organic farms. The representative of these bodies inspect farm activities to pursue the process of conversion from conventional farming system. They ensure the fulfilment of minimum standards developed for organic farming. The IOAS (International Organic Accreditation Service) emerged from IFOAM, is an independent body to provide a measure of consistency and credibility at the international level among certifiers (Fouilleux and Loconto, 2017).

Organic farming is not only environment friendly, but also economically viable. The data showed a growth of up to 170 % from 2002 to 2011 worldwide in terms of organic sales. However, adoption of organic agriculture is relatively slow as only 1 percent of agricultural land is used for this purpose (Willer and Lernoud, 2016). It has already been demonstrated in various studies that organic farming is more profitable as compared to conventional farming (Reganold and Wachter, 2016). Therefore, it could be a key factor to conversion from conventional farming. The major hurdle in the adoption of organic farming is cutbacks in crop yield. Although, contradictory reports regarding large and small differences in yield are available, it is obvious that organic agriculture cannot meet conventional farming in its yield potential (Leifeld, 2016, Ponisio, et al., 2015). However, premium pricing could serve as an appetizer for adoption of organic system (Hughner, et al., 2007). Besides that, certain factors like labour costs, and reduced income during conversion period may also affect the adoption attitude of farming community (Hanson, et al., 1997). It therefore requires attention from some government or non-government body to support farmers during the transition period. Various projects have been launched in this context and showed significant impact on adoption of organic farming (DeLonge, et al., 2016).

Since the development of standards and recognition organic products in market, organic agriculture gained importance especially in developed countries (Thøgersen, et al., 2017). However, various promotions and subsidies announced time by time, attracted farmers from developing countries to adopt organic farming. Currently, it is being practiced in more than 120 countries of the world (Willer and Lernoud, 2016). According to reports, a total of 50.9 million hectare land is being managed under organic farming system. Oceana contributes 45 % of world organic farming followed by Europe and Latin America (25% and 13% respectively). Asia and Africa contribute least to organic farming (6 % and 3% respectively) (Willer, et al., 2017).

There could be several social reasons behind low adoption of organic agriculture system in Asia, however, lack of awareness and market system are most critical factors (Asli, et al., 2016). Several NGOs (non-governmental organizations) worked in context of awareness and conducted training sessions and achieved some increase in adoption trends recently (Willer, et al., 2017). However, a lot of work is to be done for the establishment of specialized market system dedicated to organic products, but the major constraint in this perspective is affordability of consumers in developing countries like Pakistan.

The current study was designed to survey the status of organic agriculture in Pakistan. The survey focussed on variables like education, farming system, certification (organic), premium sales etc. Results of the study are expected to provide a basis for policy makers to develop organic agriculture into sustainable farming system in Pakistan.

In the manufacturing sector today, human capital is still essential for most factories to carry out a variety of manual operations, in spite of the rapid advancement of automation technology and robotics. Futuristic vision of "unmanned manufacturing" (Deen 1993) is forbiddingly expensive, because all its hardware components need to be computer controlled so as to freely communicate with each other; and yet, most of the outcomes are not promising (Sun & Venuvinod 2001). By and large, factories equipped with relatively simple machinery controls will require continuous attendance of human operators; for examples, textile mills, leather products, and medical appliances. With limited capital investments in production equipment, the main budget of their fixed costs lies on the workforce size (Techawiboonwong *et al.* 2006).

With regard to cost-effectiveness, labour planning always opts for the minimum amount of workers needed to deal with the daily operations, as well as the probable rate of disturbance (Lim *et al.* 2008). The workforce disturbance is often ascribed to absenteeism and turnover, which may result in considerable loss of productivity for any labour-intensive division (Easton & Goodale 2002). Buffering with redundant skilled workers (Molleman & Slomp 1999) or relief workers (Redding 2004) might be a direct solution to absenteeism; however, the rising labour cost must be justifiable due to the fact that underutilisation of labour during low demand seasons is considered a waste of resources. Absenteeism is the measure of unplanned absences from workplace due to some reasons like personal emergency, accident, illness, etc. Turnover occurs when an active worker resigns from the company of his own accord, thus leaving a vacant post until a replacement is found. If such disturbance has caused a large number of tasks become unattended and overdue, the company is then vulnerable to overtime cost, shrunk capacity and productivity, extra queuing time, lost business income, etc. In order to prevent these deteriorative effects, optimising the number of workers can be helpful. As a fundamental branch of knowledge in manufacturing business, workforce management will never fall behind the times. Therefore, it is worth an attempt to incorporate a novel methodology, such as HMS, into the state of the art of workforce sizing.

2. Material and Methods

The current study was planned to survey the organic farmers of Pakistan for understanding the status of organic farming and its impact on livelihood of organic farmers in the region.

2.1. Data collection, Processing and Descriptive Analysis

Data regarding survey was collected from six different administrative units of Pakistan viz. i. Baluchistan, ii. Khyber Pakhtunkhwa, iii. Punjab, iv. Sindh, v. Islamabad, vi. Azad Jamu and Kashmir. Data was collected by interviewing 150 farmers per region. The data regarding farmer education, land owned, total farming land, land for certified organic farming, land for uncertified organic farming, land for conventional farming, organic market place farming experience, organic farming experience, certified organic farming (years), tunnel cost, irrigation cost, product sold premium, product sold conventionally, house hold income, annual gross income (organic). All the variables were further categorized to understand their distribution. All the recorded data were processed for further analysis. Means and standard deviations were calculated from all the processed data using SPSS software (IBM-version 20) and presented in the form of table (Leech, et al., 2014).

The data were further subjected to linear regression modelling to understand the data trends and correlations (Zuur, et al., 2010). The data regarding all parameters (dependent variables; Y) were individual modelled against regions (explanatory variables; X). The principle of linear regression to model a quantitative dependent variable (Y) with quantitative explanatory variables (X). The linear regression with a single variable were determined using following equation:

$$Y_i = \alpha + \beta X_i + \varepsilon_i$$

Where, $\varepsilon_i = 0$; Y_i= dependent variable; Xi= explanatory variable; α=intercept; β: slope

The analysis of variance (ANOVA) was used to understand the significant impact of explanatory variable on dependent variable ($p < 0.05$). The null hypothesis was developed as H_0: $\beta = 0$, and the corresponding alternative hypothesis was H_1: $\beta \neq 0$. If this null hypothesis is true, then X has no effect on Y, while alternative hypothesis reflects that any change in X will be associated with change in Y.

3. Results

3.1. Description of variables

After detailed interview from respondents in the study area, the processed data were analysed to obtain descriptive statistics. Mean values along with standard deviation (SD) are presented in Table 1. Mean farmer's education was found 3.57 (SD=1.56). This depicts that average education of the farmers was found at secondary level of schooling.

Total farming experience was averaged as 2.69 (SD=1.09), showing that surveyed farmers having average farming experience of 11-15 years. However, mean organic farming experience was relatively low as 10 years (mean=1.84; SD=0.94). Certified organic farming experience was averaged as 1.82 (SD=0.86) representing that farmers have an average of 2 years' experience regarding certified organic production.

The average tunnel cost was found 2.17 (SD=0.8443) depicting that organic farmers invest around Rs. 42000 annually for tunnel farming. Average irrigation cost was computed as 1.5467 (SD=1.069) indicating that farmers bear Rs. 60,000 additional in terms of seasonal irrigation. The operational cost was averaged as 3 .0933 (S.D= 1.0802) showing operational cost Rs. 120,000 per annum. Overall, 41 % of farmers sold most of their product (>75%) to premium prices, while 14.44 % of farmers sold most of their product (>75 %) to conventional market.

Table 1 Categories, means, standard deviations and percentages of variables considered in the study

Variable	Mean ±SD	Coding	Category	Percentage (%)
EDUCATION	3.5733 ± 1.5698	1	Uneducated	7.78
		2	Primary	15.56
		3	Elementary	25.56
		4	Secondary	26.67
		5	Higher Secondary	10.00
		6	Graduate Degree	12.22
		7	Postgraduate Degree	2.22
FARMING YEARS	2.6933 ± 1.0902	1	1-5 Years	14.44
		2	6-10 Years	28.89
		3	11-15 Years	27.78
		4	>15 Years	27.78
		4	21-30 Years	1.11
FARMING YEARS ORGANICALLY	1.8400 ± 0.9450	1	1-5 years	45.56
		2	6-10 years	34.44
		3	11-15 years	13.33
		4	>15 years	6.67
CERTIFIED YEARS ORGANICALLY	1.8267 ± 0.8601	1	in transition	44.44
		2	<1year	35.56
		3	1-2year	14.44
		4	3-5year	5.56

TUNNEL COST	2.1733 ± 0.8443	1	15000-39999 Rs	23.33
		2	40000-64999 Rs	51.11
		3	65000-89999 Rs	21.11
		4	90000-114999 Rs	3.33
		5	115000-140000 Rs	1.11
SEASONAL IRRIGATIONAL COST	1.5467 ± 1.0691	1	10000-54999 Rs	78.89
		2	55000-79999 Rs	4.44
		3	80000-104999 Rs	6.67
		4	105000-129999 Rs	10.00
OPERATIONAL COSTS	3.0933 ± 1.0802	1	5000-80999	21.11
		2	81000-111999	20.00
		3	112000-142999	30.00
		4	143000-173999	20.00
		5	174000-205000	8.89
PRODUCT SOLD PREMIUM	3.0933 ± 1.1645	1	100% product sold	2.22
		2	>75% sold	41.11
		3	51-75% sold	22.22
		4	26-50% sold	15.56
		5	>25%sold	18.89
PRODUCT SOLD CONVENTIONAL	3.2400 ± 1.0634	1	1-25%sold	30.00
		2	26-50%sold	35.56
		3	51-75%sold	20.00
		4	>75%sold	14.44
HOUSEHOLD INCOME ORGANIC ANNUAL	2.4533 ± 1.0436	1	<25%	23.33
		2	26-50%	32.22
		3	51-75%	27.78
		4	76-100%	16.67
GROSS INCOME ORGANIC ANNUAL	3.7200 ± 1.2581	1	<30,000 Rs.	25.56
		2	30000-49000Rs	23.33
		3	50,000-99,000	26.67
		4	100,000-249,000 Rs	17.78
		5	250,000-499,999Rs	6.67
ACRES CERTIFIED ORGANIC	2.1467 ± 0.8333	1	0 Acres	18.89
		2	<5 Acres	60.00
		3	5-10 Acres	15.56
		4	11-15 Acres	3.33
		5	16-20 Acres	2.22
ACRES UNCERTIFIED ORGANIC	1.8533 ± 0.6915	1	0 Acres	35.56
		2	>5 Acres	48.89
		3	5-10 Acres	15.56
ACRES CONVENTIONALLY	2.3867 ± 0.9711	1	0 Acres	24.44
		2	<5 Acres	37.78
		3	5-10 Acres	25.56
		4	11-15 Acres	11.11
		5	16-20 Acres	1.11
TOTAL ACRES	2.4533 ± 1.0691	1	<5 Acres	13.33
		2	5-10 Acres	38.89
		3	10-15 Acres	18.89
		4	16-20 Acres	12.22
		5	>20Acres	16.67
ORGANIC PRODUCT MARKET PLACE	1.6800 ± 0.7739	1	<100 miles	47.78
		2	100-500 miles	31.11
		3	> 500 miles	21.11

The survey results showed that organic farmers earn 37% of their house hold income through organic farming (Mean=2.45; S.D=1.04). Similarly, average gross income of organic farmers was found Rs. 90000-120000 (Mean=3.72; S.D=1.25). Data regarding farming land showed that farmers most of the farmers used to cultivate an area of <5 Acres for certified organic farming (60 %) as well as uncertified organic farming (48.89 %). Most of the organic farmers (47.78%) preferred to sale their product in nearby market places (<100 miles), however, twenty one percent of the farmers sold their product to national markets away from the place of production (>500 miles).

3.2. Linear regression modelling

Data collected from farmers practicing organic farming in various administrative regions of Pakistan was analysed by applying linear regression to understand the variation of variables among regions. Results obtained are summarized in Table 2 and trends are shown in Fig. 1. A total of 16 variables were used as dependent variables in regression modelling (linear) against regions as independent variable. Nine out of 16 variables showed significant variation among various regions while the rest (seven) were non-significant. Among significant variables, seasonal irrigation cost scored highest value of R^2 (0.9201), depicting best fit to linear model. Moreover, it is obvious from the Fig. 1 that irrigation cost was highest in Islamabad Capital Territory (ICT) because most of the farms were in peri-urban areas. This adds to operational cost as seasonal irrigation cost showed positive correlation with total operational cost (0.149). However, investing on irrigation resulted in better output in terms of annual gross organic income as it showed significant positive correlation (0.258) with seasonal irrigation cost.

Table 2 Linear regression modelling of variables

Variables	R^2	F	Pr > F
Education	0.088548	1.632135	0.160403
Farming Years	0.241755	5.356415	0.000253
Farming Years Organically	0.27541	6.385536	< 0.0001
Certified Years Organically	0.147906	2.916143	0.017774
Land owned	0.191584	3.98137	0.002734
tunnel cost	0.422165	12.27405	< 0.0001
Seasonal irrigational cost	0.920111	193.4906	< 0.0001
Operational Cost	0.403655	11.37161	< 0.0001
Compost coding	0.012694	0.216	0.954798
Product sold premium	0.013092	0.222863	0.951722
Product sold conventional	0.040398	0.707259	0.619592
Household income organic annual	0.169847	3.437241	0.007108
Gross income organic annual	0.116336	2.211752	0.060574
acres certified organic	0.114809	2.178947	0.064081
acres uncertified organic	0.081761	1.49589	0.199871
acres conventionally	0.237003	5.218431	0.000321
Total acres	0.602789	25.49487	< 0.0001
Organic product market place	0.088729	1.635789	0.15945

R^2: Coefficient of determination; F: Fisher's Ratio; Pr: Probability

Total farming experience and organic farming experience also showed fitness towards the applied model (R^2 =0.242 and 0.275 respectively). Moreover, the farmers having more farming experience tend to accept organic farming early as it showed positive correlation (0.3524) with organic farming experience.

Data analysis regarding certified year organically showed that among other regions, Capital Islamabad has most experienced certified farmers. Moreover, data depicted that farmers performing certified organic farming get more benefits in terms of gross annual organic income (r=0.0168). Tunnel Cost scored value of R^2 (0.4222165), depicting best fit to linear model. Moreover, it is obvious from the Figure 1- that tunnel cost was highest in Khyber Pakhtunkhwa region. Tunnel cost showed positive correlation with total operational cost (0.2590). Data regarding annual house hold income from organic resources was found fit to linear model with a value of R^2 =0.169847. Moreover, it is obvious from the Figure 1 that house hold income organic annual was highest in Sindh region. The proportion of house hold income from organic resources showed positive correlation (r=0.2352) with land under certified organic farming.

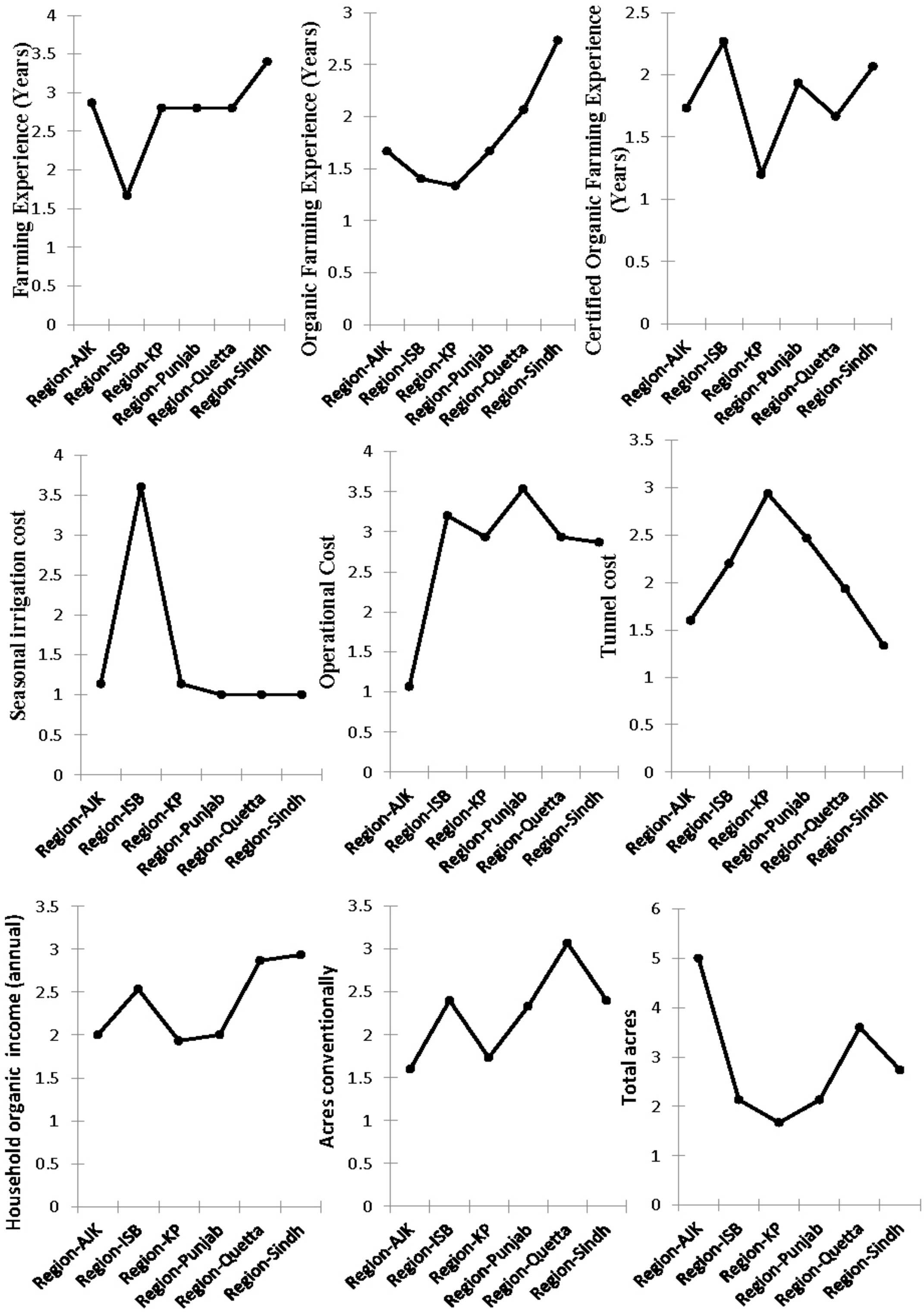

Figure 1 Charts showing mean of variables across the regions

4.Discussion

Organic farming system is a comprehensive and unique production management system that promotes ecological approach of farming by avoiding the use of synthetic fertilizers and pesticides. Organic farming improves soil health and microbiota (Hartmann, et al., 2015). The produce of organic farming is considered good for human consumption as it is free from hazardous chemicals (Lairon and Huber, 2014). Organic farming system has attracted increasing attention over the last one decade because they are perceived to offer some solutions to the problems currently besetting the agricultural sector. Organic farming has the potential to provide benefits in terms of environmental protection, conservation of non-renewable resources and improved food quality. Pakistan is bestowed with lot of potential to produce all varieties of organic products due to its diverse agro-climatic regions.

The Organic Farming was introduced in Pakistan by an non-government organization (NGO), named Lok Sanjh during 1996 (Ul-Husnain and Khan, 2015). The NGO was involved in training farmers at Farmers Field Schools (FFS) to pursue the adoption ecological friendly farming approaches. Other organizations have also tried to promote organic agriculture in their programs. A separate Directorate of Organic Agriculture at the National Agriculture Research Centre (NARC) was established in 2008. This directorate is responsible for the development and dissemination of appropriate technology for organic farming. In terms of markets, organic producers either sell their products at specified outlets or directly to larger certified firms - Panda, Prince Departmental Store, Sultan Son's (Sarafraz and Abdullah, 2014). A survey was conducted to review the current scenario of organic farming adoption so that an appropriate plan could be given to improve the organic farming system based on the farmers feedback. The survey results clearly depicted that certified organic farmers enjoy more benefits as compared to uncertified farmers. The certified organic farmers have access to specific organic markets, where they sell their products at premium prices and earn more profits. It is also evident from the data that education plays important role in adoption of organic farming. The average education of the farmers was found at secondary level of schooling during current investigation. However, the education of organic farmers has previously been discussed by Ullah, et al. (2015), where they were categorized as literate/illiterate. Most of the farmers were found illiterate, which is a contradictory statement as compared to our results. However, it could be possible to have low literacy rate of organic farmers in a particular region as Ullah, et al. (2015) confined their survey to Peshawar (a district in Khyber Pakhtunkhwa). The result of another study conducted in Punjab, Pakistan showed relatively close values (secondary level of schooling) (Yasin, et al., 2014).An average of 2 years' experience regarding certified organic farming was revealed during current survey. Similar trends regarding farming experience have been reported in previous studies conducted in India (Panneerselvam, et al., 2012). This situation depicts that adoption of organic farming covers same age in Indo-Pak subcontinent. Data regarding conventional farming experience showed that farmers have more experience tend to adopt organic farming easily. However, previous studies showed contradictory results regarding adoption of organic farming. Egri (1999) reported that newcomers to farming tend to adopt organic farming easily as compared to those doing farming from ages.According to the survey, 41 % of farmers sold most of their product (>75%) to premium prices. This is a good indicator that organic farmers are earning good revenue by selling their products at premium prices (Hughner, et al., 2007), hence depicting certified organic farming as more profitable business as discussed previously (Pimentel, et al., 2005). Data regarding farming land depicts that average land cultivation by organic farmers is low (<5 Acres) and has been described as a significant factor in adoption of organic farming (Läpple, 2010). It is an established fact that selling products into nearby markets is more convenient as well as profitable because it reduces transportation cost and damages (Rigby and Cáceres, 2001). Therefore, before making decisions of growing or promoting organic farming, proper markets are to be established in nearby regions, so that farmers could earn health profits out of organic farming.

5. Conclusion

Results of the current study suggested that organic farming is more profitable in peri-urban areas of Pakistan as market access is easy in these areas. Moreover, if properly promoted and subsidized, adoption of organic farming could be boosted and made profitable for rural areas of the country.

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