Research Article

An Assessment of Farmers' Awareness Level Regarding Integrated Farming System in District Sargodha, Punjab, Pakistan

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Abstract | Availability of adequate food and water, along with livelihood security, natural resources conservation and environmental protection are considered as basic human needs of a society. The developing world is struggling with lack of or inadequate supply of these resources while combating with climate change at the same time. It is a fact that sustainable development comes only by judicious utilization of the resources and environment protection that help in addressing socio-economic challenges. An integrated farming system (IFS) holds a special position with the central concept that nothing is supposed to be wasted here. It is an integrated approach to farming compared with existing monoculture approach. It passes on to an agricultural system that integrates crop production and livestock. IFS helps small scale farmers to increase cash income, improve quality and quantity of food produced by methodical exploitation of resources. Purpose of the study was to assess the awareness of the farmers to determine the impact of integrated farming system (IFS) on agricultural development and improving the livelihoods in the study area. To accomplish these objectives, an interview schedule was developed as a research instrument to record the opinions of the respondents by using Likert-type scale. The 200 respondents were selected through systematic random sampling technique. The response rate was 60%. Hence, the sample of 120 respondents was used for final analysis and description of the results. The instrument's validity and reliability were checked before data collection. In-person interviews were conducted by the researcher. The collected data were analyzed by Statistical Package for Social Sciences (SPSS). Based on the results, it is concluded that majority of the farmers were not willing to adopt IFS due to their traditional perceptions. Those farmers have constraints such as little or no access to information for integrated farming system. Strong association was observed between awareness for better farming choices and preferred farming practices that shows Extension intervention is required to encourage farmers choose advanced farming practices like IFS.

Received | February 10, 2020; **Accepted** | July 25, 2020; **Published** | August 14, 2020
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Citation | Ashraf, E., H.K. Shurjeel, S. Sadaf, A. Ahmad, U. Rafique and M.A. Javed. 2020. An assessment of farmers' awareness level regarding integrated farming system in district Sargodha, Punjab, Pakistan. *Sarhad Journal of Agriculture,* 36(3): 913-923.
DOI | http://dx.doi.org/10.17582/journal.sja/2020/36.3.913.923
Keywords | Integrated farming, Farmers, Extension, Awareness, Assessment

Introduction

Agreeably, Pakistan is an agricultural country and majorly in rural settings. On the other hand, it is multifaceted, since the agricultural share in the gross domestic product (GDP) is declining gradually. Dilemmas of present agriculture include decreasing agriculture growth and productivity, rise

in food insecurity, escalating malnutrition, decrease in arable land, climate variation, low groundwater, increasing production cost, low agricultural income and unemployment (Prakash et al., 2015). Decreasing pattern of agricultural resources is menacing for sustainability and profitability. This is pretty alarming for crop production systems. Hence, productive employment approaches and earning generating resources are needed for small and marginal scale farmers in the country. Of many approaches, an integrated farming system (IFS) is a reasonable and sustainable substitute of the farming system especially on marginal lands with the aim of despoiled resources preservation and steadiness in the farm earnings. Fraser et al. (2005) described higher diversity in a system is responsible for working efficiency, productivity and generating profitability to survival against distressing conditions which make stakeholders ruin and wane their socio-economic conditions following a decrease in susceptibility.

Integrated farming system is a meticulous approach regarding increase in farm productivity. For small and marginal farmers, multi-enterprises are particularly beneficial to get higher bonuses compared to farming based on single enterprise with the aim to improve producing nutritious and high quality food. Hence, contemplation of the farming community about IFS can compensate in scientific research and policymaking discussion. Fernando (2004) described that the majority of farmers are susceptible to the existing farming systems on account of less income diversification, security regarding income and saving purposes.

Because of the higher profit on limited land, IFS is globally recognized as a fruitful strategy. In order to increase crop, yield agricultural research in preceding decades centered on the establishment of novel crop varieties, improved mechanization, and crop protection technologies. This led to the exploitation of that eventually lower crop yield as well as profitability. At the same time, farmers sow low yielding varieties, practice non-judicial use of chemicals and other resources that led to less inadequate farm income for their families. Korikanthimath and Manjunath (2009) described in their study that integrated farming system approach led towards sustainability through reflecting changes in the soil organic carbon and through indication by the sustainability yield index as well. The integrated farming system makes easy and more profitable farming and uplifts the livelihoods of the farming communities. Integrated farming system is potentially proposed as an instrument regarding the pleasant, moderate and judicial utilization of all inputs and resources and decreasing challenges of the farming communities.

Integrated Farming System (IFS) is concentrated on merging farm enterprises like dairy and crops production, goat rearing, raising poultry, producing vegetables and fruits for high profits and support sustainable agriculture. Prevailing practices under IFS aptly interrelate with the environment, and striking economical and social balance to upgrade the livelihoods of farmers. Cash returning farming practices upgrade and make better socio-economic gains for farmers. Biswarup (2006) described that people have great potential to understand the prospects to diversify livelihoods structure to protect well being and lessening susceptibility.

Integrated farming system generates components which lead towards enhancement in the economy through securing livelihoods. Families with educational backgrounds possess dynamic advantages in agriculture and livestock, non-farm employment chances, earning diversity and resources accessibility, great social contribution and less susceptible markets. Opportunity to integrate livestock, crops, fruit and forest cultivation, vegetable growing, goat rearing, raising poultry, must be exploited to make judicious use of all farm inputs and natural resources to achieve great profitability and employment around the year for small scale farmers. Since small farmers generally do farming on subsistence bases where they must supply balanced food to get net income for their indispensable requirements and farm disbursements. Gill et al. (2005) conducted the study and described in their study that the IFS is not only made available in the ways of production like fuel, bio-pesticides, fertilizers, manures, food but a vigorous environment for keeping the balance ecologically. Hence the IFS is a balanced system for agricultural growth and development positively using production and profitability as well.

Integrated farming system (IFS) is a system of generating the high productivity through multi-enterprises. Multi-enterprises system in agriculture have the potential of decreasing production expenses through synergy in recycling of the residues or bi-products of different elements present in the system

and resultantly creating employment opportunities and generating income on a regular basis. The IFS is a consistent way of obtaining great products through considerable use of nutrients, increase in the organic matter replacement through using effective residues recycling. Farmers with organic farming had insignificant risk impressions as compared to farmers with conventional farming practices and techniques (Medina, 2007). On the other hand, there is a dire need to upgrade farmers' knowledge level and provide pertinent training opportunities since these factors enhance their knowledge-base and competency (Shurjeel et al., 2016).

Materials and Methods

Research design

A descriptive nature survey research design was employed. The Nonparametric technique such as chi-square used to identify the association among two categorical factors; income of farmer having awareness of the integrated farming system and farmers without awareness of integrated arming system.

Research objectives

Following objectives were evaluated during the study;

1. To assess the demographic characteristics of the farmers in the study area.
2. To see the relationship between awareness level of the respondents regarding IFS and preferred farming practices.
3. To assess the awareness of the respondents regarding IFS in the study area.
4. To determine the constraints in the implementation of IFS as perceived by the respondents in the study area
5. To assess the difference in the income of those farmers having no awareness of IFS with those having awareness of IFS

Population and sample

The study was conducted in district Sargodha, Punjab-Pakistan. Administratively, the district is divided into seven Tehsils. A list of the 400 farmers from tehsil Sargodha those have some level of awareness regarding integrated farming system (IFS) was prepared with the help of Agricultural Extension field staff. Yamane (1967) provided a formula to calculate sample size for finite population such as:

$$n = \frac{N}{1 + Ne^2}$$

Where;

n= the sample size; N= the size of population which is 400; e = the error margin such as 5%.

By using Yamane's formula with 5% margin of error and 95% confidence level, the desired sample size came up with 200 farmers from the list of 400 potential respondents. Similar formula was used by Jan and Khan (2019) in their study to assess the determinants of rice productivity in district lower Dir, Khyber Pakhtunkhwa, Pakistan. Systematic random sampling was applied for selecting 200 respondents out of the available list of 400 from tehsil Sargodha with sampling interval k=2. Where k= N/n. The response rate of the farmers to fill the survey instrument was 60%. Hence, the final workable sample of 120 respondents was used for further analysis and description of the survey results.

Instrumentation

The questionnaire was used as an instrument to assess the impact of IFS on improving the farmers' livelihoods. Instrument of 72-items (demographic, 6-items, the association between awareness and preferred farming choices, 2-items, assessing farmers' perceptions regarding IFS, 53-items, and constraints in the implementation of IFS at farm level, 9-items) was prepared. A five-point Likert-type scale was employed to record respondents' opinions and to measure variables. Validity of the instrument was checked by establishing the panel of the experts from the discipline of Agricultural Extension and found satisfactory. Instruments' reliability was pre-tested through the pilot study by taking data from thirty respondents before the final data collection. The computed value of Cronbach's alpha (0.902) established that the instrument prepared was highly reliable for data collection.

Data collection and analysis

Respondents were contacted, visited physically and interviewed face-to-face and recorded their opinions regarding integrated farming through interview schedules individually to each respondent for primary data. However, there were numbers of respondents initially consented to participate in the study but later when contacted they were either not available or filled inappropriate responses on the survey that were excluded before the analysis. This resulted in a decrease of response rate to 60%. Collected data coded and entered into an excel sheet. The Statistical

Package for Social Sciences (SPSS) version 17.0 was used for data analysis. Descriptive as well as inferential statistics were computed.

Results and Discussion

Demographic characteristics of the respondents

Demographic characteristics of the respondents always play important role in defining the status of the farmers in the study area. The number of demographic factors were identified and asked from the respondents during survey. The results are presented in the following Table 1.

Table 1: *Distribution of the respondents as per their demographic characteristics (n=120).*

	Frequency	Percentage
Age (years)		
20-39	77	64.2
40-59	36	30.0
60 -79	7	5.08
Education		
Illiterate	24	20.0
Matriculation	49	40.8
Intermediate	23	19.2
Graduate	21	17.5
Post-graduate	3	2.5
Experience		
1-10	53	44.2
11-20	45	37.5
21-30	16	13.3
31-40	6	5.0
Cultivated Land		
1-20	70	58.3
21-40	40	33.3
41-60	7	5.8
61-80	3	2.5
Farm size		
1-20	54	45.0
21-40	54	45.0
41-60	8	6.7
61-80	4	3.3
Total	120	100.0

Results depicted that maximum (64.2%) respondents were in the age group 20-39. Thirty percent were in the age group of 40-59 and only (5.08%) of respondents were in the age group 60-79 and were most senior respondents. Average age of respondents was around 36 years. Results depicted that respondents were matured and potentially able to adopt the integrated farming system and its approaches. Results regarding education of the respondents revealed that maximum (40.8%) respondents were holding matriculation degree and minimum (2.5%) respondents were post-graduate in different disciplines. A total of (19.2%) of respondents held intermediate and (17.5%) had earned graduate degrees. However, (20%) of the respondents were illiterate. Results showed that the educational profile of the respondents was encouraging in the study area. The results further described that (44.2%) of respondents were experienced up to 10 years, while and almost (37.5%) were experienced up to 20 years. Minimum (5.0%) were experienced up to 40 years. Around 13.3% of respondents were among those who had farming experience for up to 30 years. The results revealed that respondents have had good farming experience in their respective area.

The results also depicted that at the most of (58.3%) of the respondents have had cultivated land between 1-20 acres. On the other hand, few respondents (5.8%) have had cultivated land up to 60 acres in addition only (2.5%) have had 61-80 acres of land holdings in the study area. Respondents were having sufficient cultivated land to perform farming activities both at household and commercial level. Approximately (90%) of respondents were having up to 40 acres of farm size and only (10%) were holding farm size between 41- 80 acres.

Association between awareness and preferred farming choices

Second objective was to check association between awareness levels of respondents and their preferred farming choices (Table 2). For this purpose, cross tabulation was performed with chi-square test of independence. The hypothesis was generated such as awareness level regarding IFS and preferred farming choices of the respondents are independent (no association).

Results from cross tab analysis revealed that there was significant association between awareness and preferred farming choices used by respondents χ^2 (6) = 153.451, p = 0.000 (Table 3) and concluded that both awareness and preference of farming choices are not independent (associated), it means their preferred farming choices depend on their awareness level regarding IFS. It is therefore said that awareness level of the farmers regarding integrated farming systems may enhance their choices for preferred farming practices.

Table 2: *Cross tabulation between awareness vs. preferred farming choices of the respondents.*

			Farming practices generally preferred				Total
			Tradition-al	Semi-ad-vanced	Advanced	Integrated approach	
Aware-ness of farming choices	Low	Count	26	3	0	0	29
		% within awareness of farming choices	89.7%	10.3%	0.0%	0.0%	100.0%
		% within preference of farming choices	68.4%	7.5%	0.0%	0.0%	24.2%
		% of Total	21.7%	2.5%	0.0%	0.0%	24.2%
	Mod-erate	Count	12	36	2	0	50
		% within awareness of farming choices	24.0%	72.0%	4.0%	0.0%	100.0%
		% within preference of farming choices	31.6%	90.0%	7.1%	0.0%	41.7%
		% of Total	10.0%	30.0%	1.7%	0.0%	41.7%
	High	Count	0	1	26	14	41
		% within awareness of farming choices	0.0%	2.4%	63.4%	34.1%	100.0%
		% within preference of farming choices	0.0%	2.5%	92.9%	100.0%	34.2%
		% of Total	0.0%	0.8%	21.7%	11.7%	34.2%
Total		Count	38	40	28	14	120
		% within awareness of farming choices	31.7%	33.3%	23.3%	11.7%	100.0%
		% within preference of farming choices	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	31.7%	33.3%	23.3%	11.7%	100.0%

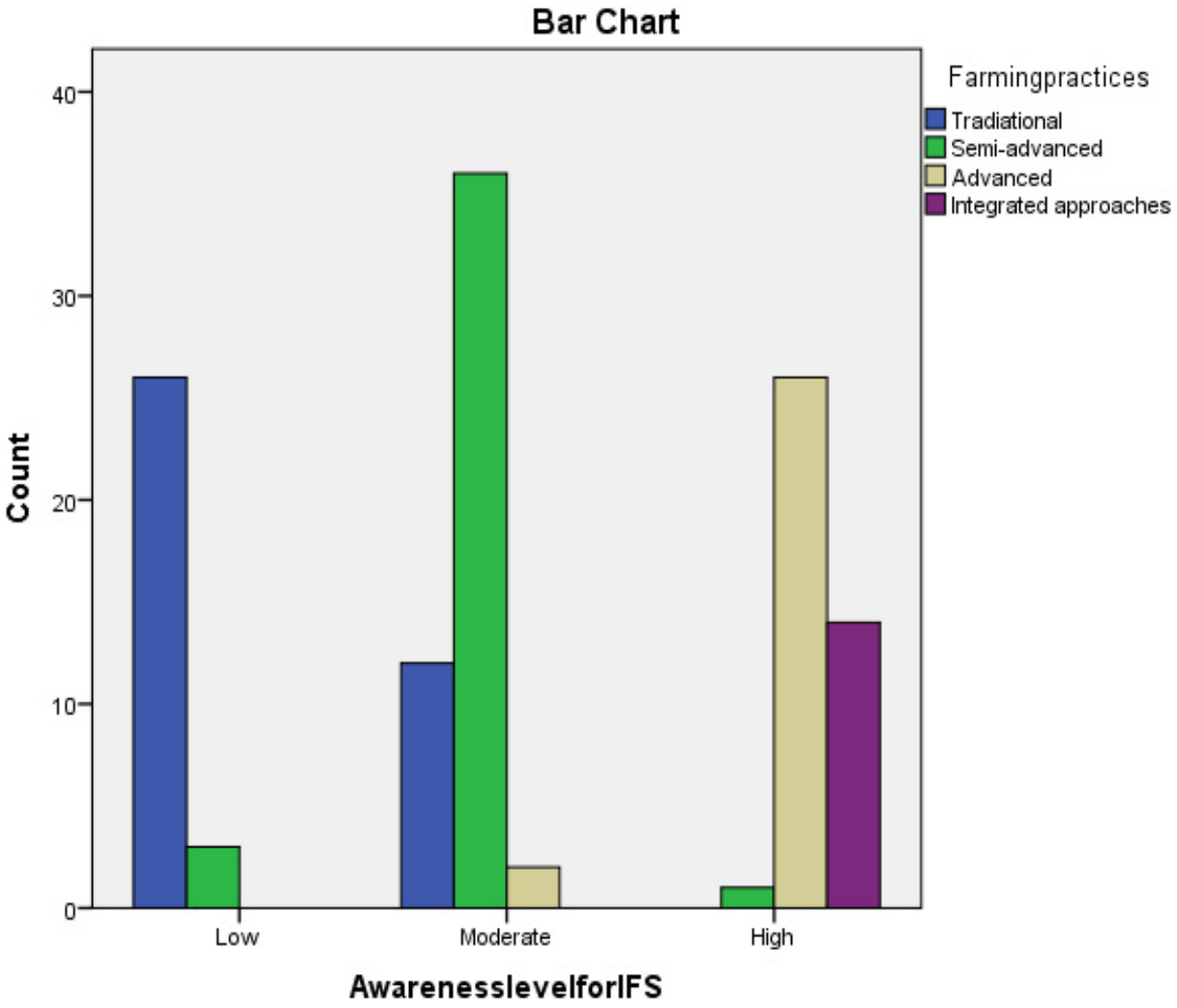

Figure 1: *Bar chart as a graphical representation for awareness level and farming choices of respondents.*

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Bar chart in Figure 1 further described that respondents' awareness level and their preferred farming choices are associated and showed that farmers with low awareness of IFS are mostly practicing traditional farming. Farmers with moderate awareness level of IFS are practicing blend of traditional, advanced and semi-advanced farming practices. Farmers with high awareness level about IFS were practicing semi-advance and integrated farming and consequently getting high income.

Respondents' awareness regarding integrated farming system

Third objective was to assess awareness of respondents regarding IFS. Result depicted that components of IFS are essential for high production and profitability. According to Ashraf et al. (2018), the success triangle i.e. education, research and extension might not possible to accomplish unless the message disseminated to end users.

Table 3: *Chi-square test model.*

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-square	153.451	6	0.000
Likelihood ratio	165.667	6	0.000
Linear-by-linear association	88.661	1	0.000
No. of valid cases	120		

The results from the Table 4 show that the mean scores of the integration of all components like (forestry, 2.52), (apiculture, 1.916), (sericulture, 1.83), (dairy, 3.25), (poultry, 2.83), (goat rearing, 2.43), (sheep rearing, 2.27), (fish farming, 2.08), (duck rearing, 1.96), (pigeon rearing, 2.05), (mushroom cultivation, 1.70), (kitchen gardening, 2.72), (seed production, 2.69), (fodder production, 2.75), (nursery preparation, 2.31), (value addition, 2.03) etc. described that the maximum utilization of resources is possible and productivity and profitability can be increased. These results are similar to the results of the study conducted by Jayanthi et al. (2003) in which they described that the farming system with the integration of various enterprises increase the productivity, enhance profitability, secure nutritional needs and maintain soil fertility through the recycling of residues of the nutrients from the enterprises engaged. Results depicted that farmers were well aware of the components of integrated farming with the highest mean score (3.25) for dairy and for selling eggs and milk. However, they think that sheep and fish rearing are the two most important components of integrated farming with the mean score as (2.27) and (2.08) respectively.

Table 4: *Means, Std. Ds. of factors for awareness of respondents regarding IFS (n=120).*

Items	n	Mean	Std. Dev
Integrated farming system (IFS)	120	2.15	0.95
Integrated farming system practices	120	2.40	0.83
IFS components like; Agriculture	120	2.77	1.19
Forestry	120	2.52	0.99
Apiculture	120	1.91	0.95
Sericulture	120	1.83	0.95
Dairy	120	3.25	0.98
Poultry	120	2.83	1.11
Goat rearing	120	2.43	1.16
Sheep rearing	120	2.27	1.29
Fish farming	120	2.08	1.25
Duck rearing	120	1.96	1.16
Pigeon rearing	120	2.05	1.08
Mushroom cultivation	120	1.70	0.99
Kitchen gardening	120	2.72	1.05
Fodder production	120	2.75	1.17
Seed production	120	2.69	0.98
Nursery	120	2.31	1.09
Value addition	120	2.03	1.12
IFS elements like; Water shed	120	2.11	1.13
Farm ponds	120	2.24	1.22
Bio-pesticides	120	2.35	1.19
Bio-fertilizers	120	2.59	1.13
Plant products as pesticides	120	2.73	1.03
Bio-gas	120	2.97	1.06
Solar energy	120	2.73	1.10
Compost making	120	2.44	1.08
Green manuring	120	2.80	0.99
Rain water harvesting	120	2.40	1.19
Rejuvenation of productivity through IFS	120	2.07	0.99
Achieve agro-ecological equilibrium	120	2.35	0.91
Reduces the use of chemicals	120	2.67	0.87
Avoid buildup of insect-pests	120	2.79	0.83
Avoid diseases	120	2.76	0.77
Reduces weed population through cropping management	120	2.56	0.84
Produce chemical-free environment for the society	120	2.69	0.96
IFS pick up profitability and reduced costs due to recycling	120	2.87	1.01

Items	n	Mean	Std. Dev
IFS produce greater sustainability in production	120	2.79	0.88
IFS integrate the different production systems	120	3.07	0.84
IFS provide money through selling of eggs, milk, etc	120	3.25	1.01
IFS provide recycling of organic wastes	120	3.05	1.06
IFS solve fodder crises to some extent	120	2.99	0.96
IFS provide the fuel and timber wood	120	2.91	1.02
IFS provide enough scope to employ farm labor round year	120	2.86	0.91
IFS forces entrepreneur to improves literacy level	120	2.71	0.96
IFS provide chance for growth of Agri-oriented industries	120	2.70	0.85
IFS increases efficiency of input resources	120	2.97	0.96
IFS overall improve the living standard of the farmers	120	3.12	1.04
IFS strengthen food-chain and produce quality food	120	2.94	0.88
IFS involve in production, consumption and decomposition	120	3.09	0.92
IFS regulate soil temperature	120	2.99	0.95
IFS improve soil micro-organism activities	120	3.03	0.97
IFS improve the soil fertility by decomposition	120	2.87	0.99

Scale: *1: Very low; 2: Low; 3: Moderate; 4: High; 5: Very high.*

Respondents were aware about the IFS elements with mean scores like (watersheds, 2.11), (farm ponds, 2.24), (bio-pesticides, 2.35), (bio-fertilizers, 2.59), (bio-gas, 2.97), (solar energy, 2.73), (compost making, 2.44), (green manuring, 2.80), (rainwater harvesting, 2.40) etc. They opined that two important elements such as farm ponds and rainwater harvesting are necessary elements of IFS with high mean scores of (2.24) and (2.40), respectively.

Respondents were also aware about the importance of two pillars of IFS such as; components and elements but they understand the significance of the remaining factors those assist farmers through the farming corridor. They opined that providing money through the selling of the by-products like eggs, milk, butter, pickle with the mean scores (3.25), improve the living standard of the farming communities (3.12), involves in production, consumption, and decomposition (3.09), integrate cropping production systems (3.07), provides recycling of organic wastes (3.05) and improve soil micro-organism activities for the betterment of soil structure, texture, and efficiency to be fertile (3.03) respectively. Combination of enterprises to avail benefits refers to integrated farming which varies region by region as per their resources. All factors are strong predictors of economically viable farming system since farmers are getting advantages from integration of resources at the farm and getting better livelihoods.

Further, farmers have had enough awareness about IFS with reference to the items asked during survey like "IFS achieve agro-ecological equilibrium" with mean scores of (2.35), reduces chemicals used (2.66), reduces the buildup of insect-pests (2.79), avoids diseases (2.75), reduces weeds population through practicing cropping management system (2.55), produce chemical-free environment (2.69), enhance profitability and reduces costs through wastes recycling and residues (2.86) and produces production sustainability (2.79) respectively. Generally, all these are strong factors for ever-increasing, boosting up and making possible the existence, life standard and socio-economics of the farmers.

According to the significance of IFS, it endows great assistance to farming communities for generating better resources for production, earning profit and for employment opportunities particularly self-employment at farm level. Results further depicted that it resolve prevailing fodder crises with mean score (2.99), provide fuel and timber wood (2.90), provides scope to employ farm labor (2.85), forces the entrepreneur to improve literacy level (2.70), provides an opportunity for agri-oriented industries growth (2.70), increases proficiency of input resources (2.96) improve soil fertility through decomposition (2.86), improve and regulate soil temperature and improve soil texture (2.99) and strengthens food-chain and produces quality food (2.94). Significantly almost all the above-stated factors regarding IFS are important to increase productivity and profitability. It is therefore considered that farmers have sound awareness regarding IFS and its advantages, productivity, resources management, wastes recycling, and profitability. Farmers understand adoption and implementation of IFS. They also have good understanding of socio-economic status upgrade and livelihood betterment through adoption of IFS.

Constraints in implementation of IFS at farm level

Fourth objective was to determine constraints in the implementation of integrated farming system (IFS) at farm level. Results revealed that there were several constraints (see Table 5) in study area hindering in adoption and implementation of IFS at farm level.

Table 5: *Constraints in implementation of integrated farming system at farm level as perceived by respondents (n=120).*

Items	n	Mean	SD	Ranks
Lack of access to IFS approaches	120	1.97	0.61	4
Lack of recommendations from EFS regarding IFS	120	1.95	0.65	6
Lack of interest and motivation	120	1.65	0.72	9
Availability of inputs required for IFS	120	2.08	0.77	3
High cost of infrastructure to establish on-farm IFS	120	2.28	0.73	1
Lack of inspiration from fellow farmers	120	1.72	0.68	8
Don't have access to resources to practice IFS	120	2.13	0.73	2
Lack of skills and technical knowledge regarding IFS	120	1.92	0.62	7
Lack of trained labor required for IFS	120	1.96	0.71	5

Scale: *1: low; 2: Some; 3: Much.*

Among all, the "highest unaffordable charges to build up infrastructure to establish on-farm IFS" was leading constraint with mean score (2.28) due to which they avoid adopting IFS. Second highest constraint was "lack of farmers' access to resources to practice IFS" with mean score (2.13) shows that respondents described that they do not have access to resources to practice IFS. The third constraint was the "lack of input availability essential for IFS with mean score (2.08). There are despondent circumstances since in this era of modernization and the technologically advanced world; respondents do not have inputs available to them in many areas. The fourth constraint was "lack of access to technical approaches of IFS with mean score (1.97) since without technical approaches, adoption, and implementation of the system is ineffective. The fifth constraint was the "lack of technical and trained labor required for implementation of IFS with mean score as (1.96). The sixth constraint was "lack of recommendations of extension field staff about integrated farming approaches with mean score (1.95). The seventh constraint was "lack of technical knowledge and skills regarding IFS with mean score (1.92). Respondents placed "lack of inspiration from fellow farmers about IFS" at number eight with mean score (1.72). The last constraint was "lack of interest and motivation" with mean score (1.65) and stands at number nine since the respondents in the study area were thinking that this was not a major constraint and if someone from Extension department convince them they could be motivated for implementation of IFS at farm level. It is therefore said that if these constraints are resolved, farmers would be able to adopt and implement this viable agricultural system which may further contribute towards sustainable agriculture.

The fifth objective of the study regarding the income of the farmers those have awareness of IFS practices and those do not have awareness of IFS practices was evaluated using independent samples t-test. The hypothesis was designed in such a way that income of the farmers with awareness of IFS is different from the income of the farmers without awareness of IFS.

H_0: $\mu_{\text{farmers' income without awareness of IFS}} = \mu_{\text{farmers' income with awareness of IFS}}$

H_1: $\mu_{\text{farmers' income without awareness of IFS}} \neq \mu_{\text{farmers' income with awareness of IFS}}$

The analysis revealed mean income in millions of Rs. of the two groups in the study (Table 6).

Table 6: *Group statistics.*

	Farmers	n	Mean	Std. Dev	Std. error mean
Income in millions	Without IFS awareness	71	1.14	0.90	0.11
	With IFS awareness	49	2.06	0.85	0.12

Results (Table 7) revealed that there is significant difference in income of those farmers who were aware with IFS and those who were not aware with IFS since the t-test *p=0.000 < alpha i.e. 0.05*. Hence, null hypothesis is rejected. So, based on results, it is stated that there was a statistically significant difference between the incomes of the two groups of the farmers *(t_{118} =-5.629, p < .05)*. The box and whisker plot was used to clearly differentiate between the incomes levels of the two groups shown in Figure 2.

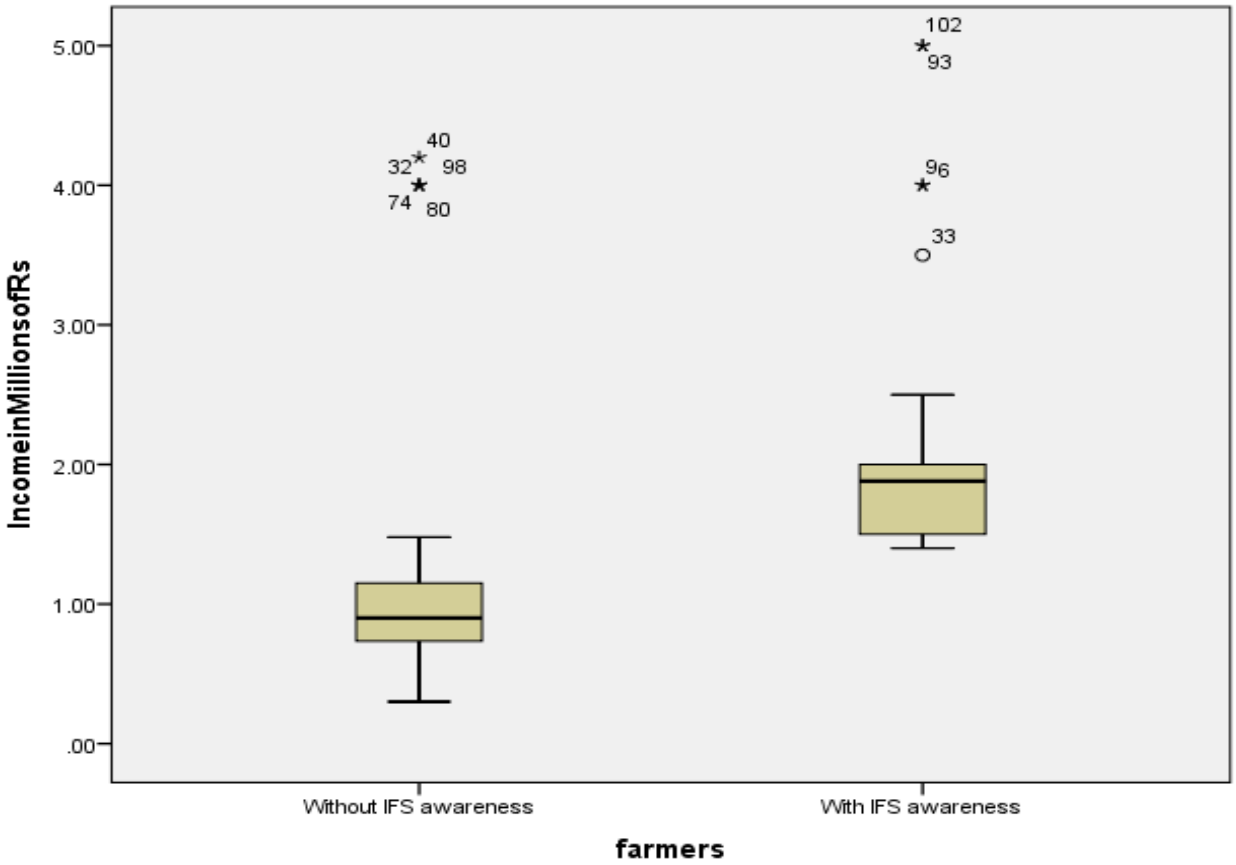

Figure 2: *Box and whisker plot comparing income of farmers with and without IFS awareness.*

Table 7: *Independent Samples t-test.*

		Levene's test for equality of variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% Confidence interval of the difference	
									Lower	Upper
Income in Millions	Equal var. assumed	.282	.596	-5.629	118	.000	-.92345	.16404	-1.24830	-.59860
	Equal var. not assumed			-5.690	107.09	.000	-.92345	.16230	-1.24520	-.60170

The comparative box and whisker plot in the Figure 2 shows the difference in the income of the two groups. Here the bold lines inside the two boxes show the median income of the farmers without IFS awareness and the farmers with IFS awareness which shows that there was a clear difference between their incomes from the farming. The farmers with IFS awareness have more median income as compared to those of without IFS awareness.

Conclusions and Recommendations

Farmers in the district Sargodha Punjab-Pakistan were aware of integrated farming system, however, they did not adopt and implemented this system on their farms. The idea of integrated farming was interesting for the respondents. The majority of the farmers were not willing to adopt and implement due to their traditional perceptions and other potential constraints. Most of the farmers were young in the study area and had sufficient farming experience. They were of the opinion that through the adoption and implementation of integrated farming practices income can be increased which is indispensable for sustainable agricultural development. Both crop and animal diversity have an equal contribution in sustainable agricultural development. This system enhances the production, brings stability of the

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ecosystem, regulates climate changes and manages natural resources.

In addition, from the results of the student's t-test, it is also concluded that farmers having awareness of IFS would be able to generate more income compared to farmers having no awareness of IFS. Strong association observed between awareness for better farming choices and preferred farming practices which shows that Extension intervention is required to make farmers choose advanced farming practices like IFS. The public extension agencies should work for the implementation of this system since farmers show progressive attitude regarding awareness level for choosing farming system and preferred farming practices. Now the need is remove all road blocks and pave the way for adoption of integrated farming system at farm level among the farmers in the study area. There is a dire need to bring positive change in their perceptions regarding IFS and all private and public organizations should introduce some sort of long term training and education programs for the farming communities to increase their awareness for adoption of this system. According to the results of the study, respondents have little access to the information for integrated farming system, hence the situation needs to be improved to access sustainable agricultural development through providing all required information and training to the respondents for adoption of IFS.

The government should take obligatory steps for reform in the training opportunities about the integrated farming concepts to get adopted by the farmers and obtain maximum productivity and profitability which is economically viable. Furthermore, all organizations should play their roles in the implementation of this system around the country at a priority level.

Followings are the recommendations derived from the study;

1. The Government should facilitate the farmers to adopt all components of IFS
2. The farmers should be accommodated against the constraints discussed in the study
3. The socio-economic conditions of the farmers could be enhanced through launching of different IFS programs
4. In order to get higher production and profitability, government should make policy for the implementing integrated farming system at the farm level in Pakistan.
5. Agricultural sector has great significance in the scenario of China-Pakistan Economic Corridor (CPEC); therefore, it is further recommended that farmers of Pakistan must be prepared for cooperative and integrated farming by Extension intervention keeping in minds the needs of future where this sector will become industry rather traditional agriculture.

Novelty Statement

In Pakistan, the concept of integrated farming system was rarely discussed in agricultural extension studies in the past. Authors tried to highlight this issue to conduct more research on this topic so that like developed countries this model may be applied in existing agricultural system in the country. This study provides significant information about farmers' awareness and attitude towards IFS which should not be squandered.

Authors' Contribution

Ejaz Ashraf conceived the idea, supervised the study, helped in analysis, interpretation of the results and prepared the final draft for submission. Hafiz Khurram Shurjeel prepared the survey instrument. Saima Sadaf and Mohammad Arshad Javed helped in corrections of final draft. Adnan Ahmad and Usman Rafique helped in data collection.

Conflict of interest

The authors have declared no conflict of interest.

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