Research Article

Factors Contributing to Non-Adoption of Sunflower Crop in Districts Swabi and Mardan, Khyber Pakhtunkhwa

Nusrat Habib[1*], Safeena Inam[2] and Abdul Hayee Qureshi[1]

[1]Social Sciences Research Institute, National Agricultural Research Centre, Islamabad – Pakistan; [2]National Institute for Genomics and Advanced Biotechnology, National Agricultural Research Centre, Islamabad-Pakistan.

Abstract | Sunflower has been produced for a long time in many parts of the world including Pakistan for the purpose to increase oil production. In Khyber Pakhtunkhwa it was adopted from many years but due to some reasons its production and acreage decreased both in Pakistan and Khyber Pakhtunkhwa. During 1997 area of sunflower was 6763 hectares with decreasing trend it reached at 503 hectares during 2011-12 in Khyber Pakhtunkhwa. This study was conducted to quantify the factors contributing to the non-adoption of sunflower. Data was collected from 100 respondents of different categories comprised of 43 adopters and 57 non-adopters of sunflower. The probit estimates were carried out to find out factors contributing to non-adoption of sunflower. Factors contributing to non-adoption of sunflower were respondent experience, access to credit, total cost of sunflower, access to price information of market, distance from input shop and more profit from competing crops indicating that the 1 percent increase in these parameters will decrease the probability to adopt sunflower. Whereas supporting parameters were highest educations level in the family, total operational holding, last year yield of sunflower, access to extension services and share of non-agricultural income. By increasing 1 percent in these parameters will increase the probability for adoption of sunflower. Keeping in view the importance of this crop it is suggested to provide market structure for sunflower growers near to their field areas and Research efforts should be made to overcome the problems faced by sunflower growers.

Received | August 06, 2016; **Accepted** | February 02, 2017; **Published** | February 28, 2017
***Correspondence** | Nusrat Habib, Social Sciences Research Institute, National Agricultural Research Centre, Islamabad – Pakistan; **Email:** nusrat.habib@ymail.com
Citation | Habib, N., S. Inam and A.H. Qureshi. 2017. Factors contributing to non-adoption of sunflower crop in districts Swabi and Mardan, Khyber Pakhtunkhwa. Sarhad Journal of Agriculture. 33(1): 60-68.
DOI | http://dx.doi.org/10.17582/journal.sja/2017.33.1.60.68
Keywords | Non-adoption, Adoption, Sunflower, Probit model, Khyber Pakhtunkhwa

Introduction

During 2013-14 total availability of edible oil was 3.20 million tonnes. Local production of edible oil contributed 0.573 million tonnes while import of edible oil/oilseeds was 2.627 million tonnes. The edible oil import bill during 2013-14 was Rs. 246.895 billion (US$ 2.50 billion) (GoP, 2014-15). Pakistan's import bill of oil and edible products are causing rise in trade deficit of the country. The situation thus necessitates for enhancing the indigenous oilseed production to save the country from a major calamity in future. Sunflower (*Helianthus annus* L.) is an imperative oilseed crop mostly grown for edible purpose in the world. It is placed as one of the world's prominent crop in terms of total production and trade (Khoso, 1992). It was cultivated on around 23.31 million hectares all over the world with 29.90 million tons of production. Russia, Argentina, America, China, Rumania, France, Canada, Turkey and Hungary are major sunflower growing countries in the world (NARC, 2009). The major oilseed crops cultivated in the country contain canola, sunflower, cottonseed, rapeseed and mustard. In Pakistan, the local availability of eat-

able oilseed hardly meets the demand and the same scenario continues since decades. Growing population and incessant increase in urbanization has more extended the gap among resident supply and demand. It is, a pity, that despite having rich lands, best canal system in the world, and an agriculture based economy, Pakistan has yet to depend on imported edible oil and a big volume of foreign exchange is expended on the importation of edible oil (Alam, 2002; Rahman, 2011)

Khyber Pakhtunkhwa has an exclusive agronomic atmosphere where growing of double harvests of sunflower in a single year are conceivable by adopting appropriate traditional practices. In Khyber Pakhtunkhwa huge area of irrigated and dry land in the high rainfall zones is open for the cultivation of sunflower in the month of June to October. Some land remains fallow after tobacco, barley, wheat, rapeseed and mustard. Sunflower is the suitable substitute which can fill up this gap as hybrid varieties of sunflower are obtainable that can matured in 90 to 110 days (Bakht et al., 2006).

Currently, D.I. Khan, Swabi and Mardan are leading districts for the area and production of sunflower in Khyber Pakhtunkhwa province. Considering major producing areas, Swabi and Mardan districts were focused for the present study. The average yield of sunflower in D. I. Khan, Swabi and Mardan districts were 602, 660 and 655 kg/ha in the year 2009 (Govt. of KP, 2011). A number of hybrid sunflower varieties such as Hysun 33, SF 187, NKS 278 and NK 265 have been introduced and grown in major sunflower growing districts of Khyber Pakhtunkhwa (Govt. of KP, 2011). Although, numbers of hybrid varieties have been reported in these districts, but the productivity statistics indicate that the adoption of hybrid is unsatisfactory. People used low standard seed that resulted in low productivity despite the fertile land and sufficient water availability.

Justification of the Study

This study aims at understanding the specific factors leading to non-adoption of sunflower farming in the study area. Sunflower is one of the most important edible oil crops growing in Khyber Pakhtunkhwa (KP). Sunflower was introduced in Punjab as a supplementary oil seed crop during 1970 and in Khyber Pakhtunkhwa during 1976.The yield of sunflower in Khyber Pakhtunkhwa is almost equal to the yield of the Punjab province and higher than the yield of the Sindh province but the area under sunflower has been decreasing over the time in KP and increasing in the other two provinces of Pakistan. Despite the potential, the farmers are not adopting the sunflower due to various reasons (GoP, 2014-15). Adoption processes of sunflower are well documented in Punjab and Sindh provinces of Pakistan but in case of Khyber Pakhtunkhwa, there is no empirical study on sunflower adoption or non-adoption process. Therefore, there is a need to enhance research on constraints of sunflower or to find out the bottlenecks in the production of sunflower in Khyber Pakhtunkhwa. The specific objective of the current study is to study the factors contributing to non-adoption of sunflower crop in districts Swabi and Mardan, Khyber Pakhtunkhwa.

Materials and Methods

The following methodological strategy was adopted for this scientific venture.

Study Area

The study was based on primary data source. Swabi and Mardan districts of Khyber Pakhtunkhwa were selected for data collection. Swabi and Mardan districts are sacred with productive farming acreage; as a result, maximum of the people are connected with farming activities of agriculture. Selection of these two districts was based on the secondary data that indicates the fact of increasing trend of sunflower non-adoption from the year 2001 to onward (Govt. of KP, 2011). A comprehensive questionnaire was developed to focus the factors that were contributing in non-adoption of sunflower in Khyber Pakhtunkhwa.

Sampling Procedure and Data Collection

Primary data was collected from the sampled respondents in the study area. A purposive sampling technique was applied and 100 respondents were interviewed from Swabi and Mardan districts of Khyber Pakhtunkhwa. The reason for purposive sampling was gaining access to respondents who could be interviewed in depth. The population of the study was comprised of the sunflower adopters and non-adopters of these districts. Swabi, Chota Lahore and Razar tehsils of districts Swabi were selected, from each tehsils two villages were selected purposively for data collection, from each tehsil of Swabi 20 respondents were interviewed and total 60 respondents from Swabi

Table 1: *Number of respondents in selected villages of Swabi and Mardan*

District	Tehsil	Village	Sample Size	Total (Tehsil)	Total (District)	Total Sample Size
Swabi	Swabi	Asota Sharif	6	20	60	100
		Ismaila	14			
	Chota Lahore	Yaqoubi	10	20		
		Chota Lahore	10			
	Razar	Karnal Sher Khan	10	20		
		Razar	10			
Mardan	Mardan	Akbar Abad	11	40	40	
		Mohdheir	17			
		Thordheir	12			

Source: *Field Survey, 2013*

district. From district Mardan, 40 respondents were interviewed from Akbar Abad, Mohdheir and Thordheir villages of tehsil and district Mardan. The total numbers of respondents were 100 which were selected purposively for the study (Table 1).

Data Analysis

Double statistical packages were used to take benefits of diverse features in both packages. Statistical Package for Social Scientists (SPSS) and STATA 12 were used for the analysis and tabulation of data.

Descriptive Statistics

The category wise i.e. adopters and non-adopters of sunflower descriptive analysis was carried out. In the descriptive analysis mostly the mean values were calculated along with minimum and maximum values.

The Probit Model

The probit model, similarly identified as the normit model, evaluate the properties of Xi on the retort likelihood, Pi = (Y=1|X). The model undertakes that households mark conclusions grounded upon a utility maximization purpose. The theoretical outline of the study model applied in this study is alike to the model that Lopes (2010) and Zavale et al. (2005) applied to evaluate households' decision about the adoption of a technology. The model undertakes that farmer' decisions whether or not to adopt sunflower crop be contingent on unobservable benefit that is resulted by farmer specific characteristics. The probit model:

$$\mathbf{E(y)} = \frac{e\beta 0 + \beta 1x1 + \beta 2x2 + \beta 3x3 \ldots\ldots\ldots + \beta pxp}{1 + e\beta 0 + \beta 1x1 + \beta 2x2 + \beta 3x3 \ldots\ldots\ldots + \beta pxp}$$

If the two values of dependent variable y are coded 0 or 1, the value of E(y) in equation above provides the probability that y: 1 given a specific set of values for the independent variables; x_1: x_2, x_3…..x_p. Because of interpretation of E(y) as a probability, so the equation written as follows:

$$\mathbf{E(y)} = P\,(y = 1 | x1, x2, x3 \ldots\ldots xp)$$

$$\mathbf{E(y)} = P\,(y = 1 | x) = \frac{e\beta 0 + \beta 1x1 + \beta 2x2 + \beta 3x3 \ldots\ldots\ldots + \beta pxp}{1 + e\beta 0 + \beta 1x1 + \beta 2x2 + \beta 3x3 \ldots\ldots\ldots + \beta pxp}$$

The estimated equation of the model is:

$$\check{y} = \mathbf{P\,(y = 1 | x1, x2, x3 \ldots\ldots xp)} = \frac{e\beta 0 + \beta 1x1 + \beta 2x2 + \beta 3x3 \ldots\ldots\ldots + \beta pxp}{1 + e\beta 0 + \beta 1x1 + \beta 2x2 + \beta 3x3 \ldots\ldots\ldots + \beta pxp}$$

$\check{y}$: provides an estimate of the probability that y: 1 given a particular set of values for the independent variables;

$$P\,(A = 1|x) = \frac{e\beta 0 + \beta 1x1 + \beta 2x2 + \beta 3x3 + \beta 4x4 + \beta 5x5 + \beta 6x6 + \beta 7x7 + \beta 8x8 + \beta 9x9 + \beta 10x10 + \beta 11x11}{1 + e\beta 0 + \beta 1x1 + \beta 2x2 + \beta 3x3 + \beta 4x4 + \beta 5x5 + \beta 6x6 + \beta 7x7 + \beta 8x8 + \beta 9x9 + \beta 10x10 + \beta 11x11}$$

Where:

A: 1 is used for the adoption of sunflower and 0 for non-adoption of sunflower.

Set of variables included in the model such as:

X_1: Respondent Experience (years); X_2: Highest Education Level in the Family (years); X_3: Total Operational Holding (acre); X_4: Access to Credit (1 if yes, 0 for otherwise); X_5: Last Year Yield of Sunflower (mounds/acre); X_6: Total Cost of Sunflower (Rs); X_7: Access to Extension Service (1 if yes, 0 for otherwise); X_8: Access to Price Information of Market (1 if yes, 0 for otherwise); X_9: Distance from Input Shop (1 if < 10 km, 0 for otherwise); X_{10}: Share of Non-agriculture Income (percent); X_{11}: More Profit from Competing Crops (dummy)

Results and Discussion

Sunflower adoption and non-adoption

This study analyse the adoption and non-adoption percent in Swabi and Mardan districts of Khyber Pakhtunkhwa. Analysis of the survey data indicated that there were 57 non-adopters and 43 adopters of sunflower. Adopters were those who planted sunflower in 2012 and 2013 season. Thus, farmers who planted sunflower in 2012 and not in 2013, still considered as adopters of sunflower. Non-adopters were those who had not planted sunflower in either 2012 or 2013. This classification of adopters and non-adopters is based on these two agriculture years' 2012 and 2013 similar classification of adopters and non-adopters applied by Morse et al. (2007). Details are presented in the Table 2.

Table 2: *Distribution of adopter and non-adopter of sunflower*

Variable	Frequency	Percentage
Non-adopter	57	57.0
Adopter	43	43.0
Total	100	100.0

Source: *Field Survey, 2013*

Major sunflower varieties

The results presented in table 3 reveals that 62.79 percent sunflower growers were using Hysun 33 variety while NKS 278, SF 187 and other varieties were being cultivated by 16 percent, 7 percent and 14 percent farmers, respectively. Hysun 33 was the most famous variety in these districts. All the respondents were using hybrid varieties of sunflower. Details are presented in the Table 3.

Table 3: *Major sunflower varieties*

Variety	Frequency	Percentage
Hysun 33	27	62.79
NKS 278	7	16.29
SF 187	3	6.97
Other	6	13.95
Total	43	100.0

Source: *Field Survey, 2013*

Descriptive statistics of the variables used in probit model analysis

In this model sunflower adoption or non-adoption was taken as dummy variable, 0 for non-adoption and 1 for adoption. The characteristics of the sunflower growers are imperative for decision making at various levels of farm management operations. Respondent farming experience was 24.18 years with minimum of 2 years and maximum of 45 years. The usage of the farmer's education level as illustrative factor in adoption studies is objectively communal (*e.g.*, Nkamleu and Adesina, 2000; Adesina and Baidu-Forson, 1995). The education factor is used as a substitute for numeral factor. At the practical level, the access to information as well as the ability to realize the technical features and effectiveness connected to diverse harvests may affect crop production decision. Education of the farmers means years of formal education which farmers completed. While in study sample education level was very low, average highest education level of the family was only 5 years of education with minimum of 0.00 and maximum of 16 years of education. Average of the total operational holding was 3.8 acres with minimum of 0.25 acres and maximum of 30.0 acres. Access to credit is also important part of the process of adoption and non-adoption of any crop. Access to credit average is 0.21. Last year average yield of sunflower was 10.83 mounds per acre. On average sunflower total cost per acre was rupees 12798 with maximum of rupees 15200 and minimum of rupees 10030.Access to extension services, distance from input shop and access to price information from markets are dummy variables that take a value of 1 if the household has access to these services and 0 for otherwise and distance from input shop was included as a dummy variable i.e., 1 if <10 Km and 0 for otherwise. In deciding whether to adopt or not–adopt sunflower access to price information and access to extension services are necessary. The average of access to extension services was 0.19, the average of access to price market information was 0.20 and distance from input shop average was 0.14. This is armored by the statistic that many studies find a substantial effect of education on the adoption of improved technologies (*e.g.*, Adesina and Zinnah, 1993). Absence of access to the market is congruently a "non- financial liberty" which is uttered in the form of dangerous poverty that reduces people susceptible by also flagging the other liberties and selections (Sen, 2003). Thus, these variables are assimilated to explanation for its effect on adoption verdicts. Average non-agriculture income was 49 percent with minimum and maximum of 27 and 73 percent respectively. More profit from competing crops average was 0.31. Details are presented in the Table 4.

Table 4: *Descriptive statistics of the variables used in the probit model analysis*

Variables	Definition	Unit of Measurement	Minimum	Maximum	Mean	Std. Deviation
Dependent Variable						
Adoption or non-adoption of sunflower		1 = Adopt 0 = Non-Adoption	0.00	1.00	0.43	0.49
Independent Variables						
Respondent experience	Farming experience of respondent	Years	2.00	45.00	24.18	10.04
Education	Highest education level in the family	Years	0.00	16.00	5.15	4.68
Total oper. Holding	Total operational holding (Acres)	Acres	0.25	30.00	3.84	3.75
Acc. to credit	Access to credit	1 = yes , 0 = otherwise	0.00	1.00	0.21	0.41
Yield	Last year yield of sunflower	Mound/acre	7.50	16.50	10.83	6.96
Sunflower cost	Total cost of sunflower	Rs.	10030.00	15200.00	12798.04	1453.39
Acc. to extension services	Access to extension services	1 = yes, 0 = otherwise	0.00	1.00	0.19	0.39
Acc. to price information market	Access to price information from market	1 = yes, 0 = otherwise	0.00	1.00	0.20	0.40
Input shop	Distance from input shop	1 if <10 Km, 0 = Otherwise	0.00	1.00	0.14	0.29
Non-agriculture income	Share of non-agriculture income	Percent	27.00	73.00	49.09	31.90
Profit from competing crops	More profit from competing crops	1 = yes, 0 = otherwise	0.00	1.00	0.31	0.51

Source: Field Survey, 2013

Determinants of sunflower non-Adoption (Probit estimates)

Main objective of the research study was to define the factors contributing to non-adoption of sunflower in Khyber Pakhtunkhwa. In the determinants of adoption or non-adoption of sunflower were respondents experience (years), highest education level in the family (years), total operational holding (acres), access to credit (dummy), yield of sunflower (last year yield mounds per acre), total sunflower cost (per acre), access to extension services (dummy), access to price information of market (dummy), distance from input shop (dummy) share of non-agriculture income (percent) and more profit from competing crops (dummy).

A total of 11 parameters were estimated. The results indicated that 1 of the parameter estimated was significant at the 1 percent level, 3 were the significant at the 5 percent level and 3 were significant at 10 percent level. The variable whose coefficient was significant at 1 percent level was more profit from competing crops. Total operational holding of the respondent, access to credit and share of non-agriculture income were significant at 5 percent level. The coefficients of distance from input shop, total cost of sunflower and highest education level in the family were significant at 10 percent level. In probit model experience of respondent was incorporated in number of years. The coefficient of experience is negative and representing that fresh farmers are more prospective to adopt sunflower as likened to old aged growers. Old age farmers had larger experience, they preferred only profitable crops and they don't take risk in adopting new crops. The highest education level in the family was included as a highest number of years of schooling in the family. The education coefficient is positive and significant at 10 percent level of significance demonstrating that higher literacy levels play meaningfully positive role in the adoption of sunflower crop in the study area.

Total operational holding of the respondent in acres was included in the model. The coefficient of total operational holding is positive and significant at 5 per-

cent level of significance indicating that larger farmers are more likely to adopt sunflower instead of small farmers. In the model access to credit was included as a dummy variable *i.e.,* 1 yes and 0 for otherwise. The farmer's access to credit coefficient is negative and significant at 5 percent level of significance indicating that as farmer access to credit increases farmers adopt other profitable crops such as tobacco and this variable decreased the probability to adopt sunflower.

The coefficient of last year yield of sunflower is positive and indicating that increase in yield of sunflower increases the predicted probability of sunflower adoption. Total cost of sunflower which farmers were bearing by adopting sunflower per acre was included in the model. The parameter total cost of sunflower per acre has negative coefficient but statistically significant that implies that increase in total cost of sunflower per acre decreases the probability of sunflower adoption. The access to extension service was included as dummy variable *i.e.* 1 yes and 0 for otherwise. The access to extension service coefficient is positive indicating that increase in access to extension services play positive role in sunflower adoption.

Access to price information of market was included as a dummy variable *i.e.* 1 yes and 0 for otherwise. The coefficient is negative indicating that the farmers who have access to price information are less likely to adopt sunflower. The main reasons are the low and inconsistent prices of sunflower. Distance from input shop was included as a dummy variable i.e., 1 if <10 Km and 0 for otherwise. The coefficient of distance from input shop is negative and significant at 10 percent level of significance indicating that as distance from input shop for sunflower increased the probability to adopt sunflower decreased.

Share of non-agriculture income in percent was included in the model. The coefficient of share of non-agriculture income is positive and significant at 5 percent significance level indicating that the increase in share of non-agriculture income will significantly increase the probability to adopt sunflower. In the model more profit from competing crops was included as dummy variable *i.e.* 1 if the farmer is earning more economic benefit from competing crops and 0 otherwise. The coefficient of more profit from competing crops is negative and significant at 5 percent significance level indicating that the increase in profit from competing crops will significantly decrease the probability to adopt sunflower in the study area. As tobacco and sugarcane are widely adopted crops in Swabi and Mardan districts due to high profitability.

In all these 11 parameters only 5 parameters were supporting sunflower adoption while remaining 6 parameters were contributing towards non-adoption of sunflower crop in the study area. Supporting parameters were education, total operational holding, last year yield of sunflower crop, access to extension services and share of non-farm agriculture income. Factors contributing to non-adoption of sunflower were respondent experience, access to credit, total cost of sunflower per acre, access to price information of market, distance from input shop and more profit from competing crops.

The values in the last column of Table 5 give the estimated changes in the probabilities of the crop being adopted or non-adopted for unit changes in the different explanatory variables. Increase in farming experience estimated to decrease the probability for sunflower adoption by about 0.009 units. By estimating, education level in the family and total operational holding, the probability to adopt sunflower increase by 0.021 and 0.006 units respectively. One percent increase in access to credit will decrease the probability to adopt sunflower by 0.475 units. By increasing the last year yield for sunflower, access to extension services and share of non-agricultural income have positive coefficients indicating that one unit increase in these variables will increase the probability to adopt sunflower by 0.074, 0.059 and 0.153 units respectively.

One unit increase in access to price information of market and distance from input shop will decrease the sunflower probability by 0.563 and 0.267 units respectively. One unit increase in the total cost of sunflower will decrease the probability to adopt sunflower by 0.241 units. More profit from competing crops was included as dummy and it described that one unit increase in this variable will decrease the sunflower probability by 0.341 units. Details of probit estimates are presented in the Table 5.

Probit estimates have been employed for determining the factors contributing to non-adoption of sunflower. The estimates revealed that factors contributing to non-adoption of sunflower were respondent experience, access to credit, total cost of sunflower per acre,

access to price information of market, distance from

Table 5: *Determinants of sunflower non-adoption (Probit estimates)*

Variables	Coefficients	Z-Value	Marginal Probability
Experience (Years)	-0.016	-0.92	-0.009
Highest education level in the family(Years)	0.073*	1.92	0.021
Total operational holding (Acres)	0.014**	2.26	0.006
Access to credit (Dummy)	-1.68**	-2.01	-0.475
Yield of sunflower (Last year yield mounds per acre)	0.199	0.51	0.074
Total cost of sunflower (Per acre)	-0.065*	-1.89	-0.241
Access to extension service (Dummy)	0.180	0.15	0.059
Access to price information of market (Dummy)	-1.891	-0.39	-0.563
Distance from input shop (Dummy)	-0.461*	-1.80	-0.267
Share of non-agriculture income (Percent)	0.650**	2.09	0.153
More profit from competing crops(Dummy)	-0.362***	-3.23	-0.341
Constant	-0.173	-1.39	-
LR Chi^2 (11) = 79.61 Pseudo R^2= 0.41			

***, ** and *: *indicate that coefficients are significant at 1, 5 and 10 percent level of significance respectively*

input shop, area under tobacco and area under sugarcane.Whereas supporting parameters were education, total operational holding, last year yield of sunflower crop and access to extension services.

Farming experience was negatively correlated with adoption decision of sunflower and positively correlated with adoption of other crops like tobacco and sunflower with Z-value of -0.92. Education was significant at 10 percent level of significance indicating that higher literacy levels play significantly positive role in the adoption of sunflower crop in the study area. Socioeconomic factors like experience, education and household size can play a more significant role if it is specific to the adoption of new technology or crop (Liberio, 2012; Lopes, 2010; Jariko et al., 2011; Adegbola and Gardebroek, 2007; Uaiene et al., 2009).

Total operational holding of respondents was significant and positively correlated with adoption decision meant that as area increased adoption of sunflower increased in the study area. Access to credit was significant and negatively correlated with the adoption probability of sunflower it meant farmers with credit preferred to grow other crops which were providing them more profit. Last year yield of sunflower was positively correlated with adoption decision of sunflower but with insignificant Z-value and these results agree with those reported by Nowak (1987). The parameter total cost of sunflower per acre has negative coefficient but statistically significant that implies that increase in total cost of sunflower per acre decreases the probability of sunflower adoption. The access to extension service coefficient is positive indicating that increase in access to extension services for farmers play positive role in sunflower adoption.

The coefficient of accesses to price information is negative indicating that the farmers who have access to price information are less likely to adopt sunflower. On similar lines other research study found that besides the constraints relating to yield per acre and adjustment of sunflower in existing cropping pattern, the major constraint was the non-existence of market price for sunflower farmers (Badar et al., 2002).

The coefficient of distance from input shop is negative and significant at 10 percent level of significance indicating that as distance from input shop for sunflower increased the probability to adopt sunflower decreased. Institutional factors can play an important role in decision taking regarding adoption of new technologies or at farm level decisions for changing cropping pattern, this is consistent with other technology adoption studies (*e.g.* Lopes, 2010; Bandiera and Rasul, 2005).

The coefficient of share of non-agricultural income is positive and significant at 5 percent significance level indicating that the increase in share of non-agricultural income will significantly increase the probability to adopt sunflower.

Smith & Franklin Academic Publishing Corporation

The coefficient of more profit from competing crops is negative and highly significant at 1 percent significance level indicating that the increase in more profit from competing crops will significantly decrease the probability to adopt sunflower in the study area. As tobacco and sugarcane are widely adopted crops in Swabi and Mardan districts due to high profitability comparing to sunflower profitability, farmers generally adopt high value crops and these are in line with Lopes 2010 research study.

Non-adoption of sunflower can be accredited to numerous factors including competing crops, non-availability of quality seed, marketing problems, poor backup extension services and a low price of the product. Technically cultivation of sunflower in these areas is only possible if government provides incentives in form of economic benefit and appropriate market structure for sunflower output.

Conclusions and Recommendations

Supporting parameters for adoption of sunflower were highest education level in the family, total operational holding, last year yield of sunflower crop, access to extension services and share of non-agricultural income. Factors contributing to non-adoption of sunflower were respondent experience, access to credit, total cost of sunflower per acre, access to price information of market, distance from input shop and more profit from competing crops. Reason for non-adoption of sunflower was that farmers preferred tobacco and sugarcane crops over sunflower due to profitability of these crops. Major constraints in adopting sunflower were more profit from competing crop, no market structure for sunflower and poor extension back up. Keeping in view the results of the study subsequent recommendations are made:

- To provide market structure for sunflower growers near to their field areas.
- To provide awareness about importance of sunflower to the farmers.
- To provide stable and more or equal to competing crop price for sunflower.
- To provide high quality hybrid seed to farmers.
- Research efforts should be made to overcome the problems faced by sunflower growers.

Author's Contribution

Nusrat Habib was the principal author who conducted this research for fulfilling her M.Phil. Degree. Safeena Inam participated in data collection and handling during the field survey. Abdul Hayee Qureshi assisted in preparation of the draft of this paper.

References

Adegbola, P. and C. Gardebroek. 2007. The effect of information sources on technology adoption and modification decisions. Agric. Econom. 37: 55-65. https://doi.org/10.1111/j.1574-0862.2007.00222.x

Adesina, A.A. and J. Baidu-Forson. 1995. Farmers' perception and adoption of new agricultural technology: Evidence from analysis in Burkina Faso and Guinea, West Africa". Agric. Econom. 13: 1–9. https://doi.org/10.1016/0169-5150(95)01142-8

Adesina, A.A. and M.M. Zinnah. 1993. Technology characteristics, farmers' perceptions and adoption decisions: A Tobit Model application in Sierra Leone. Agric. Econom. 9: 297–311. https://doi.org/10.1016/0169-5150(93)90019-9

Alam, S.M. 2002. Pakistan has achieved import substitution to the tune of $50 million in edible oil during 2001-2002. Gulf Economist.

Badar, H., M.S. Javed, A. Ali and Z. Batool. 2002. Production and marketing constraints limiting sunflower production in Punjab, Pakistan. Int. J. Agric. Biol. 4(2): 267-271.

Bakht, J., S. Ahmad, M. Tariq, H. Akber and M. Shafi. 2006. Performance of various hybrids of sunflower in Peshawar valley. J. Agric. Biol. Sci. 1(3): 25-29.

Bandiera, O. and I. Rasul. 2005. Social networks and technology adoption in Northern Mozambique. Econom. J. 116(514): 869-902. https://doi.org/10.1111/j.1468-0297.2006.01115.x

Government of Pakistan (GoP). 2014-15. Economic survey of Pakistan, economic advisory wing, finance department, Islamabad.

Govt. of Khyber Pakhtunkhwa. 2011. Crop reporting service Swabi, Khyber Pakhtunkhwa, Pakistan.

Jariko, A.G., M.A. Junejo, M.S. Rahpoto and Z. Shah. 2011. Socioeconomic factors affecting adoption of sunflower varieties in Sindh. Pak. J. Comm. Soc. Sci. 5(1):192-201.

Khoso, A.W. 1992. Crops of Sindh. Dept. of

Agronomy, Sindh Agriculture University of Tando Jam, 65.

Liberio, J. 2012. Factors contributing to adoption of sunflower farming innovation in Mlaliward, Mvomero District, Morogoro, Tanzania. A dissertation. University of Agriculture, Morogoro, Tanzania.

Lopes, H. 2010. Adoption of improved maize and common bean varieties in Mozambique. A thesis of Msc in agricultural, food, and resource economics. Michigan State University.

Morse, S., R. Bennett and Y. Ismael.2007. Inequality and GM crops: A case-study of Bt cotton in India. Agric. Biol. 10(1): 44-50.

National Agricultural Research Centre (NARC). 2009. Annual progress report of oilseed research program, Islamabad.

Nkamleu, G.B. and A.A. Adesina. 2000. Determinants of chemical input use in Peri-urban lowland systems: Bivariate Probit Analysis in Cameroon. Agric. Syst. 63: 111–121. https://doi.org/10.1016/S0308-521X(99)00074-8

Nowak, P.J. 1987. The adoption of agricultural conservation technologies: Economic and diffusion explanations. Rural Soc. 52: 208-220.

Rahman, M.S. 2011. Pakistan oilseed and products annual 2010. USDA Foreign agricultural service. Global Agricultural Information Network Report.

Sen, A. 2003. Un-nouveau modèle économique. Développement, justice, liberté (Development as Freedom, 1999), Paris, Ed. Odile Jacob.

Uaiene, R., N. Arndt and W.A. Masters. 2009. Determinant of agricultural technology adoption in Mozambique. Ministry of Planning and Development Republic of Mozambique. Discussion papers No. 67E.

Zavale, H., E. Mabaya and R. Christy. 2005. Adoption of improved maize seed by smallholder farmers in Mozambique. SP 2005-03, Department of Applied Economic and Management, Cornell University, Ithaca, New York.