Impediments to Technology Adoption: A Case Study of Peach Production in District Swat, Pakistan

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Abstract

It is widely accepted that the use of advance agriculture technology increases the yields and/or agriculture output. While the dominance of technology in the agriculture sector, the factors affecting the adoption and management of the various agriculture technologies cannot be ignored. Pakistan, like other developing economies, largely depends on agriculture. Therefore, it is quite surprising that like other developing countries, Pakistan is still struggling to access the modern advance agriculture technology of the 21st century. This paper deals with the questions vital to identify the factors affecting the use of appropriate and available agricultural technologies in Peach farming. Peach farming is the largest in terms of cropland use and the production in District Swat amongst other districts in the province of Khyber Pakhtunkhwa. However, in terms of productivity and yield, it is found significantly low concerning identified potential. An objective analysis is conducted to identify the available technologies and factors that affect the extent of usage in the sample farm households and communities. The collected data with the help of questionnaire was analyzed with frequency distribution, percentages and mean values. Empirically, aprobit model is used to determine the influence of different factors on the adoption of new technologies. It is revealed that the main factors that affect the level of the adaptation new technologies are the lack of information about new technologies and lack of credit services. The probit model indicated that there are significant links between lack of information, lack of credit funds, the high cost of fertilizers, lack of improved verities and adoption of appropriate technologies. Government intervention is highly needed to facilitate the access to technology and ensure the availability of inputs for the

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adoption of technology. The results and recommendations are indicative to take the appropriate measure for the development of peach farming and adoption of advance technology in the agriculture that could have taken to improve the yield and produce at its maximum potential for the benefit of masses.

Keywords: Agriculture, Technology, Agriculture finance, Agriculture technology

Introduction

Amidst growing food insecurity, the central role of agricultural sector in country's economy cannot be ignored. Pakistan being an agrarian economy, the sector plays a central role contributes around 21% to Gross Domestic Product and employs almost 45 %of labor force. While more than 60% of the country's population living in rural areas, the foremost income sources of the rural population is directly or indirectly related to agriculture. Besides that agriculture is the main supplier of inputs in the form of raw material to relevant industries, because of strong backward and forward linkages.

Contrary perhaps to perceptions, for Pakistan as a whole, the agricultural sector does not dominate the rural economy. Apart from the immediate and direct linkage of the rural economy's agriculture sector in the country's GDP, the rural economy also contributes significantly in the service and industrial sector GDP to an extent of 40.7 percent and 21.3 percent, respectively (SPDC, 2014).

Pakistan's agricultural sector is still dominant in the economy of Pakistan, despite unsatisfactory performance and highly volatile (mixed trends) in growth pattern (Memon et. al., 2008). The sector still unable to achieve the efficiency and sustainability in several agriculture produce for domestic requirements. There are many reasons behind the shortcoming like; lack of awareness of farmers, ignorance of policy makers and technological deficiency etc. (Ali et. al, 2008).

It is generally believe that the per hectare productivity of fruit orchard in Pakistan is low from other developed nations (Bakhsh, 2006). However, (Bourne, 1986) explain that for the minimization of post-harvesting losses, the use of proper facilities and technologies are very important. This study, therefore, is an attempt to understand the challenges related to factors affecting the adoption of technologies in fruit production. Amidst increasing climatic uncertainties, it is believed that without the use of appropriate modern technologies and adaptation, the growth in agriculture production may not be sustainable. Using micro-level approach, the research raises the main concerns of the farmers and other socio-economic constraints in adoption of new technologies and practices of agriculture production. District Swat in province Khyber Pakhtunkhwa, Pakistan is the centre and standalone geographic scope of the study. The selection is based on a noteworthy contribution of the district in the production of peach in the province. The arguments on farm-based technologies and practices are taken for the production of Peach (*Prunuspersica*), a China native fruit developed in Persia (Jahan and Khan, 2008). Peach is a fragile crop, which needs a lot of care and use of right technologies. Thus, it is important to understand the constraints and impediments to attain the production growth path in the peach farming in District Swat, province of Khyber Pakhtunkhwa, Pakistan.

The structure of paper follows from the introduction section and a brief description on the fruit – Peach. Relevant and selected literature on adaptation in agriculture and growing food insecurity is discussed in the review, followed by the methodological framework. Finally, the results and discussion surface the conclusion and policy recommendation.

Peach (Prunuspersica)

Among the stone fruits, Peach (*Prunuspersica*) is a rich edible juicy, citrusy fruit with thin but velvety skin. Alike other fruits belong to genus Prunus (cherry, apricot etc), a fresh peach is a good source of vitamins A and C, as well as contain potassium and fiber.

Peach grows in a limited range in continental or temperate climates. China is the major producer Peach in the world. In Pakistan, the production is largely dominated in the northern part in the province of Khyber Pakhtunkhwa having typical continental steppe climate.

District Swat is a valley and administrative district of the province Khyber Pakhtunkhwa, Pakistan. Besides other important aspects of river valley i.e. 'the princely state', 'the Switzerland of the east', green meadows and high mountains – the district is also known because of rich taste fruit productions. Almost half of the Swat's economy is based on horticulture and agro-based industries. Peach is the leading fruit among all categories of fruits grown in Swat. During the last few years, there has been an increase in the cultivation of peach trees – thus the increases the production of peach in the district. This is mainly because of high economic returns of the fruit due to its rich taste and presence of essential nutrients. Beside this, Peach sector provides employment to a large number of the people in the Swat valley. Table 1 exhibits the comparatively high and dominant share of district swat by area and production of Peach.

Table 1: Area and Production of Peach in Districts of Khyber Pakhtunkhwa

Name	Swat	Mardan	Haripur	Buner	Upper Dir	Peshawar	Nowsherea
Area	9263	924	924	272	245	200	185
Production	17625	3617	1018	1066	891	930	750

PHP	1.9027	3.9145	1.1017	3.919	3.6367	4.6500	4.0540

Note: Area represents in hectare while production in tons, where, (PHP) Per Hectare Productivity
Source: Khan et al (2014)

It is important to note that the per hectare productivity in the district Swat is half from the rest of the producers in the province with an exception of district Haripur. There are many reasons behind such low productivity and efficiency in the peach farming and are framed in the latter part of this research paper.

Technological Adoption in Agriculture
The poorest people largely belong to farmer community in the world and in particularly in South Asia and in sub-Saharan Africa. At the same time, agriculture is the mainstay as an income source and a potential source of employment in these regions. Amidst other steps to alleviate poverty in these regions, technological advancement and use of advance and modern technology in the agriculture sector would likely to play a major role in combating poverty. Modern technology has the potential to improve productivity and yield, reduces the risk to uncertainties and may also improve and keep the nutritional balance and quality of food (Jack, 2013).

Macours (2014) reviews the challenges and constraint in adoption of modern technologies in the agriculture sector. The author used the micro-level approach to understand the farming practice and production challenges in the developing economy of Nicaragua. The paper provided arguments on the complexity of understanding the adoption and adaptation decision and shed light on the underlying decision processes. The paper also evaluates the impact the innovative program by the government '*Atención a Crisis'* in response to drought shock in the poor rural municipalities of Nicaragua. An important finding reveals that while farmers recognize the risks associated with agriculture i.e. the climate uncertainty, they still continue to invest without any adaptation for changing climatic patterns. Thus, it is important to have outside interventions to affect adoption decision of farmers.

Singh et. al. (2013) carries a socio-economic stud on adoption of technology in the agriculture sector of Bihar state in India. They mainly focus on the level of adoption, access to farm technology, the agriculture institutional framework. They found that institutional coverage of agricultural development is limited; however, the line departments associated with the transfer of farm technology are successful in their work. Land holding is one of the main constraints behind limited use of modern farm technology. Improvement in the knowledge of farmers regarding the use of modern technologies is also suggested by authors. The paper reveals that the adoption of farm technology is a key input for the robust growth in the agriculture sector. They found more than three-fold increase in productivity with the use modern technologies.

Foster et. al. (2010) discusses the impact of technological adaptation on per-capita GDP and wages across countries. They examined the micro studies that focus on the understanding the adoption process. The paper emphasizes that the adoption and efficient use of modern technology that contributes to the development of the economy. Thus, a better understanding of constraints to technological adoption is useful in understanding a major component of growth. Analyzing the existing literature they suggested that education is not only a key to facilitate the acquisition and efficient use of modern technologies but also affects the decision process for adoption. Beside this, credit availability has also impact on adoption to technology, particularly among the relatively poor segments of the society.

Naved (2006) provides qualitative discussion on the intra-household impact of the transfer of modern agriculture technology in Bangladesh. Gender perceptive is the cross-cutting theme in the relative bargaining power of household members. The paper mainly compares the effects of agriculture programs targeting at improving women's household income. The adoption of technology in fish production assures better results.

Mariam et. al. (1993) analyzes the production efficiency and technological adoption in Ethiopian agriculture. Using stochastic frontier production function they revealed that farmers who adopted have relatively higher efficiency in cereal production besides other comparative advantages. They also revealed that the impact of production knowledge and education are higher relative to other variables. The study recommends the intervention strategies for the use of technology in agriculture that may contribute to increase in production vis-à-vis conventional approaches to low and inefficient production.

Methodological Framework and Data Collection

As explained in the previous section, the study is an attempt to understand the challenges and constraints to improve production efficiency in the peach farming. Based on primary data collection, the geographical coverage is limited to District Swat mainly because of two reasons – one is the financial and resource constraint and the second major reason is the low productivity despite having a dominant share of peach production amongst other producers in the province.

Data Collection

Primary data both qualitative and quantitative is collected from the survey of farm household in the most productive tehsil of the valley include Barikot, KhwazaKhela, Matta, Charbagh, and Kabal. A total of

50 farm households were selected for data collection i.e. on average 10farm households from each tehsil. Detail interviews were also conducted with key individual and experts on the subject. Along with this information was also collected from the other stakeholders including NGOs and relevant government authorities in the district. A checklist was prepared prior to have dialogues and detailed interviews. Secondary data was collected to support the qualitative arguments and the primary data collected from the government sources as well as from the newspapers and journals on the subject. Following table exhibits the distribution of respondents:

Table 2: Distribution of Respondents

Information sources	Frequency	Percentage
NGOs	04	08
Secondary Data Collection	04	08
Farm Households	42	84
Total	50	100

Variables

The rate of adoption of new technologies matching with peach production, technologies which were taken to assess the rate of adoption are: tractor, power spray, harvesting kit, pruning kit, proper, use of pesticides, insecticides, and tools for identification of disease, insects and nutrition deficiency. The rate of adoption was measured by the degree of the use of these technologies by the farmers in peach production. On the other side, variables are the factors that influence the level of adoption such as knowledge and information, the high cost of technologies, credit facilities, age, education, mobile use, gender, and occupation.

Data Analysis

Both descriptive and inferential statistical tools were used in this study, the descriptive statistics consist of mean values, percentages, and frequency distribution while for inferential statistics; we used the probit model to determine the influence of factors influence on adoption of new technologies. Following table (Table 3) explains the variable description and measurement means:

Table 3: Measurement and explanation of variables

Variable	Type	Explanation	Data source
Tractor	Binary	Use of tractor (1 when farmer used tractor, 0 otherwise)	Questionnaire
Power spray	Binary	Use of power spray (1 when farmer use power spray,0 otherwise)	Questionnaire
Harvesting kit	Binary	Use of harvesting kit (1 when farmer use harvesting	Questionnaire

		kit, 0 otherwise)	
Pruning kit	Binary	Use of pruning kit (1 when farmer use pruning kit, 0 otherwise)	Questionnaire
On time and proper use of pesticides, insecticide and fertilizers	Binary	Proper use of pesticides , insecticides and fertilizers on time (1 when farmer use pesticides, insecticides and fertilizers on time, 0 otherwise)	Questionnaire
Information	Binary	Availability of Information (1 when information available to the farmer, 0 otherwise)	Questionnaire
High cost of technology	Binary	(1 when technology cost is high for the farmers, 0 otherwise)	Questionnaire
High cost of inputs	Binary	(1 when input cost is high for the farmers,0 otherwise)	Questionnaire
Mobile use	Binary	(1 when framer use mobile, 0 otherwise)	Questionnaire
Education	Binary	(1 when farmer is educated, 0 otherwise)	Questionnaire
Age	Continues Variable	Not Applicable	Questionnaire
Gender	Binary	(1 when farmer is male, 0 otherwise)	Questionnaire

Empirical Framework

As we know that our dependent variables are binary variables: use of the tractor, power spray, harvesting kit, pruning kit, and on time and appropriate use of pesticides, insecticide, and fertilizers. Therefore, we applied the probit model to identify the factors which help to encourage the use of new technologies in peach production. In the probit model a positive association between dependent and explanatory variables indicates that an increment increase the explanatory variable will raise the probability of having using new technologies in peach production vice versa. As we know that our dependent variables are binary, hence, we have used the probit model to estimate the regression because the OLS estimation method yields inappropriate results, when we observe 0 and 1 values for dependents variables. Therefore, we specified the model of our study in the following way.

$$Y_i^* = \alpha_0 + \alpha_1 x_{1i} + \alpha_2 x_{2i} + \alpha_3 x_{3i} + \alpha_4 x_{4i} + \alpha_5 x_{5i} + \alpha_6 x_{6i} + \mu_t \qquad (1)$$

Where:

$Y_i = 1$ if

$Y_i = 0$ Otherwise

In our case all of the explanatory variables are also binary variables $x_{1i}, x_{2i}, x_{3i}, x_{4i}, x_{5i}, x_{6i}$

$$\Pr(Y_i = 1) = \Pr(\alpha_0 + \alpha_1 x_{1i} + \alpha_2 x_{2i} + \alpha_3 x_{3i} + \alpha_4 x_{4i} + \alpha_5 x_{5i} + \alpha_6 x_{6i} + \mu_i > 0) \quad (2)$$

$$\Pr(Y_i = 1) = \Pr(u_i > -(\alpha_0 + \alpha_1 x_{1i} + \alpha_2 x_{2i} + \alpha_3 x_{3i} + \alpha_4 x_{4i} + \alpha_5 x_{5i} + \alpha_6 x_{6i})) \quad (3)$$

$$= 1 - \Pr(u_i > -(\alpha_0 + \alpha_1 x_{1i} + \alpha_2 x_{2i} + \alpha_3 x_{3i} + \alpha_4 x_{4i} + \alpha_5 x_{5i} + \alpha_6 x_{6i})) \quad (4)$$

$$= 1 - F(-(\alpha_0 + \alpha_1 x_{1i} + \alpha_2 x_{2i} + \alpha_3 x_{3i} + \alpha_4 x_{4i} + \alpha_5 x_{5i} + \alpha_6 x_{6i})) \quad (5)$$

In the above equation F represent the cumulative density function of the variables u. As we know random term is normality distributed then:

$$\Pr(Y_i = 1) = 1 - \phi(-(\alpha_0 + \alpha_1 x_{1i} + \alpha_2 x_{2i} + \alpha_3 x_{3i} + \alpha_4 x_{4i} + \alpha_5 x_{5i} + \alpha_6 x_{6i})) \quad (6)$$

$$= 1 - \phi(-X_i \alpha)$$

$$= \phi(X_i \alpha)$$

Where ϕ denotes the cumulative normal distribution function. The coefficients of these models are asymptotically efficient we can estimate the coefficients of the model with the help of maximum likelihood techniques; moreover these coefficients cannot be interpret like OLS coefficients.

Results and Discussions

Descriptive Profiling

It is important to note that no female farmer is selected in the sample due to some cultural restrictions. The majority of farmers are found mature and independent in making decision and observations on the peach production in their farm fields. Approximately 70 percent of the farmers have more than a decade experience of farming and working in the field. The age profiling of the respondents provided comfort as more than 75 percent have sufficient experience in the field of agriculture and are more than 35 years old. Thus, the average age of the farmers in the sample stood at 44 years. The table below (Table 4a) exhibits the farmers' profile and relative frequencies.

Table 4a: Respondents Profiling

Profile / Characteristics			
Age	Percentage	Experience	Percentage
25-35	24	<10	30
36-45	40	11-20	62
46-55	24	21-30	08
56 and above 60	12	>30	00
Sex	Percentage	Marital status	Percentage
Female	000*	Single	16
Male	100	Married	84

*Note: *female also actively participating indirectly in production activities like making food, tea and other indoor production activities. However, they are not engaged with the production activities directly.*

Formal education is found satisfactory in the farmers of district Swat; however, the level of education is largely limited to primary level (60 percent). Of the total farmers, 20 percent have completed middle education, while 15 percent have completed secondary education. Only 5 percent of the farmers have completed intermediate education (Table 4b).

Agriculture is the main source of income as earning impetus of farm households is largely dependent on single source i.e. farm income which is mainly peach farming. Only 10 percent of the farmers reported income from sources which are government service (2 percent), trading of peach (2 percent) and other sources (4 percent).

Table 4b: Socio-Economic Profiling

Socio-Economic Profile / Characteristics	
Education	Percentage
Non-formal education	00
Primary	60
Middle	20
Metric	15
FA/ FSc	05
And above	00
Occupation	Percentage
Farming	90
Trading	04
Government Servant	02
Others	04

Farm size	Percentage
<3	6
3-6	36
6-8	40
>8	18

A mixed pattern of landholding with respect to size is observed, more than 75% of farmers landholding size ranges between 2 acres to 9 acres. The average landholding size is reported 6 acres in the group. Thus, peach farming is found on a small scale with respect to landholding size by most of the farmers. The landholding below 3 acre is only found with 6 percent of farm households in the sample (Table 4b).The maximum land size is found 25 acres in the sample, which is reported by very few i.e. less than 10% of the respondents. It is important to note that ownership of farm is reported by more than 75% of farm households, which is an important aspect of decision making in farming practices.

Almost all farmers have the mobile facility, mobile phone is very important to get information related to market demand, prices, effective and timely communication and transportation etc. Table 4c shows that more than 85% of the farmers have access to mobile phone service, of them 70% of the farmers are able to send and received Short Message Service (SMS). This reveals that having primary education make possible a person to use the basic utilities with respect to communication via mobile phone.

Credit services and farm financing are found limited for farmers in District Swat. Zarai Taraqiati Bank Limited (ZTBL) is a dedicated development financing bank to serve the needs of the farming community for modern agriculture technology and loans in Pakistan. Despite having ownership of farm lands by 70 percent of the farmers, only 5 percent reported a financing service from the legal credit services. While 35 percent of the farm households, have reported access to informal loans from family and friends. Peach farming by farm households is largely based on self-financing in the sample (60 percent) that may have an impact on the use and affordability of modern agriculture technology in farming practices (Table 4c).

Table 4c: Access to Utilities / Services

Selected Utilities / Services			
Mobile	Percentage	Loan	Percentage
Using Mobile	86	Self-financing	60
Not Using	14	Family and friends	35
		ZTBL	05

In the modern competitive agricultural environment for profitable agriculture ventures, attainment of the latest information is quite essential about new agricultural technologies, farming techniques and market situation, all these help the farmers to enhance production efficiently and sustainability in production. Despite having access to communication services, the farmers have reported that the source of information related peach farming is largely family and friends (65 percent). This reveals the weak institutional framework in the district Swat and limited role of Agriculture extension department in the district. Other stakeholders in the district also have limited but effective role to some extent as 19 percent of the farmers have linkages with local NGOs providing them the information on agriculture practice and other market information. Despite high literacy in the sample, the print and media access is found limited as 12%of farmers reported their source of information is newspapers, radio, and television.

The previous discussion reveals that lack of access to reliable and authentic technical information with respect to farming activities and practices is affecting the adoption capacities of farmers. In the absence of agricultural extension services, farmers are unable to cope with the emerging challenges and adopt the modern technology. On the other side, inadequate and limited access to credit facility hinders the adoption of appropriate technologies for peach farming. Other factors affecting adoption capacity of farmers is the high cost of pesticides, insecticides and fertilizers and unavailability of improved seed varieties of peach. The latter aspect reveals the sluggish performance by agriculture extension department in the district.

Table 5: Factors Affecting Adoption of Appropriate Technologies

Factor	Percentage
Lack of information	90
Inadequate credit facilities	82
High cost of fertilizer	70
Unavailability of improved varieties	50

Considering the importance of agriculture amidst high food insecurity and growing population, thus the advancements in the agricultural technology are found most revolutionary in the modern technology.[1]Across the globe, farmers' community is found to be the most innovative community due to their continual and ongoing shift from manual agriculture practice to most advance agriculture technologies. Today, modern farmer's tool box contains everything which is required for automated field farming includes auto-pilot tractors, biotechnology, GIS and GPS system, and crop sensors etc.

[1]http://www.newworldencyclopedia.org/entry/Agricultural_technology

Despite being an agrarian economy, the access to modern advance agriculture technology is found very scarce across the country. In fact, farmers community in Pakistan are still using the agricultural technology which is now obsolete and do not come under the umbrella of 21st-century modern advance technologies. Despite this, the farmers have limited access to moderate and obsolete agriculture technology and using tools which are less effective for increasing yield and productivity. It is revealed from the key informants as well as from the farmer community that a significant amount of production is lost in the form of pre and a post-harvest loss, in addition of this, the growth of the peach sector is limited due to the lack of accessibility to new technologies and production methods.

To assess the appropriate technologies which are currently used in peach production, we have taken the available technology and their accessibility in the sample farmers. These technological tools include tractor, harvesting kit, pruning kit, power spray etc. Use of pesticide, insecticides and fertilizers are also taken as a proxy for adoption of new tools in the agricultural farming in the sample. Table 6 below reveals that despite the technologies reported are obsolete; still the farmers have limited access to these technologies. With an exception of Tractor, harvesting kit and pruning kit, all other inputs and tools are relatively found inaccessible to peach farmers in the district. The former tools and technologies i.e. Tractor, harvesting and pruning kit are accessible to farmer community in the sample mainly because of the government incentives and scheme during the last one decade.

According to experts, the proper use of pruning kit is very important for the desired growth of flowers, fruits, and plants but unluckily this technology is the least employed by the farmers, only (12%)of the farmers use pruning kit. As evident from the results in the table below (Table 6), incremental efforts should be made by the government to promote the usage of modern technology to get maximum fruit yield. It is important to note that despite high subsidies provided for the use of pesticides, insecticides, and fertilizers in Pakistan, almost half of the peach farmers do not use it in Peach farming.

Table 6: Adoption Level of Technologies in Peach Production

High Use of Technology		Moderate / Low Use of Technology	
Technologies	Percentage	Technologies	Percentage
Use of tractor	95	Power Spray	47
Harvesting kit	78	Use of pesticide	50
Pruning kit	12	Use of Insecticides	50
Appropriate Spacing	58	Use of Fertilizers	50

Empirical Results

Applying the empirical probit model[2] for the use of moderate technologies as discussed in the previous section, used to identify the factors which help to encourage technologies in the peach farming. A positive association reveals the increment increase in the explanatory variable will raise the probability of using respective identified agriculture technology in Peach production. Table 7 below exhibits the results of probit model for different technologies identified by the peach farmers in the sample.

Table 7: Probit Model – Factors Affecting Technology Adoption

Regression	(1)	(2)	(3)	(4)	(5)
Variable	Tractor	Power spray	Harvesting kit	Pruning kit	Use of PIF
Constant	2.5827	3.6801	2.2107	2.0207	1.0040
Information	0.1781*	0.1502**	0.2207	0.6844*	0.1201*
High cost of technology	0.0003	0.0068*	-0.0231*	-0.994	-0.0194*
Training	0.0001*	0.0091	0.1804**	0.6510**	0.0130
Mobile use	0.3300*	0.146*	0.010	0.0012*	0.2808*
Education	0.0911	0.1350*	0.1135*	0.1541*	0.0057*
Experience	0.2776*	0.005*	0.1082*	0.0700	0.0921*
Pseudo R-square	0.1821	0.289	0.2100	0.121	0.110

Note: (PIF) Pesticides, Insecticide and Fertilizers; $**p<0.05$, $*p<0.10$.

The results of the regressions found the effectiveness of 'information and knowledge' in the use of modern and advance technologies in the Peach farming. Except for harvesting kit, all other technologies have a positive significant effect of information on their use. Although there is a high subsidy on the use of technology and other chemical and fertilizers by the government, still farmers feel that the subsidy is not sufficient with respect to the production cost, product prices, and inflation. The high cost of technology is negatively associated to the harvesting kit, pruning kit and on time and appropriate use of pesticides, insecticides, and fertilizers. That is why the per-hectare productivity of Peach in the district is low because of relatively less access to new technologies and production methods.

Education is found positively correlated with all technologies, as without having basic information on how to use the technology there would be negative impact on farming practices, Therefore, education explains the use of technology amongst all farmers who are 100 percent literate and can use basic information services effectively. Education is

[2]*Dependent variables are binary*

positively connected to tractor, power spray, harvesting kit and strongly associated with pruning kit and on time and appropriate use of pesticides, insecticides and fertilizers. The strong association with the pruning kit is highly necessary because of the sensitive and soft nature of fruit structure.

Conclusion

Overall the survey peach farming households and communities were found to have very limited adoption of agriculture technologies; in fact they have only access to obsolete agriculture technologies. This is mainly on the back of weak financial resource, and relevant knowledge and accessibility to such modern advance agriculture technology. Therefore, it is highly important to promote and assist for acquiring and use of modern agriculture technology to increase the yield and productivity of peach and to achieve the potentiality and sustainability of the fruit.

The result shows that the most important factors that influence farmers' adoption of new technologies are; lack of appropriate information, education, cost of new technologies, cost of fertilizers. All of these reflect the limited outreach of government departments and agriculture extension to peach farmer communities in the district Swat. The institutional environment for the adaptation of modern technology in the agriculture in particularly peach farming in district Swat is found relatively ineffective. In order to get massive output, the government must ensure the provision of necessary information to peach farmers through different means of communication. It will be quite beneficial if the government provide interest-free loans, storage system and arranged training on capacity building programs for the peach farmers in district Swat. Moreover, the government should ensure the timely and quality inputs supply to the peach farmers. Specific programs are needed for peach farming communities to make the livelihood sustainable and extract the potential output of peach farming in the district.

The role of agriculture department and print media, NGOs is negligible in support of farmers and promotion of peach production, thus an active role is required from all these sources for the betterment of the farmers. Strong coordination is required amongst the public and private stakeholders with the involvement of farming communities. There is a need to develop and design the communication system via mobile phones in vernacular languages and comprehensible format for effective outreach for information and other related communication on farming practices. The current communication system is not found ineffective, and inadequate, in fact it is failed to reach the farming communities successfully.

The results and recommendations are indicative to take the appropriate measure for the development of peach farming and adoption of advance technology in the agriculture that could have taken to improve the yield and produce at its maximum potential for the benefit of masses.

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