LINKING FINANCIAL MARKET AND FARM & FARMERS' FEATURES FOR ADOPTION OF NEW FARM TECHNOLOGY A CASE STUDY OF D.I.KHAN DISTRICT OF KHYBER PAKHTUN KHAWA (PAKISTAN)

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ABSTRACT

Agriculture is not only the spine of our food, livelihood and environmental security system, but is also the very soul of our dominion. In Pakistan population mass is high and has been increasing day by day and agricultural land has been decreasing because of fragmenting or converting it into residential plots. Also in study area Dera Ismail Khan, technical know how of farmers limited. Farming was run mostly on primitive lines and yield per acre were low. To meet the domestic food requirements use of improved production technologies developed by research is must specially in adoption of improved seeds, fertilizers and pesticides. In this behalf government of Pakistan has been extending loan to poor farmers for adoption of new farm technology, a capital intensive technology. Also adoption depends upon several determinants. Therefore objective of the paper was to see which farms and farmers' features are helping in adoption of new farm technology that may guide financial market to extend loan to whom.

INTRODUCTION

Mellor (1966) agriculture is the main fountain of food, raw material, labor, capital, foreign exchange, and a market for other sectors. It is the life force of all steps of economic development. Gustavo *et al.*,(2006) two third population of Pakistan live in rural areas and are attached with farming and its linked activities. Therefore Agriculture is an important sector in Pakistan's economy, accounting for a quarter of gross domestic product (GDP) and roughly two-thirds of exports value. Olagunju, (2007) the credit facilities enable poor farmers to employ higher resource and capacity utilization. Output is increased and hence income. In this way poverty in rural areas is reduced.

Dera Ismail Khan Division lies in the arid zone of Pakistan and is located in the extreme south of the Khyber Pakhtun Khawa (KPK) Province at the bank of river Indus. It lies on 71.07 longitude and 31.57 latitude and 500 m above the sea level. Out of total geographic area of 0.73 million hectares only 0.24 million hectares area is cultivated. About one third of the cultivated area is irrigated by means of Chashma Right Bank Canal,

tube wells and centrifugal pumps etc. Other two third depends on rainfall and hill torrents for its moisture requirements. The land is hard clay and sandy loams to sandy calcareous in nature, deficient in organic matter, nitrogen, and phosphorus and adequate to marginal in potassium. The climate is arid to semi arid and is hot and dry in summer with moderate spells during monsoon season. Agriculture is the main stay of peoples of this area. Seventy five percent of populations derive its earning directly or indirectly from agriculture.

Statement of the problem

This study was designed to elaborate the farm and farmers' features helpful in adoption of new farm technology that guides financial market whom to extend loan "a case study of D.I.Khan district of khyber pakhtun khawa" (Pakistan)

Literature Review

The claim yield rising factors and implementation of new farm technology can be realized by knowing the socio economic status of the farmers. Different interrelated factors within the environment in which farmers operate influence adoption of modern agricultural technologies differently. For example Robert Kalyebara (1999); Uaiene *et al.*,(2009***)*** found deficient in financial support, imperfect access to information, insufficient farm size and human capital, lack of enough farm equipments, disordered supply of complementary inputs and inappropriate transportation infrastructure as key constraints in the way of adoption of innovations in farming in less developed countries. All socio economic factors were found not equally important in different areas and for different farms and farmers' characteristics. The variables most commonly included in this category were age, education, and house hold size, land holding size, and livestock, ownership and like other factors that influenced adoption of new farm technology. Farmers who had big farms were able to purchase improved farm technologies and could bear risk if the technology failed. This was confirmed in the case of fertilizer by Hassan *et al.*,(1998); Stello *et al.*,(2001).

Farm size did not matter in adoption of new farm technology Aloyce *et al.*,(2000). Adunni *et al.*,(2007); Uaiene *et al.*,(2009***)*** advocated that farmers with

small land holding were more adoptive in producing food grains. This suggested that obtaining increased yields from a small piece of land dictated only through the adoption of latest farm technology. Zubair, (2002) and Baloch *et al.*,(2004) reported that younger farmers were more responsive to latest technologies. Older the farmers less the probability of adopting innovations in farming (Bauer *et al.*,2007).

The role of education in adoption of new farm technology had been discussed at length in the literature. Education enhanced the locative ability of decision makers by enabling them to think critically and use information sources efficiently. Farmers with more education were aware of more sources of information, and more efficient in evaluating and interpreting information about innovations than those with less education (Wozniak 1984). Education positively affected adoption of improved maize varieties (Alene *et al.*,2000; Ebenezer *et al.*,2004; Uaiene *et al.*,2009***)***. New farm technology adoption increased with the increase in years of schooling. (Bauer *et al.*,2007).

Age of the household head is an important factor affecting adoption of new agricultural technologies. The conventional approach considered age to be negatively related to adoption of new farm technology with conjecture that with age farmers become more traditional and less acceptable of new ideas. On the other hand, it is also argued by many researchers that with age farmers gain more experience and acquaintance with new technologies and hence are expected to have higher ability to use new technologies more efficiently. Hence age is an important determinant of adoption of new farm technology (Stella *et al.*,2001; Fufa and Hassan 2006). Aloyce *et al.*,(2000); Ebenezer *et al.*,(2004) found no role of age in determining adoption of new technology.

Family size also affected the taking up of new farm technology. It caught up the adoption of technologies in areas where farmers were very poor and used financial support for other family commitments with little left for purchase of farm inputs (Adunni sanni *et al.*,2007). On the other hand it was proved an incentive for adoption of new technologies as more agricultural output was required to meet the family food consumption needs (Yohannes *et al.*,1990) or as more family labor was required for adoption of labor intensive technologies (Stella *et al.*,2001;Fufa and Hassan, 2006).

Adoption of new agricultural technologies depends on a number of institutional factors. The introduction of

new technologies created demand for information useful in making adoption decision (Wozniak, 1984). Agricultural extension organizations provide useful information about new agricultural technologies. Access to such sources of information can be fundamental in adoption of improved varieties (Robert, 1999; Ebenezer *et al.*,2004; Uaiene *et al.*,2009***).***

Furthermore, risk associated with the adoption of agricultural technologies was another important factor in adoption decision (Parikh et al,1995; Hassan *et al.*,1998; Shiyani *et al.*,2002 ;).Farm type was also considered in decision making for adoption of new farm technology Aloyce *et al.*,(2000); Fufa and Hassan (2006) found that more rainfall zone significantly influenced adoption.

Methodology

Primary data from 320 farmers who participated in farm credit were collected using stratified sampling technique on farm and farmers' characteristics affecting adoption with the help of structured questionnaire and interview as used by many researchers such as (Nunung *et al.*,2005, Oladosu, 2006). Regression analysis was applied to know cause and effect as worked by (Oladosu, 2006; Olagunju, 2007).

Modeling

The General Linear Model is frequently estimated using ordinary least square one of the most widely used analytic techniques in social sciences (Cleary and Angel 1984). Most of the statistics used in social sciences are based on linear models, which means trying to fit a straight line to data collected. Ordinary least square is used to predict a function that relates dependent variable (Y) to one or more independent variables (x_1, x_2, $x_3 \ldots x_n$). It uses linear function that can be expressed as

$$Y = a + bX_i + e_i \qquad \text{Where}$$

a Constant
b Slope of line
X_i Independents variables
e_i Error term

Hence to assess contribution of different determinants in wellbeing due to intervention in farm credit Linear Regression Model was expressed as follow:

Adoption (Y) = a (Constant) + bX_1 (Occupation) + bX_2 (Marital Status) bX_3 (Farm Type) + bX_4 (Farm status) + bX_5 (Age) + bX_6 (Education) + bX_7

(Farming Experience) + bX_8 (Dependence) + bX_9 (Farm size) + bX_{10} (Nos of times credit attained) + bX_{11} (Tenancy status) + e_i (Error term)

A second model was developed to see changes in the impact of independents variables on dependent variable adoption by inclusion of numbers of purpose of using loan, modes of repayment, and sources of loan and extension services and also impact of new including independent variables.

Adoption (Y) = a(Constant) + bX_1 (Occupation) + bX_2 (Marital Status) + bX_3 (Farm Type) + bX_4 (Farm status) +bX_5 (Age) + bX_6 (Education) +bX_7 (Farming Experience) bX_8 (Dependence) + bX_9 (Farm size) + bX_{10} (Nos of times credit attained) + bX_{11} (Tenancy status) + bX_{12} (Nos of purpose of using loan) + bX_{13} (Mode of repayment)+X_{14} (Sources of loan) +bX_{15} (Extension services)+ e_i (Error term)

Analysis and Interpretation

The estimated coefficient from a regression model, standard error, F-statistics (test the null hypothesis) are given in table1.

Table 1 Regression impact of different variables on adoption (model a)

Model	R	R Square	Adjusted R Square	F	Sig.
1 **Independent variables**	.57	.334	.311	14.069	.000

	Unstandardized Coefficients		Standardized Coefficients		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	7.603	1.311		5.801	.000
Age (years)	-.040	.027	-.111	-1.478	.140
Education	.001	.048	.001	.017	.986
Occupation	2.693	.405	.346	6.653	.000
Nos of dependents	-.236	.063	-.186	-3.768	.000
Marital status	-1.663	.519	-.170	-3.204	.001
Farm size (acres)	.000	.000	-.059	-1.247	.213
Farm type	-1.401	.482	-.139	-2.906	.004
farm status	-3.444	1.007	-.300	-3.421	.001
Tenancy status	-.190	.998	-.017	-.191	.849
Farming experience	.024	.025	.070	.990	.323
NTCA	.352	.105	.174	3.348	.001

Six out of eleven variables included in the model were found significant. These variables were occupation, family size, marital status, farm type, farm status and numbers of times credit attained. From

the analysis null hypothesis was rejected and it was confirmed that different farm and farmers characteristics collectively were important in the use of farm credit for agricultural productivity. The value of F-statistics 14.069 in the table indicates that the explanatory variables included in the model collectively had significant impact on adoption. The high R^2 and Adjusted-R^2 values 0.33 and 0.31 respectively suggest that over 30 percent variations in the adoption were explained by the explanatory variables included in the model. The coefficient for occupation and numbers of times credit attained was positive and significant at 0 percent level and 1 percent level respectively suggests that occupation and numbers of times credit attained affected adoption positively. Remaining explanatory variables in the model were significant but affected adoption negatively. After inclusion of NPUL, MOR, SOL and AIS in the model age and farming experience became significant while marital status became insignificant. Also NPUL, SOL and AIS significantly influenced adoption (table 2).

Table 2 Regression impact of different variables on adoption (model b)

Model	**R**	**R Square**	**Adjusted R Square**	**F**	**Sig.**
1	.628	.394	.364	13.188	.000
Independent variables	**Unstandardized Coefficients**		**Standardized Coefficients**		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	6.158	1.312		4.695	.000
Age (years)	-.047	.026	-.130	-1.782	.076
Education	.009	.046	.012	.195	.845
Occupation	1.984	.424	.255	4.679	.000
Number of dependents	-.228	.061	-.179	-3.720	.000
Marital Status	-.780	.545	-.079	-1.430	.154
Farm Size (acres)	.000	.000	-.057	-1.252	.211
Farm Type	-1.815	.481	-.180	-3.772	.000
Farm status	-3.100	.984	-.270	-3.149	.002
Tenancy Status	-.362	.981	-.032	-.369	.712
Farming experience	.056	.025	.161	2.293	.023
NTCA	.258	.104	.128	2.479	.014
NPUL	.410	.121	.213	3.389	.001
MOR	.174	.242	.037	.717	.474
SOL	-.537	.260	-.127	-2.062	.040
Agricultural information	.176	.053	.165	3.318	.001

Age became significant with negative coefficient at 7% significant level. Farming experience became positively significant at 2% level. Numbers of purpose of using loan and agricultural information system positively affected adoption at 1% level. Sources of loan negatively affected adoption at 4% level.

CONCLUSION

From the findings of present survey it is concluded that different farm and farmers' features used in the model were collectively important in explaining impact on adoption. But effect of occupation ,family size, farm type ,farm status farming experience numbers of times credit attained, numbers of purpose of using loan, availability of loan providing sources and extension workers guidance is more significant. R^2 = 0.394 and adjusted R^2 = 0.364 were also distinctive in explaining impact. It means that 1 % change in the above variables brings a change of 40% in the adoption of new farm technology that guides financial markets to extend loan to the farmers of these features that can bring a change in farming mode to increase productivity and causes economic development of the area.

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