Journal of Scientific Research and Development 2 (1): 62-66, 2015
Available online at www.jsrad.org
ISSN 1115-7569

Investigating the reasons for non-acceptance of new machines by wheat growers in Nadia County

Uosof Baladi [1], Mohammad Aghapour Sabbaghi [2,*]

[1]*MSc student of Department of Agricultural Management, college of Agriculture, Shoushtar Branch, Islamic Azad University, Shoushtar, Iran*
[2]*Assistant professor of Department of Agriculture Management, college of Agricultural, Shoushtar Branch, Islamic Azad University, Shoushtar, Iran*

Abstract: According to investigations, in most provinces of the country, the usage of machines input is less than optimal point and its consumption was less than optimal. Due to lack of willingness of wheat growers in Nadia County to machinery for culturing wheat, in a case study, has been discussed the reasons for this rejection. For this purpose, the Logit model has been used as a model for data analysis. The required data for this research, in 2013, has been collected by a questionnaire and using Cochran formula for 150 wheat growers. The findings show that the acreage, education, income in last year, facilities, attending in educational classes, the ratio of water to dry lands; have a positive effect on the adoption of new machinery. But the variables of experience and land fragmentation have a negative impact on the adoption of new devices in the study area. Adopting policies to enhance the ownership of farmers, land consolidation, conducting training classes and increased levels of irrigation lands compared with dry lands in the study area, are among suggestion to increase the acceptance level of mechanization in the study area.

Key words: New machinery; Wheat growers; Andika County; Logit model

1. Introduction

Agriculture requires a rapid transition from traditional and economical production stage to the level of industrial and commercial production stage in order to achieve food security. Therefore, it is necessary to renew it in all aspects through adopting expertise measures. Technological development and its applications are among most important measures that should be noticed to renew agricultural sector. To improve the quality and quantity of production and competition in the agricultural products market, the sector's actors - both governmental and non-governmental- are forced to adapt themselves to the conditions which are derived from the use of novel technologies. The mechanization of agricultural activities is one of the manifestations of technology. Mechanization is one of the main factors in the agricultural development and essentially is vital as an approach to transform the agriculture sector into the industrial and commercial production stage (Bagheri and moazen, 2006). Thus, changes in the level or type of mechanization, increasingly affect the amount of produced yields per unit area, provided that it won't lead to eliminate or at least reduce restrictions on the way to achieve the production capacities and be applied based on other inputs (Alizadeh and Naini, 2009).

Given the important role of mechanization as an essential element and a major driver of agricultural development to meet the diverse needs of producers on the one hand and consumers, on the other hand (both within and outside the country) and also with regard to the fact that the agricultural sector is of a significant role in the country's economy (Pishbin et al., 2006) it is necessary to consider the use of this new technology in agricultural macro planning by all planners of the different subsectors of agriculture and research (Kohansal and Mansoori, 2013).

In Iran, during last decades, agricultural machinery entered to various stages of production and has been an integral part of agriculture. But over the years, the supply of agricultural machinery has been faced with difficulties and ups and downs that these problems not only caused the failure of the mechanization of agriculture, but also even in many cases have not covered depreciation of machinery. According to investigations, in most provinces of the country, use of the machines input is less than optimal point. So in these regions, workforce must be replaced with machinery in order to increase profits in production (Amjadi and Chizari, 2006).

Andika County in Khuzestan Province, which supplies about 65 percent of the province's total wheat production, is not exempt from these problems. In this county the total arable farming area is 33 thousand hectares that due to the shortage of planting and harvesting machinery (combine), each year, only 25 thousand hectares are utilized.

* Corresponding Author.

According to reports, the number of existing and active combines in the county is only two, therefore, in recent study, the object is investigating and determining the factors affecting the denial of machines by wheat farmers in Andika County.

2. Research method

The present study is a theoretical- applied research and is causal-relational in terms of methodology and has been conducted as a survey. Among a total of 300 persons of wheat farmers in Andika County, in 2013, 150 people of them were selected to complete a questionnaire. To investigate the non-acceptance of machines by wheat farmers in the Andika County, the dual models are used in this study. In this case, there is a random variable which has zero and one values. In these models, occurrence of a particular case for i-th sample is shown by the random variable Yi that in the time of occurring the predicted event, the value one and otherwise the value zero is took into account.

However, giving the value zero to each variable when things do not happen and the value of one for the event can be an opposite case (Aghapour et al., 2009). If Pi is the probability of yi = 1, then Pi-1 is likelihood of Yi =0 (Salami and Mohtashami, 2005).

In the case of the present study, if we assume that Xi shows the vector of variables which are effective on the acceptance and rejection by the i- th individual and β is the vector of parameters associated with each variable, then we can consider the following relations to address the factors affecting the probability of acceptance as following:

$$prob(Y_i = 1) = F(\beta' X_i)$$
$$prob(Y_i = 0) = 1 - F(\beta' X_i) \qquad (1)$$

To transform the $\beta' X_i$ Index into the likelihood, on of probability distribution functions must be used. The normal distribution and the logistic distribution are two common distributions in this area. The normal distribution function is the basis of the logistic distribution function and the Logit model.

The structure of Logit model can be expressed as follows:

$$p = \frac{1}{1+e^{-Z_i}} \qquad (2)$$

In this equation, P represents probability of farmers' acceptance and $Z_i = \beta_1 + \beta_2 x_i$. In this case Z_i varies between $-\infty$ and $+\infty$ and p_i between 0 and 1. p_i also nonlinearly depends on Z_i. X_i also represents a set of variables influencing acceptance and also B shows the vector of model parameters (Aghapour Sabbaghi and Masihi, 2012).

Now if p_i is likelihood of farmers acceptance for machines, in this case $1 - p_i$ explains the farmers rejection. That it can be written as:

$$1 - P_i = \frac{1}{1+e^{Z_i}} \qquad (3)$$

So we can write:

$$\frac{p_i}{1-p_i} = \frac{1+e^{Z_i}}{1+e^{-Z_i}} = e^{Z_i} \qquad (4)$$

Change in the probability of $Y_i = 1$ is called Marginal Effect due to the effect of a single unit change in the independent variable.

In this model, the elasticity of the k-th explanatory variable in the logit model is obtained from the following relationship:

$$E^l = \frac{\partial \Lambda(\beta' x)}{\partial X_k} \cdot \frac{X_k}{\Lambda(\beta' X)} = \frac{e^{\beta' x}}{(1+e^{\beta' x})^2} \cdot \beta_k \cdot \frac{X_k}{\Lambda(\beta' X)}$$

$$\frac{\partial \Phi(\beta' x)}{\partial X_k} \cdot \frac{X_k}{\Phi(\beta' x)} = \frac{\phi(\beta' x).\beta_k . X_k}{\Phi(\beta' x)} \qquad (5)$$

Where E^l elasticity of logit model is, E^p shows the elasticity of the Probit model. The elasticity of each variable expresses that a one percent change in the independent variable leads to what percentage of the change in the probability of Yi = 1 (Salami and Mohtashami, 2005) .

3. Results

The main objective of this research was to identify factors that influence the acceptance and rejection of new innovations in the field of agricultural machinery by wheat farmers in Andika County. The results of estimating the logit model are presented in Table One. As specified in the table below, the statistic values of R2 imply the ability of the model to express the variables that influence the adoption of modern machinery in the region. Although these statistics are low compared with the conventional models but given the dual nature of the dependent variable, this amount of the R2 statistic is acceptable for this type of model.

It should be noted that the variables of the number of the household, membership in cooperatives have been removed due to the lack of a significant effect.

The first column in the table below indicates the type of the variable, the second column shows the resulting coefficient, and the third column shows the statistic T which explains the significance coefficient and the last column shows the acquired elasticity for the variable. As can be seen, all variables are

significant at the one and five percent levels. The resulted signs show that variables such facilities, the ratio of water to dry land, land ownership, the main occupation being of agriculture, education, attending at the promotion courses and income in the last year have a significant positive effect on the adoption of new technologies in the agriculture sector of Andika County's wheat farmers. Only variables of experience and the number of agricultural lots have a negative effect on the adoption of new technologies.

Table 1: Results of the estimated logit model for factors influencing the adoption of the machinery technology

Variable	Coefficient	t-static	Elasticity
Receiving facilities	**1.53	2.6	0.042
the ratio of water to dry land	**0.81	1.93	0.19
land ownership	***0.73	2.65	0.017
Experience	**-0.047	-1.98	-0.047
number of lots	**-0.31	-1.92	-0.061
the main occupation being of agriculture	***1.07	2.6	0.24
Education	***1.1	4.15	1.69
attending at the promotion courses	**1.02	1.9	0.039
Income in the last year	***0.21	2.83	0.31
R^2 Mafaden: 0.36		R^2 Esterla: 0.39	
Log-Likelihood: -83.79		R^2 Madala: 0.33	

Source: the research findings

Since the value of the obtained number for the variable coefficient cannot be interpreted in dual model, in these models, the elasticity is used to investigate the effects of continuous variables and the marginal effect is used for livestock variables.

The resulting elasticity of facilities shows that a one percent increase in this variable can lead up to 4% increase in the probability of people's acceptance.

Given that the acreage of dry-land crops are salient in the region, in this study the ratio of water to dry land is considered as a variable that can affect the adoption of new technologies in the region. As the coefficient of this variable shows, by increasing the acreage of irrigated crops, the farmers tendency to use the new machines increases as well. The resulting elasticity shows that due to a one percent increase in this proportion, the tendency increases 19 percent.

Farmer's experience is of variables which has a negative impact on the acceptance of wheat farmers in the region. In other words, people who have more experience are less willing to accept the use of new technologies in this area. The resulting elasticity shows that due to a one percent increase in farmer's experience, their willingness to embrace new technologies declines about 7.4 percent. The number of lots is the second variable that has a negative impact on the adoption of this technology in the Andika County. The obtained elasticity shows for this variable that a one percent increases in the number of lots; their tendency to adopt new technologies reduces by about 6%. Education is of the most important factors for adoption of new technologies by wheat farmers in Andika County.

A positive and significant coefficient has been obtained for this variable that shows due to increase in the education level of wheat farmers, their tendency to use new technologies increases. Finally, last year's income is considered as the most important economic factor in adoption of novel technologies in agriculture sector in the intended model. The positive coefficient for this variable shows that the increased farmers' annual income can have a positive impact on the adoption of new methods in the coming years by them. The obtained elasticity shows for this variable that a one percent increase in this variable can lead to 31 percent increase in the probability of farmer's acceptance.

As mentioned, using the coefficients and elasticity cannot be useful for the virtual variables; therefore, the marginal effect is used instead of elasticity, in cases of these variables. The marginal effect of the virtual variables which were entered in the model is provided in the following table.

Table 2: The marginal effect of the virtual variables which were entered in the model

Variable	Coefficient
Receiving facilities	0.17
Land owner shop	0.082
the main occupation being of agriculture	0.12
attending at the promotion courses	0.11

Source: the research findings

As can be seen in the above table, the marginal effect of 0.17 is achieved for receiving facilities which shows that the wheat growers who have used bank facilities are 17% more willing to use new machines compared with a group who have not used these facilities.

Land ownership is also another variable which has a positive impact on the adoption of new technologies in the field of machinery. The marginal effect of this variable shows that the wheat growers who own their own land compared with those who have lease their land, by an average of 8.2 percent, are more willing to adopt new technologies

The results also show that a positive marginal effect is acquired for the variable of the main occupation. In other words, people who the farming is their main occupation, about 12 percent, are more

willing to embrace technology than those that the agricultural is their second or third jobs career. Finally, for the variable of attending in the promotion courses, also a positive marginal effect of 0.11 is obtained, this means that wheat farmers who have participated in these classes, by 11 percent, are more willing to take new machines compared to wheat growers who have not participated in these classes.

4. Discussion and recommendations

In the present study, the main goal was determining the factors affecting the non-acceptance of new technologies in the field of agricultural machinery. The results show that a positive and significant sign has been obtained for the variable of irrigated land acreage. This means that by increasing the acreage of irrigated land, farmers' tendency to adopt new technologies increases. In the study was done by Owenbo and colleagues in 2012, Swanson in 1970, Kohansal and Mansuri in 2011, was mentioned the positive impact of farming area on the adoption of the technology of machines. Given that in general, there are more yield and production in irrigated land compared to dry land, by increase in the acreage of these lands, the willingness of farmers to new technologies in the field of machines increases.

The study results show that the dispersion and fragmentation of land negatively affect the adoption of technology among farmers in the study region. This means that farmers who own integrated lands have a higher affinity for the acquisition of machinery. However, this result is consistent with the fact, this means that possessing larger and integrated lots provides required land for the use of new machines and small lots are major obstacle to the use of various machines. A result which is stated in different studies like Shrestha and Crisan in 1993, Haso and colleagues in 2013 and Verma in 2008.

Given the significant effect of the variable of number of lots and the positive impact of land integration on farmer's acceptance, it is recommended that the land consolidation policy be taken into account as a complementary policy in the agricultural sector. Education is of the most important factors that influences the adoption of new technologies by wheat growers in Andika County. A positive and significant coefficient is obtained for this variable that indicates given the increased level of education of wheat growers, their tendency to use new technologies increases. Due to increase in knowledge and expertise, it is natural that people are more willing to use of new technologies. This positive effect was noted in the study by Owenbo et al in 2012, Ghorbani and Darijani in 2009, Gholikhani et al in 1392.

The positive coefficient for the variable of income in last year shows that increase in farmers' annual income can have a positive impact on the adoption of new methods in the coming years by them. In other words, this result is obtained in this study that increase in farmers' fiscal power can have a positive impact on the use of machines by farmers in the region that this conclusion seems logical. The positive effects of income on adoption of machines are mentioned in studies such as Abedi et al. in 2011, Kohansal and Mansouri in 2012, Davido et al. 2006, Owonbo et al in 2012 and Shrestha and Crisan in 1993.

Due to the impact of income status on the adoption of machinery in the study area, making policies by the government and planners in order to increase the financial power of farmers in the region and the logical support in this field are considered among the main recommendations of this study. The positive impact of participating in promotion and educational classes on the adoption of new machinery by wheat growers in Andika County are mentioned in this study.

This means that these classes could encourage farmers to use the new technologies in the agricultural sector. Kohansaal and Mansouri in 2011, Dadras Moghadam and Gol mohamadi in 2006, Owonbo et al in 2012 and Haso et al. in 2013, in their studies, mentioned the effectiveness of training and promotion classes on to the adoption of new technologies. Therefore, it is suggested first, to continue to hold these classes in the region and secondly, it is proposed to take into account of new training methods, such as the school in farm in order to transfer this knowledge by relevant authorities.

References

Abedi,S.Gorbani,M. Lyagati,H.Agakhani,M.Kohansal,M.2000. Resale programming in agriculture machine production business. Journal of economic agriculture and development. 24(1):120-128.

Amjadi,A. Chizari,A.M.2006. Mechanization condition in Iran, journal of economic of agriculture and development. 14:155-182

Bageri,A. Malekmohamadi,A.2005. Behavior of rain irrigation between Ardabil agriculture. Journal of agriculture science . 36(6):148-161.

Dadrasmogadam,A.Golmohamadi,F.Chizari,M. Bagaie,M.2006. Survey of technology and innovation acceptation in pistachio farmers in South Khorasan province 62-81.

David C.Johinke , Bernard J.Noonon, Nicholas G.Wachsmann, M.Norton (2007).The adoption of precision agriculture in Australian bordure cropping system–challenges and opportunities .Field Robert Crops Research 104 , pp 68-76. available at www.elsevir.com

Golikhani Farahani,N.Hossini,S.M. Omidi Najafabadi,M.2013. Survey of factor affecting inovation of irrigation systems with Karaj agriculture , journal of cultivation and education 6(2):37-48.

Gorbani,M. Darijani,A.2009. Survey of factor affecting investment in agriculture machinery. Hecman methodology. Journal of agriculture science .16(14):1-12.

Houssou, N., X.Diao, F.Cossar, S.Kolavalli, K.Jimah, and P.Aboagye.2013. Agricultural Mechanization in Ghana is specialization in agricultural mechanization a viable business model?, IFPRI discussion paper.

Kohansal,M. Mansori,H.2013. Survey of economic and social factor affecting agriculture machinery ownership. Mechanization journal. 1:53-59.

Owombo, P.T., A.Akinola, O.Ayodele, and G.Koledoye.2012. Economic impact of agricultural mechanization adoption: Evidence from maize farmers in Ondo state, Nigeria. Journal of Agriculture and Biodiversity Research, 1(2): 25-32.

Shrestha, R. & C. Gopalakrishnan. 1993. Adoption and Diffusion of Drip Irrigation technology: An Economic Analysis, Econ. Develop. And Culture. Change. 41: 407-18.

Sovanson,s. 1991. Agriculture cultivation. Translated by Shahbazi,A and Hajaran,A.

Verma S.R.2008.Impact of agricultural mechanization on production, productivity, cropping intensity income generation and employment of labor. Status of farm mechanization in India. Punjab Agricultural University. Ludhiana.133-153.