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Diffusion and Adoption of Oat NARC Variety in Rainfed Area, Pakistan

Sobia Naheed
Scientific Officer; Social Sciences Research Institute, National Agricultural Research Centre, Islamabad, Pakistan
Nusrat Habib
Scientific Officer; Social Sciences Research Institute, National Agricultural Research Centre, Islamabad, Pakistan
M. Zubair Anwer
Principal Scientific Officer; Social Sciences Research Institute, National Agricultural Research Centre, Islamabad, Pakistan
Sabeen Siddiqui
Assistant Scientific Officer; Social Sciences Research Institute, National Agricultural Research Centre, Islamabad, Pakistan

Abstract

The present study was planned to estimate the extent of diffusion (spread) and adoption of fodder variety Oat NARC developed by Fodder Programe NARC. For this study, farm level information was collected through a formal survey method. For the official survey, an organized and well-structured questionnaire was designed. Mainly oat area of Pothwar region was the study domain. Overall from all selected tehsils, 65 farmers were taken as sample farmers. The findings of present study that includes frequency, descriptive analysis, oat adoption rate and also identified adopters and non adopters. Technical, extension, financial, agro-colmatic and marketing factors constraining adoption of Oat NARC variety also acknowledged. Main objective of this study is to determine the factors affecting the adoption of Oat NARC variety through probit model. Factors like fodder area, soil type, cultivated land , nearest grain market (distance in km), farming experience (years), present level of involvement in farming, availability of credit for purchasing inputs, different varieties you have tested at your farm have positive role in the adoption of Oat NARC variety. The above mentioned variables positively affecting the adoption of oat NARC. This model also show that the area wheat, input market (distance in km), area for local variety, distance from market, lack of knowledge of market information and do you prefer change of varieties grown affects the adoption of Oat negatively.

Keywords: Diffusion and adoption, oat, constraining factors, rainfed, Pakistan

Introduction

Pakistan is sanctified with diverse types of livestock and gives foodstuff safety to small farmers. It donates 11.5% in the nationwide GDP and 55% towards agricultural GDP (GOP, 2008). The residents of live stock in Pakistan is 163.0 million which is additional growing day by day resultantly animal nourish necessities are also mounting in the country (GOP, 2006). Pakistan has a strict or unlikable fodder deficiency in two periods.

Corresponding author's
Name: Sobia Naheed
Email address: sobianarc@gmail.com

The most deficit periods are December to January and other critical period is May to June respectively (PARC, 2011).

(Hussain *et al*., 1993) deliberated give up and superiority mechanism of 15 foreign and native varieties of oats. They informed that highest mean fresh scavenge and dehydrated substance yields were attained from variety PD2LV65 while variety No.681 had higher unfinished backbone contented.

Oats (*Avena sativa L*.) is an imperative coldness season cornflakes feed crop which can be profitably developed all over Pakistan below equally irrigated and rainfed surroundings with a rain of 400 mm and a best possible warmth series of 16-32^{o}C. It is an significant forage/grin crop grown as a meadow, hay, silage and pullet nourish in the earth. It involves moderate and cold sub-tropical circumstances for its expansion. The utilization of oats as search or grain crop is a frequent performs the world over. In recent times propensity to use oats for forage and seed has enlarged in irrigated as well as high rainfall areas of Pakistan (Ashiq *et al*., 2011).

Ali *et al*. (2003) detailed that oats afford green fodder during the incline phase (December, January) when green fodder is limited and animals are fed with dehydrated silage, encouraging the oats production in the country. Scientists of fodder programe NARC have developed many fodder varieties.

The present study was planned to estimate the extent of diffusion (spread) and adoption of fodder verity Oat NARC developed by Fodder Programe NARC and give appropriate suggestions to farmers and policy makers to improve the invention and worth of fodder.

Materials and methods

Survey was conducted for this study. Fodder area was selected and visited to categorize the areas and farmers that provide fodder. Questionnaire was urbanized in collaboration with the Fodder Program NARC for collecting data. Both quantitative and qualitative data was collected according to diffusion and adoption status of fodder varieties developed by fodder program NARC. Then farmers were interviewed based on a prearranged questionnaire. Data processesed and analysed using SPSS and STATA softwares.

Survey technique

For this study, farm level information was collected through a formal survey method. The information so synthesized can be utilized as basis for research, planning and policy making. A multi-disciplinary team of social scientists from National Agricultural Research Center (NARC) conducted the survey in April 2013.

Questionnaire

For the official survey, an organized and well-structured questionnaire was designed. In questionnaire the order of the questions was specially taken care of so that farmers may easily recall their memory and provide the compulsory information with self-reliance. Also practicability and workability of the questionnaire was given priority for smooth running of the interviewing process. So, before implementation, questionnaire was pre-tested modified keeping in view the workability and systemization of ordering of the information gathered. Mainly the variables programmed for the present study included socio-economic condition of the farmers, village infrastructure, land ownership, soil type cropping pattern of the area, crop rotation, varietal spread, adoption history and factors constraining adoption of Oat Varieties.

Study area

Mainly oat area of Pothwar region was the study domain. However, special emphasis was given to that area where oat seed was provided in three Tehsils namely Rawalpindi, Islamabad and Gojar Khan through PARC Agro Tech Company Private

Limited (PATCO) which was developed by fodder program, NARC.

Sampling procedure and data collection

Mainly oat area of Pothwar region was the study domain. At the first stage we found list of Oat NARC seed purchaser of three tehsils from Fodder Program where they distribute the seed of new developed Oat variety then it was decided as sample tehsils and at the second stage, no of villages from each tehsil were selected. Keeping in view the scope of the study, resources and time, three villages from each tehsil were surveyed. At the third stage, number of sample farmers was decided and about 5 farmers were supposed to be interviewed from each village. Overall from all selected tehsils, 65 farmers were taken as sample farmers Table 1.

Table 1: Sample farmers distribution by tehsils

Tehsils	Frequency	Percent
Gojar Khan	23	35.4
Islamabad	22	33.9
Rawalpindi	20	30.7
Total	65	100

Source: Field survey, 2013

Data analysis

The composed data was passed in to the computer using the SPSS and Stata softwares, keeping the requirement of the study, expressive statistics was used to find the result, pronounced in new section, descriptive analysis and Probit model was run through SPSS packages and Stata software.

Probit model

The probit model is expressed as

$$Prob\ [Y_i=1] = P_i = \phi\ (\alpha + \beta X_i + Xii + Xiii \ldots\ldots\ldots X_{xiv})$$

Y_i = 1 if adoption and dependent variable including one dummy for adoption status.

X_i = 0 Non-adoption and denotes independent variables those are:

X_i = Area wheat
X_{ii} = Fodder area
X_{iii} = Soil type
Xv_i = Cultivated land
X_v = Nearest grain market
Xv_i = Input Market
X_{vii} = Farming experience
X_{Viii} = Present level of involvement in farming
X_{ix} = Area for local variety
X_x = Do you prefer change of varieties grown
X_{xi} = Different varieties you have tested at your farm
X_{xii} = Availability of credit for purchasing inputs
X_{xiii} = Lack of knowledge of market information
X_{xiv} = Distance from market

Results and discussion

This section presents the finding of study that includes frequency, descriptive analysis, Oat adoption rate and also identified adopters and non adopters. Socioeconomic Characteristics have an important role in distribution process of any new farm technology. It is general information, among the experts, that if a person or community possesses a strong socioeconomic background, both dissemination and adoption rate of the new technologies, always remain higher. Hence, socioeconomic information about the respective communities is vital to be explored for planning and policy formulation work. This kind of information also significance for the scientist working on the development of technology packages.

Table 2 shows the present level of involvement, formal education and farming experience and age of respondents. Mostly farmers were involved in present farming maximum number of farmers belongs to the age group of 47 years. Education plays a vital role but the average education of the respondent were middle pass of the area and

average farming experience of the respondents was 24 years in the area similarly it was found that all the respondents of the area.

Table 2: Sample farmer's socioeconomic characteristics

Variable	Minimum	Maximum	Mean	Std. Deviation
Present level of involvement in farming	1	2	0.65	0.482
Formal education (years)	0	16	8.84	3.813
Farming experience (years)	4	60	24.03	14.64
Age of respondent (years)	20	80	47.28	15.951

Source: Field survey, 2013

The socioeconomics characteristics of the host farmers were determined to judge their compatibility with the farm size of the area. In above table 50.8 farmer's have less than 5 acre farm size, 26.1 farmers have 5 to 12.5 acre farm size and 23.1 farmers have greater than 12.5 acre farm size in Table 4

Table 3: Distribution of sample farms by size

Farm size	Farm size categories	Number of respondents	Percentage
Small	< 5 acre	33	50.8
Medium	5 – 12.5 acre	17	26.1
Large	> 12.5 acre	15	23.1
Total		65	100

Source: Field survey, 2013

Generally in rainfed areas, soils are good and fit for crops production. Mainly soils are well and almost every farmer prefers best soil for oat cultivation the results also supported the general observation and indicated that those farmers who have clay type of soil and mix soil are not a promblem for them. About 13.9 percent farmers, who have clay type of soil, as well as 13.9 percent farmers who have laal soil and 21.5 percent farmers have mix soil also pointed out that their soils are well and they can grow oat on their land. About 50.7 percent farmers who have kaali soil, this type of soil has been considered best soil by large majority of the respondents.

The farmer's response was understandable and logical in nature. Overall, it can be concluded that in majority of the oat producing tehsils, abiotic factors are favorable for oat cultivation.

Table 4: Distribution of sample farmers by soil types

Soil Type	Frequency	Percent
Clay	9	13.9
Kali matti	33	50.7
Laal matti	9	13.9
Mix	14	21.5
Total	65	100

Source: Field survey, 2013

Generally in rainfed areas, soil fertility is good and fit for crops production. Mainly soils are healthy and approximately every farmer prefers good soil fertility for oat cultivation. About 51.9 percent farmer has good soil fertility. The results also maintained the general observation and specified that those farmers who have medium soil fertility are not a problem for them, those are about 22.8 percent farmers and 1.3 percent farmers who have poor soil fertility, also pointed out that their soils are poor and they can grow oat on their land. Overall, it can be accomplished that in majority of the oat producing tehsils, soil fertility are favorable for oat cultivation Table.

Table 5: Distributions of sample farmers by soil fertility

Soil Fertility	Frequency	Percent
Good	46	51.9
Medium	18	22.8
Poor	1	1.3
Total	65	100

Source: Field survey, 2013

According to the survey Adoption rate was low of Oat NARC variety as 30.7 percent adopters and 69.3 percent non-adopter of this variety of the sample farmers.

Table 6: Adoption rate of variety Oat NARC

Adoption Rate	Frequency	Percent
Adopted	20	30.7
Non-adopted	45	69.3
Total	65	100

Source: Field survey, 2013

Two types of fallow systems are predominant in barani areas. First was on year fallow system, land is fallowed for one year in drier areas to protect moisture and the other is seasonal fallow system. The major reasons for fallowing land were lack of moisture and risk due to drought. Continuous cropping produces lower yield and is not economically feasible. Indifferent provinces for the oat fodder production; it should be sown in mid-October to November. Oat is sown with wheat crop to fulfill the fodder shortage during that period. After that maize and ground nut is sown as food crop.

Constraining factors

Table 7 shows that technical factors constraining adoption of oat varieties, fodder legumes have an important role, in animal health and fulfilling the nutritional requirements of the animal. Moreover, Government of Pakistan is also spending lot of time for developing the new varieties of fodder as high nutritional value. In the present production scenario, oat cultivation looks extremely important in the Pothwar region of Punjab. But having, much technical factors, constraining adoption of oat variety the farmers perceived constraints were identified and then prioritiezed separately. Among the technical factors non availability of quality seed, Non availability of harvesting machinery, due to non-availability of water and soil type problem emerged as most important technical problems. The farmers supposed extension and financial constraints were also identified. Among extension factors, lack of technical assistance for extension linkages, non-availability of literature, lack of coverage of adopting fodder by mass media, poor extension backup and in financial factors non-availability of credit for inputs.

Table 7: Technical, extension, financial, agro-colmatic and marketing factors constraining adoption of oat NARC variety

	Score		Percentage		Rating	
Technical Factors	Adopters	Non-adopters	Adopters	Non-adopters	Adopters	Non-adopters
Non availability of Quality seed	54	11	83.08	16.92	3	7
Non availability of harvesting machinery	53	12	81.54	18.46	4	6
Due to non-availability of water	53	12	81.54	18.46	4	6
Soil type problem	47	17	72.3	27.7	5	2
Extension factors						

Lack of technical assistance from extension linkages	61	4	93.84	6.2	1	8
Non-availability of literature	58	7	89.23	10.77	2	1
Lack of coverage of adopting fodder by mass media	58	7	89.23	10.77	2	1
Financial factors						
Non availability of credit for inputs	44	21	67.69	32.31	1	1
Agro-Climatic factors						
Sand lands	45	20	57	25.3	8	3
Dry rainfall zone low	46	19	58.2	24.1	7	4
High rainfall zone	45	20	57	25.3	8	3
Marketing factors						
Marketing problem for inputs	45	19	57	24.1	8	4
Distance from market	45	19	57	24.1	8	4
Lack of knowledge of market information	48	16	60.8	203	6	5

Source: Field survey, 2013

Regular marketing and stable prices are considered as key factors, which facilitate the process of bringing change in the farm. The price of agricultural produce specifically perishable commodities remains almost unstable in the markets.

The price instability, directly or indirectly provide opportunity to change the farmers preferences. In this context, marketing factors constraining adoption of oat were marketing problem for inputs, distance from markets, and lack of knowledge of market information. Likewise agro-climatic factors were sand lands, dry rainfall zone low, medium and high.

Determinants of adoption of oat NARC variety

Main objective of this study is to determine the factors affecting the adoption of Oat NARC variety. Factors like Fodder area, Soil type, Cultivated land , Nearest grain market (Distance in Km), Farming Experience (years), Present level of involvement in farming, availability of credit for purchasing inputs, Different varieties you have tested at your farm have positive role in the adoption of Oat NARC variety. The above mentioned variables positively affecting the adoption of oat NARC. By increase one unit in mentioned factors fodder area in their mean value will

increase the probability of oat by 31 percent adoption of Oat NARC variety with 2.21 Z-value which is significance at 5 percent as such type of results are described in (Aloyce R. M *et al.*, 2000). By increase in mention factor soil type and cultivated land by one unit increase in their mean value will increase the probability value of oat by 28 and 5 percent. By increase in these factors nearest grain market and Farming Experience by one unit increase in their mean value will increase the probability value of oat by 31 and 01 percent. Likewise by one unit increase in Present level of involvement in farming and Different varieties you have tested at your farm in their mean level will increase the probability value of oat by 44 and 74 percent with 2.22 z-values which is significant at 5 percent. Similarly by one unit increase in availability of credit for purchasing inputs of its mean value will increase the probability value of oat by 6 percent.

The model also show that the Area Wheat, Input Market (Distance in Km), Area for local variety, Distance from market, Lack of knowledge of market information, Do you prefer change of varieties grown affects the adoption of Oat negatively. By one unit decrease in the mean level of area wheat will decrease the probability value of oat by 6 percent. By one unit decrease in the mean level of Input Market and Distance from market will decrease the probability value of oat adoption by 25 and 3 percent. One unit decrease in area for local variety will decrease the 6 percent adoption of Oat NARC variety with 2.21 Z-value which is significance at 5 percent. By one unit decrease in the mean level of Lack of knowledge of market information and do you prefer change of varieties will decrease the probability value of oat adoption by 45 and 61 percent as results are similar in (CIMMYT, 1993). Table 14 shows the role and significance of different factors in the adoption of Oat variety. R^2 value is 0.41 which shows that there is 41 percent of variation in variables of adoption.

Table 8: Determinants for adoption of oat NARC Probit regression

Adoption	Coef.	Z-Test	P-value	Odd ratio
Area wheat	-0.0556	-1.09	0.274	0.945902
Fodder area	0.27544	2.21*	0.027	1.31711
Soil type	0.25256	0.46	0.644	1.287317
Cultivated land	0.05359	1.69**	0.091	1.055055
Nearest grain market (Distance in Km)	0.27452	1.41	0.159	1.315896
Input market (Distance in Km)	-0.2786	-1.41	0.158	0.756832
Farming experience (years)	0.00195	0.11	0.911	1.001955
Present level of involvement in farming	0.36738	0.72	0.472	1.443953
Area for local variety	-0.0601	-0.08	0.937	0.941632
Do you prefer change of varieties grown	-0.5935	-1.21	0.228	0.552381
Different varieties you have tested at your farm	0.55735	2.22*	0.026	1.746034
Lack of knowledge of market information	-0.9208	-1.46	0.144	0.398197
Availability of credit for purchasing inputs	0.7236	1.07	0.283	2.061849
Distance from market	-0.0244	-0.04	0.971	0.97591

Note: The independent variables were adoption of new variety; * and ** indicate significance at the 5% and 10% levels respectively

Conclusions and recommendations

The results of survey about adoption of oat NARC variety indicated that those farmers who have more experience of oat varieties, growing oat NARC. Its results also showed that increasing in fodder area also increasing the rate of adoption of this variety.

Likewise good soil type, cultivated land , nearest grain market , their farming experience , their present level of involvement in farming, availability of credit for purchasing inputs are the factors which are going toward adoption of this variety so it can said that these factors have been identified of affecting adoption of fodder verity Oat NARC developed by fodder program NARC. These would be helpful for researchers, policy makers and other stake holders to streamline their activities. It would also be helpful for Fodder Program to realign it in future research and development effects. Similarly the results were the availability of good quality fodder throughout the year ultimately improvement in animal productivity and value chains. The ultimate objective of this study is to promote oat crop among the farmers and increase. It is only possible by increasing per acre yield of crops particularly the high value cash crops. In journal observation majority of the farmers were preferred NARC oat variety PD2-LV65 due to high grain yielding and fodder production. It is clearly indicated from the empirical results that oat crop has potential to improve socioeconomic conditions of the rural masses. The current oat crop management practices needs immediate attention of the stakeholders to popularize use of agriculture machinery at farm level. This intervention will save farmers time, precious resources and ultimately provide them resources to improve their farming activities. Government should announce support price for oat to encourage the oat growing community to improve fodder for the livestock and

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