Research Article

CrossMark
click for updates

Feasibility Study for Strengthening Agricultural Mechanization Competencies of Agricultural Extension Officers of Khyber Pakhtunkhwa, Pakistan

Muhammad Zafarullah Khan*

Department of Agricultural Extension Education and Communication, The University of Agriculture, Peshawar, Khyber Pakhtunkhawa, Pakistan.

Abstract | Agricultural Mechanization in the present era led to drastic changes in the transformation of agriculture to produce more farm commodities in shortest possible time with minimum inputs. Agriculture is the pivotal source of producing food crops including dairy, fruit cultivation, poultry, bee keeping and edible and non-edible like forestry products etc. An Agriculture Extension Officer (AEO) plays the role of a hub in agricultural development and covers all the areas of Agriculture. The present study was carried out in all the 24 districts of Khyber Pakhtunkhwa to investigate the agricultural mechanization competencies of AEOs. Sum total of 111 AEOs were contacted for data collection. Primary data were collected from the selected sample of AEOs by mailing the questionnaires. The results showed that overwhelming majority of the respondents i.e., 88% were M.Sc degree holders. They have had an average work experience of 16 years. Significant differences were observed among the competencies of AEOs with their participation in training programs and their higher educational qualification. The differences were considered as training needs and the AEOs need in-service training to enhance their ability in agricultural mechanization. A significantly high competency level was found in describing the agriculture machines and equipments and use of hand tools and implements. Most of the respondents have high competency level having practical farming experience. Study suggests pre-service along with in-service trainings along with higher degree in agriculture i.e. PhD for improving their technical competencies in agricultural mechanization.

Introduction

Agriculture provides raw material to industries, aids in poverty reduction, contributes 19.8 percent in GDP and engages 42.3 percent of Pakistan's labor force is thus an important component of Pakistan's economy. The growth of agriculture is dependent on favorable weather conditions. Agriculture's economic performance is affected by climate temperature, flood, precipitation and other aspects by affecting agricultural production, prices of commodities resulting in economic growth. Agriculture in Pakistan is heavily dependent upon important crops such as wheat, maize, rice, cotton and sugarcane which account for 23.55 percent of value added in agriculture and 4.67 percent in GDP. The value added in agriculture by other crops is 11.36 while its share to GDP is 2.25 percent. Another important sector, livestock, has its share of 58.55 in value addition of agriculture, while, it accounts for 11.61 percent of GDP (GoP, 2016).

Links Researchers

More than 20 million people lives in Khyber Pakhtunkhwa Province and overwhelming majority of this population (83%) resides in rural area, hence, putting a gigantic pressure on land resources of the rural areas of the province. To accomplish the needs of livelihood of this giant part of population the province posses 10.17 million hectares of land. In contrast, the cultivable land covers an area of about 2.75 million hectares, of which the majority (49%) is rain fed. A subsistence farm level situation is resulted that 94% farm is now below the range of 12.5 acres. Khyber Pakhtunkhwa land tenure system can be classified into three groups: a) owners operated farm area (58%), b) Owner cum tenant operated (27%) and c) Tenants operated farm area (18%). Khyber Pakhtunkhwa, due to diversified climate and soil types, grows more than 42 crops. Important crops of the province are wheat, rice barley, maize, sugarcane and tobacco, rape and mustard, groundnut, pulses, vegetables and fruits. About 90% of the cropped area is occupied by these major crops and play an important role in the sustenance of rural populace (Govt. of NWFP, 2005).

Mechanized farming assists farmers greatly in timely field operations of plant and harvest even in adverse climatic conditions, and results in better return and improved livelihood. To accelerate farm operations, experts and agriculture officers can play their part by assisting farmers in mechanizing agriculture. Certainly, the goal of agriculture extension is to minimize long-run costs and production risks through development of an enough flexible system which can be adapted to diversified crop and climatic conditions. Pawlak et al. (2002) suggested that using appropriate farm mechanization techniques in plant and animal breeding can yield significant results.

A wide gap in future food requirements and supplies is greatly expected, which may be countered by improved average yields through intensive mechanization of farm operation. Obviously, the introduction and effective utilization of mechanized farming techniques boosts cultivation process by accelerating harvesting and threshing operations (PAMC, 2004).

Time saving in field operations and maximizing profit by creating awareness among communities associated to farming is the main objective of agriculture mechanization. Additionally, reduction in labor cost and decreased risk of perishable commodities such as fruits and vegetables specifically during picking, grading and packing processes is the objective of scientific and mechanized farming. Likewise, the income of farmers increases and his socio-economic status is improved which is the ultimate goal of an agricultural extension agents. Crop production is increased due to agriculture mechanization. The responsible agency for transfer of developed agricultural technology and technically guiding farmers for improved agricultural practices for enhanced agricultural productivity is Agricultural Extension Department. (Pervaiz, 2001; Khan et al., 2006; Ahmad, 1993).

An increase of 67% in the utilization of agricultural machinery (24,269 tractors, trolley 18709 and thresher 9761) is noticed in Khyber Pakhtunkhwa during the 1994-2004 (PAMC, 2004). Therefore, the current study was carried out in Khyber Pakhtunkhwa province to identify the gap between the present and desired competencies of AEOs regarding Agriculture mechanization and also to study the effect of demographic characteristics on their competencies.

Materials and Methods

This research study was carried out in Khyber Pakhtunkhwa province to assess the technical competencies of agricultural extension officers related to their effective job performance in agricultural mechanization. Total sample respondents of 111 agriculture extension officers were selected to get primary data for the study. Primary data was collected from the sample respondents while secondary was amassed from numerous sources such as journals, internet, books etc. A pretested and validated questionnaire was used for the collection of primary data. The questionnaires were mailed to each AEO for collecting data and with the collaboration of agriculture extension department meetings were arranged so that they can understand the questionnaire. AEOs' job description was used as a basis to determine their desired abilities. In the past similar techniques was used by numerous researcher like (Easter, 1985; Najjingo et al., 1991; Randavary and Vaughn, 1991). To identify the level and technical experiences of AEOs likert scale was used. Five point Likert scales was used to measure for both the competencies that they currently have and also that is needed for them as perceived by them where 1 was for very low competencies level and 5 was for very high competencies level. Moreover, the index of scaling was measured by 0 to 1 and were classified as; very low (0.00 - 0.20), low (0.21 – 0.40), moderate

(0.41 – 0.60), high (0.61 – 0.80) and very high (0.81 – 1.00) also used by (Qadeer, 1993). Information on demographic and social characteristics and technical competencies perceived by AEOs were also collected by the survey questionnaire. Also Chi-square test was applied in order to check the association between the level of mechanization competencies of the AEOs and demographic characteristics. T-test was applied to find the difference between the present and desired competencies of the AEOs.

Results and Discussion

Age
Table 1 present the results of the age of the respondent which shows that maximum of the respondents 42% were in the age category of 46.0 to 55.9 years while almost 13% (newly inducted) of the respondent fall in the age category of 25. 0 to 39.0 years. The mean age of the sample respondents was 44.21 years that lies between 25.0 to 60 years.

Table 1: *Distribution of agricultural extension officers regarding their Age*

Age (Years)	Frequency	Percent
25.0 – 35.9	14	13
36 .0 – 45.9	19	17
46.0 – 55.9	47	42
Above 56	31	28
Total	111	100
Mean	44.21	
Min: 25 Max: 60		

Table 2: *Distribution of agricultural extension officers by professional experience*

Experience (in years)	Frequency	Percent
Up to 6	22	19.8
6.0 – 10.9	3	2.7
11.0 – 15.9	16	14.4
16.0 – 20.9	32	29
21.0 – 25.9	30	26.9
Above 26	8	7.2
Total	111	100
Mean	16.81	

Professional experiences of AEOs
The data regarding job experience of the AEOs are presented in Table 2 which shows that maximum of the respondents 29% had job experience of 16.0 to

20.9 years followed by almost 27% of the respondents that had job experience of 21.0 to 25.9 years. About 20% of the respondents had job experience up to 6 years and almost 14% of the respondents had job experience of 11.0 to 15.9 years. It is remarkable that only 7% of the respondents had job experience of above 26 years. The mean job experience of the total sample respondents was 16.81 years.

Educational qualification levels of AEOs
Figure 1 highlights the results regarding educational qualification of the officer in the field of provincial agricultural extension system in the study area which showed that overwhelming majority of them were highly qualified and had M.Sc (Hons.) degree *i.e.* 88 %. Only nine percent of the respondents had degrees of B.Sc (Hons.) and 3% respondents of them were PhDs in various disciplines of agriculture as shown in Figure 1.
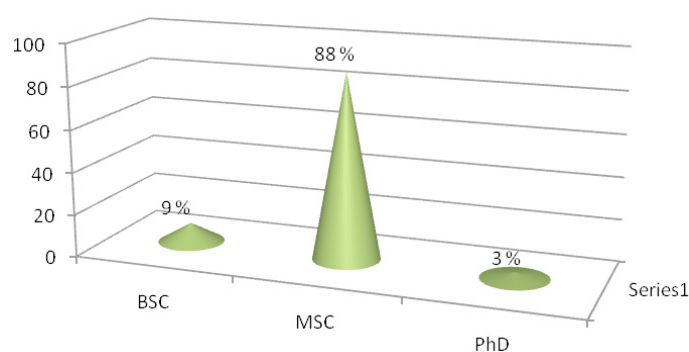

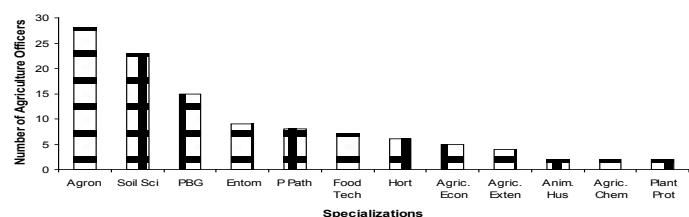**Figure 1:** *Educational qualifications of AEOs in Khyber Pakhtunkhwa*

Figure 2: *Distribution of AEOs according to field of specialization*

Specialization fields of AEOs
According to the system of agricultural education at the University of Agriculture Peshawar, the first two years all the students study introductory agriculture and have to choose one discipline later in third year for specialization. There are many disciplines in which specialization were given at graduate level. These disciplines include agronomy, horticulture, soil science, entomology, plant breeding and genetics, plant pathology, agricultural economics, agricultural extension education and communication, rural sociology, animal husbandry and plant protection but now in-

cluded more. Distribution of respondents regarding their field of specialization is presented in the Figure 2. Majority of AEOs had specialization in Agronomy (23%), Soil Science (14%) and PBG (11%).

Comparison between existing and expected agricultural mechanization competency levels of AEOs

The comparison of the existing and expected competencies in agricultural mechanization assessed by them is presented in a web-radar diagram Figure 3. Agriculture Oofficers in Extension must be proficient in each and every sector of agriculture which helps to elevate income of the farming community. According to Khan et al. (2006), weeds compete with the major crops for water, nutrients, space and light, thus reduce the crop yield. These weeds can be controlled through farm machinery by educating the farmers through competent Agriculture Extension Officers. Ahmad (1992) in his study observed that non availability of training opportunities for extension agents had negatively affected their job performance.
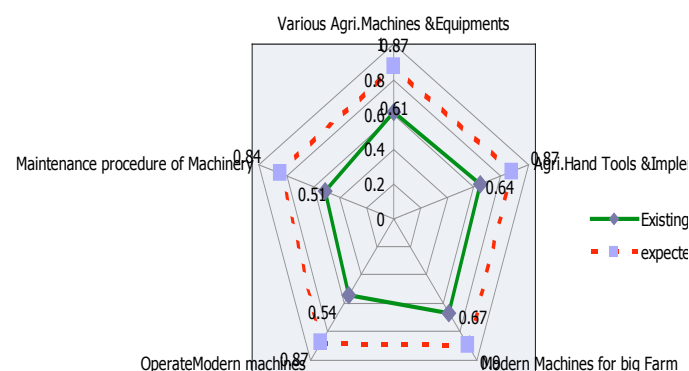

Figure 3: *Comparison between existing and expected levels of technical competencies of AEOs in farm mechanization*

Analysis of competencies in farm machinery of AEOs by demographic and social characteristics

Age: Chi-square test result in Table 3 shows no statistical association among age and abilities of AEOs in mechanized farming which means that AEOs' age had no effect on their technical competency. The results further showed that AEOs who are from age group 46-55 have a high competency level (83.0%) followed by 36-45 (84.2%) respectively. While those who have relatively lower technical competencies are from the age group 25-35 which is (35.7%) and 56 and over (32.3%) respectively.

Experience in job: Chi-square results between experience in job and their competency in mechanized farming is given in Table 4. Table 4 depicts that agriculture extension officers who had higher competen-

cies had experience of job amid 11-20 years i.e. 83%, 79% had above 21 years and 72% had 1-10 years. There is no significant association between the abilities in farm mechanization and experience in job of AEOs at 1% level of significance. This lofty variation in competencies among the diverse job experiences might be due the fact that due to self variation of individuals as mostly individual takes keen interest in their job and later on goes down with the passage of time.

Table 3: *Technical competency level of AEOs in farm mechanization by age group*

Age(Years)	Low		High		Total	
	F	%	F	%	F	%
25-35	5	36	9	64	14	100
36-45	3	16	16	84	19	100
46-55	8	17	39	83	47	100
56 and Over	10	32	21	68	31	100
Total	26	23.4	85	76.6	111	100
Chi-square test,	Sig.=0.239					

Table 4: *Technical competency level of AEOs in farm mechanization by Job experience*

Job Experience (Years)	Low		High		Total	
	F	%	F	%	F	%
1-10	7	28	18	72	25	100
11-20	8	17	40	83	48	100
21 and Over	8	21	30	79	38	100
Total	23	22	88	78	111	100
Chi-square test, Sig.=0.432						

Table 5: *AEOs' competencies level in farm mechanization by experience in farming*

Farming Experience	Low		High		Total	
	F	%	F	%	F	%
Below 1	6	26	17	74	23	100
1-10	8	23	26	77	34	100
11-20	8	27	22	73	30	100
21 and Over	4	17	20	83	24	100
Total	26	23	85	77	111	100
Chi-square test, Sig.=0.831						

Experience in Farming: Table 5 showed that there is no statistical association between experience of agriculture extension officers in farming with their competencies in farm mechanization as P= 0.831. The agriculture extension officers who reported high competencies in agricultural mechanization were dis-

tributed as 83% had farming experience of above 21 years, 77% had 1 to 10 years, 73% had 11-20 years and 74% had below 1 year of farming experience. Maximum of the respondents (27%) who reported low competencies had 11-20 years of farming experience.

Association between educational status of AEOs and their potentials in agricultural mechanization: Chi-square test results are given in Table 6 which showed highly significant association between education status and potentials of agriculture extension officers in farm mechanization because P=0.000 (less than 0.05) at 1% of significance level. It is also depicted from Table 6 that agriculture extension officers having bachelor education had low competencies (90%) and 10% had high competencies in agricultural mechanization and those that have Master and Doctorate degrees had reported low competencies (17%) and high competencies (83%).

Table 6: *Technical competency level of AEOs in farm mechanization by education Level*

Education Level	Low		High		Total	
	F	%	F	%	F	%
Bachelor	9	90	1	10	10	100
Master and Doctorate	17	17	84	83	101	100
Total	26	23	85	77	111	100
Chi-square test, Sig.=0.000						

Table 7: *Technical competency level of AEOs in farm mechanization by domicile*

Domicile	Low		High		Total	
	F	%	F	%	F	%
Rural	25	26	72	74	97	100
Urban	1	7	13	93	14	100
Total	26	23	85	77	111	100
Chi-square test, Sig.= 0.124						

Origin Place: Table 7 shows the results of chi-square test applied to test the association among the residential type of the agriculture extension officer and their abilities regarding mechanized agriculture. It was found that agriculture extension officers that have low abilities regarding mechanization of farming were 26% who had rural background while 7% have urban background. Both the categories of the agriculture extension officers i.e., rural (74%) and urban (93%) had higher level of competencies in mechanized farming. However there was no significant as-

sociation between residential status of the agriculture extension officers and their potentials in understanding farm mechanization as P>0.05.

Participation in training: Table 8 shows results of Chi-square test between the technical competencies of AEOs and training attended by them which shows that there is highly significant difference as P<0.05. Table 8 recorded that those agricultural extension officers had attended trainings during their service were highly competent (97%) as compared to those who did not attended training (68%). The results also showed that the agricultural extension officers that reported low competence were 32% of those that do not attended training whereas 3% had attended. Statistically significant difference among technical competencies regarding farm mechanization and training programs was found at 1% significant level.

Table 8: *Technical competency level of AEOs through available training opportunities*

Regular Training	Low		High		Total	
	F	%	F	%	F	%
No	25	32	53	68	78	100
Yes	1	3	32	97	33	100
Total	26	23	85	77	111	100
Chi-square test, Sig.=0.001						

One of the main functions of agriculture extension is to assist the farming community in increasing their production and income and also to establish collaboration between them. Therefore, today agriculture extension programs emphasis more on competence building instead of delivery model (delivering technological practices) so that they can recognize and acquire both the technical and economic opportunities available to them. To execute such a manifold rationale roles, hence extension agents must be qualified and also trained enough to establish skills in farmer's mobilization (World Bank, 2008). Lodhi (2003) also reported that extension system of the Punjab is very weak and their staff is not so much competent due to the non availability of training opportunities for them.

Conclusions

The findings of the current study concluded that the professional qualification and trainings have improved the abilities of the agriculture extension

agents in agricultural mechanization. Moreover, the demographic characteristics such as age, job experience, farming experience and the place of origin have no effect on technical competency regarding agricultural mechanization. The results further concluded that agricultural extension don't have the compulsory information and therefore, depend on the orthodox extension technologies and hence affecting the productivity of the farming community. A larger part of the agricultural extension officers lack the required competencies regarding agricultural mechanization that helps the farming community in boosting agricultural productivity.

Recommendations

• It is recommended that newly inducted AEOs should be trained enough regarding agricultural mechanization before joining the service so that they can effectively carry out their assigned duties.
• During the service, trainings on regular basis should be given to the AEOs so that they can be updated and aware about the latest improved technologies in farming with particular accent on agriculture mechanization.
• Efforts should be made to educate the AEOs about the suitability of a particular technology to their local conditions so that higher production can be achieved.

References

Ahmad, M. 1992. Evaluation of the working of extension field staff for the development of farming community. Pak. J. Agri. Sci. 29(1): 40-42.

Ahmad, M. 1993. Evaluation of the working extension field staff for the development of the farming community. Pak. J. Agric. Sci. 29(1) Univ. Agric. Faisalabad, Pakistan.

Easter, G.W. 1985. Assessment of professional competence needed by extension agent in developing countries. Case study in Swaziland. Doctoral Dissertation Pennsylvania State University, USA.

GoP. 2016. Economic survey of Pakistan (2015-16), Govt. of Pakistan. Ministry of Finance, Eco. Advisor's Wing, Finance Division, Islamabad.

Government of NWFP. 2005. Agriculture Policy 2005.

Lodhi, T.E. 2003. Need for paradigm shift from top down to participatory extension in the Punjab, Pakistan: perception of farmers, change agents and their supervisory staff. Unpublished doctoral dissertation, Department of Agric. Ext. Univ. of Agric. Faisalabad, Pakistan.

Khan, M.Z., K. Nawab and I. Khattak. 2006. Assessment of the existing and required level of professional competencies of agriculture officers in NWFP in program planning and extension teaching. J. Human. Soc. Sci. Vol. XVI, No. 2: 104-115.

Najjingo, M. Kasujja and I.L. McCasline. 1991. An Assessment of the technical and professional competence needed by extension personnel in the central region of Uganda Proc. of AIAEE Conference, St. Louis., Mo.

Pakistan Agricultural Machinery Census (PAMC). 2004. Government of Pakistan Statistics Division. Agricultural Census Organization.

Pawlak, J., D. Pellizzi, and M. Fiala. 2002. On the development of Agricultural Mechanization to ensure a long term world food supply. Agricultural Engineering International: the CIGR J. of Scientific Research and Development. IV. 24(31) 235-241.

Pervaiz, U. 2001. Main factors affecting extension activities. A case study of Malakand agency. M.Sc thesis Deptt. Of Agric. Extension Education and Communication, NWFP Agri. Uni. Peshawar, Pakistan.

Qadeer, A.M.M. 1993. Applied Statistics. A Course handbook for human settlement planning. Bangkok, Thailand, Asian Institute of Technology, Division of Human Settlements Development. pp. 315-316

Randavary, S. and P.R. Vaughn. 1991. Self perceived professional competence needed and possessed by agricultural extension worker in the western region of Thailand. A multivariate technique approache The Informer Association for Inter. Agric. Ext. Edu. 7 (1), 19-26.

World Bank Report. 2008. World development report. pp 173.