Research Article

Exploring the Technical Competencies of Extension Field Workers as Perceived by Farmers in Selected Areas of Khyber Pakhtunkhwa, Pakistan

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Abstract | Technically competent public agricultural extension field staff plays a vital role in increasing productivity by dissemination of modern agricultural production technology to the farmers. Main objective of the existing study was to understand the technical competencies possessed by public agricultural extension field workers (EFS) in the Khyber Pakhtunkhwa (KP) province of Pakistan.Data were collected through a validated and pre-tested structured questionnaire from 300 randomly selected farmers of five districts of KP (namely Karak, Swabi, Mardan, Upper Dir and Charsadda), and all public extension field Staff (field assistants (FAs) and Agriculture Officers (AOs) working in the above areas constituted the sample respondents.Data were analyzed using Statistical Package for Social Sciences(SPSS). The results showed that the technical competency of FAs remained in between low and high categories with mean values ranging from 2.45 to 3.80. Similarly, the technical competency of AOs was in between low and very high categories with mean values ranging from 2.88 to 4.07. The FAs were comparatively more competent in fertilizer application (mean 3.80), sowing (mean 3.76) and irrigation (mean 3.74). At other hand, the AOs were found more competent in sowing and fertilizer application (mean 4.07). Both FAs and AOs were observed technically least competent in weeds control, insects/pests identification and their control. Findings of this study recommend that the EFS should be enabled technically more competent in all spheres by arranging proper trainings for technical efficiency in order to increase agricultural productivity and subsequently the socio-economic status of the rural community of the KP province.

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Introduction

Agriculture remains an important profession in the province of Khyber Pakhtunkhwa (KP) and about 30% of the land is cultivable in which one-third is irrigated area. Major crops of the province are wheat, maize, tobacco, sugarcane etc. Quality fruits such as apricot, apple, peaches, plums, walnuts etc. are also produced in large parts of the province. Climatic versatility and off-season vegetable production increase the importance of the province as compared to other parts of the country. Agricultural Extension Department in KP province has the mandate to transmit modern agricultural technologies to the farmers for increasing agricultural production. Achievement in self-sufficiency of major farm commodities in Pakistan have always been attributed to the low efficiency of agricultural extension services (Ahmad, 1993; Idrees, 1994; Urooba, 2001). There are many factors which affect the efficiency of agricultural extension field staff in the province of Khyber Pakhtunkhwa and the possession of technical competencies on the part of extension workers is one of the important factors which contributes towards their effective services delivery (Farooq *et al*., 2010).

The ability to describe agronomic practices of minor crops was ranked first among the given training needs of AOs, followed by the ability to recommend plant protection measures for minor crops and the ability regarding seed rate of minor crops in Punjab (Pakistan), according to calculations made by Khan *et al*. (2007). Bajwa *et al*. (2008) underlined the amount of efficacy up to an average level for information distribution from crop management to harvest in different research. According to Khan *et al*. (2011), all five of the AOs' self-perceived mechanized farming skills required training. Similarly, Khan *et al*. (2012) found the "training gap" of the AOs and concluded that the technical competency of the AOs in Pakistan was lower than the required level to ensure the delivery of agricultural technology to the clientele. Moreover, Yaseen *et al*. (2015) made an investigation through review studies that in Pakistan, technical and professional competency of EFS were not satisfactory and not according to the field situations. The function and productivity of EFS have been significantly impacted by the constantly shifting and growing demand for high-quality and high-yield agricultural goods by agricultural institutions and farmers in the twenty-first century. As a result, market-driven or commercial farming is progressively taking the place of conventional subsistence farming. This could be attributed to factors such as the adoption of new technologies, market expansion, market liberalization, rising food requirement, urbanization leading to a decline in the population of farmers, liberalization and open economic policies, bilateral and multilateral economic agreements, developed infrastructure in agricultural fields, and government agricultural policies. Farmers' willingness and access to new technology will determine improvements in overall agricultural production, productivity, and sustainability (Chikaire *et al*., 2018).

Transforming this information and knowledge system among actors into a holistic approach and strong integration of stakeholders is a very important action. Then, in order to apply this holistic approach, research is needed to identify key stakeholders and their roles and responsibilities, assess their linkages and analyze factors that influence the integration of stakeholders to implement agricultural extension in the study area, but systematic and empirical studies have not tried it so far. In light of the above, the research project investigates the technical competency of public outreach field workers in Khyber Pakhtunkhwa, Pakistan. The research findings will contribute to the formulation of policies on improving the technical capacity of extension field workers and will complement high agricultural yields, improved socio-economic conditions and quality of life of poor farmers and efficient use of agricultural resources.

Materials and Methods

Universe of the study

The KP Province is located in the northwest of Pakistan, geographically located at 34.0000° north latitude and 71.3200° east longitude. The province has a total area of 74,521 square kilometers (28,773 square miles) and a total population of 30,523,371(Khan *et al*., 2022). The KP is connected to the northeast with Gilgit-Baltistan, to the northwest with Afghanistan, to the east with Azad Kashmir, to the southeast with Punjab, and to the south with Balochistan, Pakistan (Khan *et al*., 2022) (Figure 1). The current study was conducted in the province of Khyber Pakhtunkhwa, Pakistan which consists of thirty-four (34) districts including the newly merged Federally Administered Tribal Areas (FATA) and Frontier Regions (FRs).

Figure 1: *Map of Khyber Pakhtunkhwa Province, Pakistan.*

Selection of sample

The required sample was selected using a multi-stage sampling technique in which five (5) districts were randomly selected from each of the eastern, western, northern, southern and central districts of the province. The selected districts were: Swabi, Charsadda, Upper Dir, Karak and Mardan. Two tehsils were then randomly selected from each region. In the third stage, three trade union councils were randomly selected from each of the two selected tehsils, and in the fourth stage, one village was randomly selected from each of the three trade union councils. In the final stage, ten (10) farmers were randomly selected from each selected village for data collection. As farmers are the ultimate recipients of extension techniques from the extension workers so they are included in the data collection to know their opinions regarding the study. The total sample size of farmer respondents for this study was three hundred (300). Likewise, all EFS (FA and AO) of the selected tehsils served as EFS respondents, bringing the sample size of EFS respondents to ninety-five (95).

Data collection

Two separate questionnaires were developed for data collection. For data collection from farmer respondents' questionnaire was used as interview schedule while for EFS questionnaire was distributed among the EFS respondents. A five-point Likert Scale (very low, low, average, high, and very high) was used to find out the technical competencies of EFS (Likert, 1967).

Data analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS). Descriptive statisticssuch as mean, standard deviation, and weighted scores were used and results were interpreted.

Results and Discussion

Technical competency of field assistants (FAs)

Technical competency of FAs refers to the technical knowledge of the subject possessed by the FAs. Data were obtained in this regard and presented in Table 1. Efficient irrigation, sowing and fertilizer application were the technical competencies of FAs rated very high by 30.3, 31.7 and 32.7% of the respondents, respectively. In comparison, most (40.7 to 44.7%) of the respondents perceived high technical competencies of FAs about seed selection, harvesting and post-harvest handling. Furthermore, most to half (41.0 to 51.7%) of the respondents were of the view that FAs possessed average technical competencies in harvesting, seed selection, marketing, insect/pests identification, farm management and weeds control. Data further reveals that 32.7, 43.0 and 51.0% of the respondents reported technical competencies of FAs low regarding marketing, insect/pests identification and insect/pests control.

Table 1: *Perception of farmer respondents regarding various technical competencies of FAs.*

Technical competency	Percentage				
	VL	L	Ave.	H	VH
Seed selection	0.3	7.0	42.3	40.7	9.7
Farm management	-	17.0	49.7	31.0	2.3
Land preparation	-	14.3	34.3	27.0	23.7
Sowing	0.3	11.3	31.7	25.0	31.7
Fertilizer application	0.3	12.0	27.3	27.7	32.7
Efficient irrigation	0.3	14.3	27.0	28.0	30.3
Weeds control	5.3	26.7	51.7	16.3	-
Insects/pests identification	6.3	43.0	45.7	5.0	-
Insects/pests control	4.7	51.0	38.7	5.7	-
Harvesting	0.3	8.3	41.0	42.0	8.3
Post-harvest handling	0.3	17.7	35.3	44.7	2.0
Marketing	4.0	32.7	43.3	18.7	1.3

VL= Very low; L= Low; Ave. = Average; H= High; VH= Very high.

Relative scores and means were obtained which depicts that farm management, post-harvest handling, harvesting, seed selection, land preparation, irrigation, sowing and fertilizer application were

the technical competencies which came in between average and high but farm management (FM) and post-harvest handling (PH) showed their tendencies towards average (means= 3.19 and 3.30). In addition, fertilizer application (FA), sowing (sow.), Efficient irrigation (irrig.) and land preparation (LP) were inclined towards high level (means = 3.80, 3.76, 3.74 and 3.60) and ranked 1st, 2nd, 3rdand 4thwith highest weighted scores of 1141, 1129, 1121 and 1076, respectively (Figure 2). Similarly, weeds control, insects/pests identification and insects/pests control were ranked as 10th, 11th and 12th, respectively. It can be inferred from the above results that for the purpose of increasing agricultural productivity in the studied areas, technical competencies of FAs in all the studied parameters need to be upgraded especially in the areas of 'weeds control' insects/pests identification and insects/pests control. These results are partially similar to those of Siddiqui (2006).

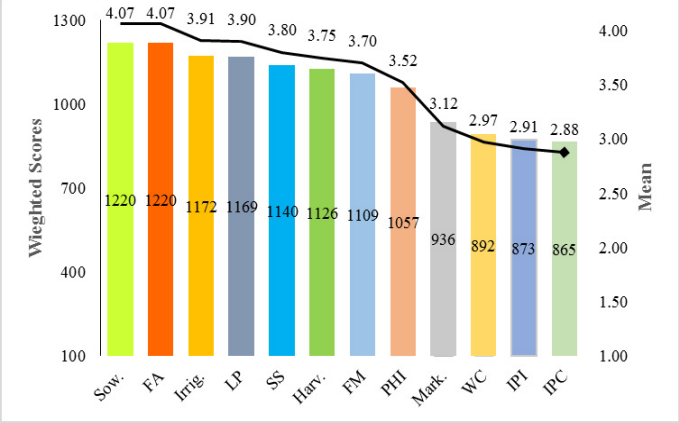

Figure 2: *Technical competency of field assistants (FAs).*

Technical competency of agriculture officers (AOs)

Table 2 shows that most (33.0 to 40.7%) of the respondents were of the view that AOs possessed very high technical competency in Efficient irrigation, land preparation, fertilizer application and sowing. Similarly, most to half (43.0 to 53.3%) respondents rated the technical competency of AOs in high category in the subjects of seed selection, farm management, post-harvest handling and harvesting. Moreover, half to fair majority (50.0 to 68.0%) respondents were of the opinion that AOs possessed average technical competency in the subjects of marketing, weeds control, insects/pests identification and their control.

Relative scores and mean values showed that sowing (sow.) and fertilizer application (FA) were the technical competencies of AOs which were placed in between high and very high categories but tended more towards high category (mean= 4.07). Similarly, Efficient irrigation (irrig.), land preparation (LP), seed selection (SS), harvesting (H), farm management (FM),), post-harvest handling (PH) and marketing (M) were placed in between average and high categories (means= 3.91, 3.90, 3.80, 3.75, 3.70, 3.52 and 3.12) but all tended towards high category except marketing which tended towards the average category. In addition, sowing and fertilizer application were ranked 1st with weighted score 1220 and weed control, insects/pests identification and insects/pests control ranked 9th, 10th and 11th with weighted score 892,873 and 865, respectively (Figure 3). These results indicate that for the purpose of increasing efficiency of AOs their technical efficiency in all the studied parameters are required to be upgraded with special attention towards weeds control, identification and control of insects/pests. These results are in line with Khan *et al.* (2012).

Table 2: *Perception of farmer respondents regarding various technical competencies of AOs.*

Technical competency	Percentage				
	VL	L	Ave.	H	VH
Seed selection	-	2.3	35.0	43.0	19.7
Farm management	-	5.7	35.0	43.3	16.0
Land preparation	-	6.3	31.7	28.0	34.0
Sowing	1.0	4.3	22.3	31.7	40.7
Fertilizer application	0.7	5.7	17.0	39.7	37.0
Efficient irrigation	0.7	4.7	31.0	30.7	33.0
Weeds control	1.7	21.7	54.3	22.3	-
Insects/pests identification	1.0	19.0	68.0	12.0	-
Insects/pests control	1.0	20.3	68.0	10.7	-
Harvesting	0.3	4.7	28.0	53.3	13.7
Post-harvest handling	0.7	8.7	33.3	52.3	5.0
Marketing	-	20.0	50.0	28.0	2.0

VL= Very low; L= Low; Ave.= Average; H= High; VH= Very high.

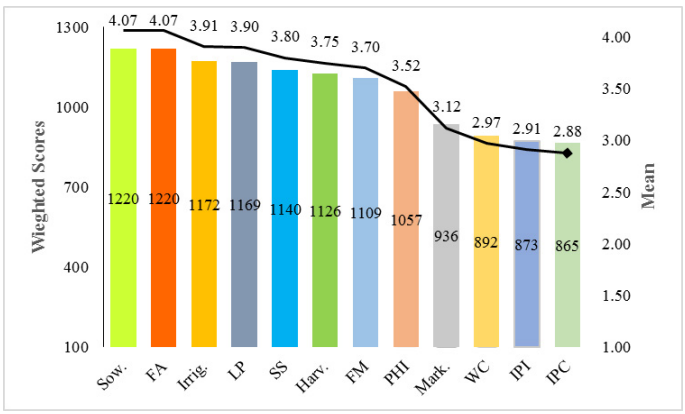

Figure 3: *Technical competency of AOs.*

Self-perceived technical competency of EFS

Table 3 shows that seed selection, farm management and land preparation were the technical competencies rated high by 42.1, 44.2 and 48.4% of the EFS respondents, respectively. More than half (50.5 to 53.7%) of the EFS respondents were of the view that they possessed average technical competencies in insects/pests identification, marketing, sowing and harvesting and its timings. Similarly, weed control, insects/pests control and their identification were the technical competencies of AOs rated low by 20.0, 22.1 and 23.2% of the EFS respondents, respectively.

Table 3: *Self-perceived technical competencies of EFS (FAs and AOs).*

Technical competency	Level of technical competency				
	VL	L	Ave.	H	VH
	Percentages				
Seed selection	-	-	48.4	42.1	9.5
Farm management	-	-	48.4	44.2	7.4
Land preparation	-	-	42.1	48.4	9.5
Sowing	-	-	52.6	38.9	8.4
Fertilizer application	-	4.2	36.3	38.9	10.5
Efficient irrigation	-	6.3	49.5	33.7	10.5
Weeds control	-	20.0	45.3	33.7	1.1
Insects/pests identification	-	23.2	50.5	24.2	2.1
Insects/pests control	-	22.1	45.3	32.6	-
Harvesting & its timings	-	6.3	53.7	37.9	2.1
Post-harvest handling	-	11.6	49.5	34.7	4.2
Marketing	-	16.8	52.6	30.5	-

VL= Very low; L= Low; Ave.= Average; H= High; VH= Very high.

Relative scores and means obtained depicted that self-perceived technical competencies of EFS in all the given subjects were placed in between average and high category but land preparation (LP), seed selection (SS), farm management (FM)), sowing (sow.)and fertilizer application (FA) tended towards high category (means= 3.67,3.61,3.59,3.56,3.56) and insects/pests identification (IPI), insects/pests control (IPC), marketing (M), weed control (WC), post-harvest handling (PHI), harvesting and its timings (Harv.) and efficient irrigation (irrig.) tended towards average category (means= 3.05, 3.11, 3.14, 3.16, 3.32, 3.36 and 3.48). In addition, land preparation, seed selection, and farm management with weighted scores 349, 343 and 341 were ranked 1st, 2nd and 3rd respectively and marketing, insects/pests control and insects/pests identification with weighted scores 298, 295 and 290 were ranked 9th, 10th and 11th, respectively (Figure 4). It is evident from the above results that in majority of the studied production technologies EFS (both FAs and AOs) were found to be less competent and ranged from low to an average category. Since all the parameters related to agricultural productivity are equally important and the EFS are supposed to be competent in these areas in order to effectively disseminate the latest techniques to the ultimate users (farmers). Special attention should be given for the up-gradation of competencies related to the identified weaker areas such as 'insects/pests identification, insects/pests control, marketing and weeds control. These results are similar to those of Bajwa *et al.* (2008).

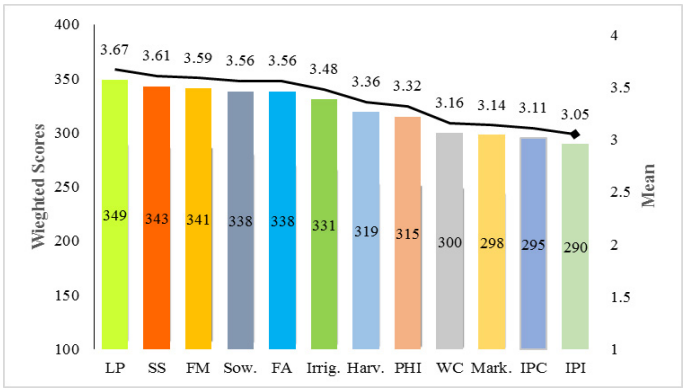

Figure 4: *Self-perceived technical competency of EFS.*

Conclusions and Recommendations

The study indicated that AOs were judged to be comparatively more competent solely in the sowing and fertilizing topics, but the technical competence of FAs was ranked in low to high categories in terms of numerous basic subjects they required. In terms of weed control, insect/pest detection, and their management, FA and AO were shown to be the least successful. The technical competence of EFS (FAs and AOs) in all given subjects, especially weed control, insect/pest identification, insect/pest control and marketing needs to be improved through proper training in order to disseminate to farmers what is needed to improve agricultural productivity knowledge. The proposed study therefore addresses this research gap and attempts to make empirical extrapolations to provide valuable research findings that can be used by farmers, government and NGOs, and policy makers involved in the agricultural development process to plan appropriate mechanisms to improve integration, knowledge and information sharing among participants in agricultural development. For agricultural development, agricultural extension

agencies, especially in developing countries, are the main players in providing extension services to farmers.

Therefore, the proposed study addresses this research gap and attempts to make empirical inferences to provide valuable research findings that can be used by farmers, governmental and non-governmental organizations, and policy makers involved in the agricultural development process to plan appropriate mechanisms to improve actor integration, knowledge and information sharing for agricultural development. For agricultural development, agricultural extension agencies, especially in developing countries, are the main players in the provision of extension services to farmers.

Novelty Statement

This study is a practical approach to explore the technical competencies of agricultural Extension Field Workers regarding different crop production technologies in the studied areas.

Authors' Contribution

Syed Muhammad: Principal author, did research, data collection, compilation analysis, and write-up.
Badar Naseem Siddiqui: Supervised the research work.
Farhat Ullah Khan: Provided technical guidelines
Muhammad Adnan: Helped in data analysis
Sami Ullah and Nawab Khan: Helped in compiling the results

Conflict of interest
The authors have declared no conflict of interest.

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