Research Article

An Investigation to The Technical Abilities (Climatic Change) of Agriculture Officers Serving in Agriculture Extension Department Khyber Pakhtunkhwa, Pakistan

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Abstract | The key role of agriculture extension services is to facilitate and uplift the socio-economic condition of the farming community. Keeping in view recent trends and evolving flukes in the agriculture sector, Agriculture Officers (AOs) would be capable of assisting their staff in the dissemination of the latest technology. Hence, this study was steered to investigate the specialized skills regarding climate change abilities of AOs engaged in the Agriculture Extension Department Khyber Pakhtunkhwa, Pakistan also to scrutinize the existing and required level of technical abilities underscoring the mean and ranking the dispositions of training needs. A total of 79, AOs were selected from all districts of Khyber Pakhtunkhwa and were interviewed through a pre-tested interview plan. The outcomes are displayed in percentages, graphs and tables. To achieve the desired objectives, the regression model (dummy variable regression model) paired sample t- Test and means were used. Outcomes disclosed that the majority (49.4%) of the respondents recorded in the age category of 31-40 years, next 24.1% 24.1% within 41-50 years of age. The Educational levels of AOs were recorded in which the majority (79.7%) of the respondents possessed a master degree in the relevant subject. The outcomes highlight that maximum (81.0%) of the respondents did not avail of any in-service training. Problem-solving discussion and participatory techniques were ranked by AOs as suitable methods to diffuse the latest information and improved technologies to the rural populace with a mean of 2.29 and 2.27, respectively. Familiarity with climate change and understanding & communicating weather were ranked by AOs at 1st and 2nd ranked order highlighting (t-value of -15.64) and -1.62 (t-value -15.35) that had significant variance between the level possessed and required. It is recommended that AOs should be encouraged and supported to pursue doctoral-level education and more in-service training courses need to be conducted regarding this global issue. The number of AOs would be increased for easy and timely reporting of the area under their jurisdiction.

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Introduction

Agriculture sector play a key role in Pakistan's economic development. Pakistan, like other emerging states, is primarily an agricultural country as a considerable section of the populace depends on agriculture for both work and revenue, making it a vital sector for rural life. An exceptional climatic condition of Pakistan i.e. deep loams, satisfactory landscape, and water resources, has the potential to attain agricultural sustainability if appropriately managed (Khan, 2006 and Rehman *et al*., 2011).

Global food security depends on both adequate food production and food access in which all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life. The worldwide phenomena of climate change is characterized by modifications to the planet's normal climate (in terms of precipitation, wind, and temperature) that are specifically driven by human action. Future food security is projected to be threatened by the extensive impacts of climate change on agricultural production. Drought and increased crop water demand may result in a shortage of water needed for food production. As some regions become climatically unsuited for production, competition for land may intensify. Furthermore, abrupt drops in agricultural productivity brought on by climate change-related extreme weather events could result in sharp price hikes (FAO, 2013).

Agricultural extension is mostly dependent on farmer-to-farmer communication (Rehman *et al*., 2012). This circumstance demands appropriate farmers' teaching of new and advanced technology, which can only be attained by educating the farming community by the skilled extension personnel (Khan *et al*., 2008). Even though extension services are available but their efficacy is hampered by issues like low adoption rates of climate-resilient technology, institutional limitations, underprivileged outreach in rural areas, and inadequate training of extension personnel. Enhancing farmer-led participatory techniques, integrating ICT-based advisory systems, boosting financial support, and fortifying public-private partnerships are all central strategies for boosting climate adaption. In this regard, Agriculture Officers (AOs) have to be capable enough in performing their duties efficiently which are considered as significant pillars of the agricultural economy (Sallam and Akram, 2005).

Objectives

- To investigate the technical abilities (climatic change) of Agriculture Officers serving in the study area.
- To examine the status of in-service training availed and preference of training method of the respondents for delivery of information.

Materials and Methods

Universe of the study

Khyber Pakhtunkhwa Province (North Latitude 31 to 37 °, East Longitude 70 to 74 °) was the universe of the study and all the Agriculture Officers were population of the study from the four zones of Khyber Pakhtunkhwa namely, central valley plain, northern mountainous zone, eastern mountainous zone and southern piedmont plain that constitutes 12.8% of Pakistan's total geographic area (Khan, 2017).

Research design

The smooth path is the appropriate research design for getting to the destination of accurate, dependable, and authentic results. The descriptive survey research design was preferred as the current study was designed to analyze the specialized skills of Agriculture Officers.

Research validity

Validity authenticates that the instrument is correct as assessed by experts who examine it in light of the intent behind its creation. The actual findings of the research tool with both face and content validity are as accurate as the data collection (Wimmer and Dominick, 2003). In order to verify the validity of the instrument and incorporate their opinions and suggestions, the interview schedule was presented to the experts and professionals of the Department of Agriculture Extension at the University of Agriculture Peshawar and the Provincial Agriculture Extension department.

Reliability of the research instrument

The consistency of the research tool is the contradiction of its validity. Since internal consistency and homogeneity are closely related, the instrument's core reliability holds a distinctive place among these characteristics (Cronbach, 1951). Considering the suitability of the instrument internal consistency, Cronbach's Alpha was used.

Pre-testing of the research instrument

Before data collection, the interview schedule was pre-tested on 10 Agriculture Officers to address any shortcomings and lessen prejudice.

Data collection and statistical frame work

The data of the total respondents (79) were obtained by interacting with them in their offices using the personal interview approach. The collected data were analyzed through Statistical Package for Social Sciences (SPSS) version 20. The desired outcomes were displayed in the form of graphs and percentages. Moreover, the mean difference amid the level required and the level possessed, standard deviation, regression model, and paired sample t-test was applied for the analysis of data based on the review of literature.

Results and Discussion

Age of the agriculture officers

Age is an important demographic characteristic that affects how new technologies are adopted and diffused (Saleem, 2010). Table 1 highlight that maximum (49.4%) Agriculture Officers were observed in 31-40 years of age and minimum (12.7%) were recorded in the age category of 22-30 years of age. Similarly, (24.1%) respondents were stated in the category of 41-50 while 11.9% were recorded in category of 50-60 years of age. Among the Agro-Ecological Zone the maximum (17.7%) respondents were recorded in in Central Valley Plain who had age between 31-40 years following Southern Piedmont Plain and Eastern Mountainous Zone which was (11.4%) respectively. The outcomes highlighted that 49.4% of the AOs were found young and energetic which fully devoted to provide their services in a fruit full way. Our results somewhat support those of Demenonge *et al.* (2015), who noticed 37.6% of agriculture extention personnel were in the 31–40 age range.

Education brings desirable changes in human behavior. It provides not only a deeper comprehension of one's potential and abilities but also supports core task performance by giving people declarative and procedural knowledge to accomplish their task level (NG and Feldman, 2009). Table 2 shows that the majority (79.7%) of the respondents had a master's qualification while 11.4% were qualified up to the bachelor level. Similarly, only 8.9% of respondents were PhDs in their respective fields. AL-Subaiee *et al.* (2005) stated that the Agriculture Officers who had higher educational levels were much more satisfied as compared to those whose education level was low.

Table 1: *Respondents distribution regarding their age*

Agro ecological zones	**Respondent's age (in years)**				**Total**
	22-30	31-40	41-50	**50-60**	
Central valley plain	1 (1.3)	14 (17.7)	5 (6.3)	4 (5.1)	24 (30.4)
Southern piedmont plain	3 (3.8)	9 (11.4)	3 (3.8)	4 (5.1)	19 (24.1)
Eastern mountainous zone	4 (5.1)	7 (8.1)	5 (6.3)	2 (2.5)	18 (22.8)
Northern mountainous zone	2 (2.5)	9 (11.4)	6 (7.6)	1 (1.3)	18 (22.8)
Total	10 (12.7)	39 (49.4)	19 (24.1)	11 (13.9)	79 (100)

Field survey, 2020-2021
Note: Values in parenthesis are percentages

Table 2: *Respondents distribution regarding education*

Agro ecologica zones	**Respondents educational level**			**Total**
	B.SC (Hons)	M.SC (Hons)	**PhD**	
Central valley plain	2 (2.5)	20 (25.3)	2 (2.5)	24 (30.4)
Southern piedmont plain	4 (5.1)	12 (15.2)	3 (3.8)	19 (24.1)
Eastern mountainous zone	2 (2.5)	15 (19.0)	1 (1.3)	18 (22.8)
Northern mountainous zone	1 (1.3)	16 (20.3)	1 (1.3)	18 (22.8)
Total	9 (11.4)	63 (79.7)	7 (8.9)	79 (100.0)

Field survey, 2020-2021
Note: Values in parenthesis are percentages

Table 3: *Distribution of respondents regarding in-service training availed by them*

Agro-Ecological zones	In-Service training		Total
	Yes	No	
Central valley plain	5 (6.3)	19 (24.1)	24 (30.4)
Southern piedmont plain	6 (7.6)	13 (16.5)	19 (24.1)
Eastern mountainous Zone	2 (2.5)	16 (20.3)	18 (22.8)
Northern mountainous Zone	2 (2.5)	16 (20.3)	18 (22.8)
Total	15 (19.0)	64 (81.0)	79 (100.0)

Field survey, 2020-2021
Note: Values in parenthesis are percentages

Agriculture extension agents act as a bridge between the farming community and research station to fill the gap for overall agricultural development (Msuya *et al*., 2017). Table 3 highlighted that mainstream (81.0 %) of AOs didn't avail proper in-service training related to their field of service from any government and non-government organizations. Attention to organizing proper training would certainly improve AO's skills and make them competent in the provision of services to the rural community. The outcomes show similarity to that of Farooq *et al*., (2010) who concluded that Agriculture Officers needs trainings for the improvement and management of farm practices to overcome the emerging problems.

Organizing of proper training could increase the efficiency of AOs to manage the emerging challenges in the dissemination of the latest information and technologies to the farming community. Keeping in view such an essential role the AOs were interviewed to rank the best suitable method to diffuse the latest information and improved technologies to the rural populace as shown in (Table 4).

Table 4: *Rank, mean and SD of agriculture officers regarding preferred training method*

S. No.	Training method	Ranks					Mean	SD	Rank order
		1	2	3	4	5			
1	Problem solving discussion	2 (2.5)	5(6.3)	2 (2.5)	29 (36.5)	41 (51.6)	4.29	0.97	1
2	Participatory technique	2 (2.5)	2 (2.5)	6 (7.5)	31(39.0)	38 (47.8)	4.27	0.90	2
3	Brain storming	2 (2.5)	3 (3.8)	5(6.2)	37(46.6)	32 (40.3)	4.18	0.90	3
4	Discussion	2 (2.5)	5(6.3)	7(8.82)	31 (39.0)	34 (42.8)	4.13	0.99	4
5	Demonstrations	9 (11.3)	10 (12.6)	9(11.3)	14 (17.6)	37 (46.6)	3.75	1.44	5
6	Role Playing	7(8.8)	3 (3.8)	22 (27.7)	31(39.0)	16 (20.1)	3.58	1.12	6
7	Lecture	7(8.8)	8 (10.0)	35 (44.1)	18 (22.8)	11 (13.8)	3.22	1.09	7
	Overall mean						3.91		

Field survey, 2020-2021, Note: Values in parenthesis are percentages
Likert scale: 1=Very low, 2=Low, 3=Medium, 4=High, 5=Very high

Table 5: *Training need in climate change capabilities amongst the level possessed and required of agriculture officers*

S. No.	Capability statement	Existing level	Level required	Mean diference	Rank	T-value
1	Familiarity with climate change	3.24	4.63	-1.39	1	-15.64**
2	Communicate climate information effectively	2.92	4.54	-1.62	3	-15.35**
3	Practicing cultural method to reduce the climate change impacts	2.89	4.54	-1.64	4	-14.61**
4	Recongnizing and delivering wheather forecast	3.10	4.54	-1.46	2	-14.01**
5	Evaluation of adaptation options with respect to climate change	2.58	4.49	-1.91	7	-17.63**
6	İntroducing climate resilent varieties	2.87	4.73	-1.86	6	-21.20**
7	Know how of water and soil conservation tactics	2.93	4.60	-1.67	5	-12.20**

Represents significance at 5% level of probability, source: field survey, 2020-2021

It was observed from the findings that no single method is appropriate in the delivery of information and provision of technical skills to the respondents. However, problem-solving discussion was recorded at topmost rank representing a mean of 4.29. Similarly, participatory technique was recorded at 2nd rank order with a mean of 4.27 and SD 0.90 followed by brainstorming methods that were ranked at 3rd order with a mean possessed 4.18 and SD 0.90 considered suitable for transmitting ideas and information to the respondents.

Required and possessed level of climatic change capabilities of agriculture officers

Future food security is going to be affected by the substantial impact of climate change on agricultural production. Climate change related severe weather conditions will abruptly lower agricultural productivity, which would raise prices substantially (FAO, 2013, Wimmer and Dominick, 2003).

Data given in Table 5 revealed that familiarity with climate change was at topmost rank with a mean difference of -1.39 and a t-value of -15.64 followed by understanding and communicating weather forecast at ranked 2nd with a mean difference of -1.46 and t-value of -14.01. Communicate climate related information resourcefully highlighting t-value of -15.35 and mean difference of -1.62 possessed significancy between the required and possessed level and placed at 3rd rank. Mean difference -1.64 and t-value -14.61 was noticed in cultural practices to mitigate climate change impact with highly significant variance was ranked at 4rth order of the training need. Highly (P≤0.05) significant difference was reported in familiarity with climate change, understanding and communicating weather forecast, communicate climate information effectively and to practice the traditional methods to address climate change impacts.

Conclusions and Recommendations

Interpreting the findings, the situation demands that Agriculture Officers should be enough capable to perform their duties efficiently who are considered as significant pillars of the agricultural economy as they act as front-line soldiers to educate the farming communities regarding latest agriculture technologies. The study reveals least preference was given to in service training program.

Novelty Statement

This study examines the technical abilities of agriculture officers in addressing climate change challenges, that received limited pragmatic attention in the context of Khyber Pakhtunkhwa, Pakistan. Unlike preceding research focusing on general competencies, this study emphasizes climate change–related technical skills, offering new insights to strengthen climate-resilient agricultural extension services.

Author's Contribution

Shah Saud: Comprehended the inkling and managed the work while
Muhammad Zafar Ullah Khan: Executed the field research and data analysis.

Conflict of Interest

No conflict of interest exists.

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