An analysis of farmers' perception about agriculture extension workers' capabilities in enhancing maize productivity in District Shangla-Khyber Pakhtunkhwa with reference to climate change

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Abstract. This study analyzed farmers' perception about extension workers' capabilities in enhancing maize productivity with reference to climate change in District Shangla, Khyber Pakhtunkhwa Pakistan. Two villages were taken purposively from three union council of Tehsil Besham in District Shangla for data collection. Data was collected data through well-structured interview schedule which was analyzed using SPSS V.20 software and descriptive statistics, likert scale and Chi-square test was used for association. Maximum respondents (32%) were found in the age 26-35 years with majority (47%) of respondents having 1-2 acres of land. Moreover, maximum maize growers were literate in joint families, whereas majority was small landholders and owner cultivators with main source of income which was business. About 49% maize growers were getting Pakistani Rupees 20,000 per season as maximum (82%) growers were getting 6400-12800 kg/acre maize production from local varieties. Farmers' perceptions about extension workers' familiarity with climate change on record keeping about climate change issue was ranked 1st with highest mean value 3.12 and standard deviation 1.34 and promoting cultivation of improved maize varieties were ranked 2nd with higher mean value 2.73 and standard deviation 1.21, while familiarity with climate change was ranked 4th with lowest mean value 2.67 and standard deviation 1.31. Extension personnel should visit maize growers regularly from seeding through harvesting which was highly discouraging in regards of visits for addressing their issues regarding climate change and weather suitability of maize hybrid varieties for higher production through local agriculture programs broadcast on a local FM channel and pamphlets.

Keywords: Climate change, extension workers' capabilities maize crop, Khyber Pakhtunkhwa, Pakistan

1. Introduction

Agriculture is the most important sector in Pakistan's economy and is considered the keystone of every economy. Pakistan as an agrarian country, contributes 19.3 percent to Gross Domestic Product (GDP) employs nearly 42.3 percent of the overall labor force, and accounts for a substantial portion of export earnings. Almost 68 percent of people in rural areas are engaged in agriculture, either directly or indirectly, through the cultivation, refining, and trade of both minor and major agricultural products, as

it is their primary source of income and support, meeting the population's food needs and supplying raw materials to industries[1].

Community in the world is facing environmental issues due to climate change affecting human activities directly and indirectly. The deliberate role of agricultural productivity is mainly due to the weather and climate. Climatic causes variation in temperature, precipitation, magnitude and other weather conditions such as greenhouse gas (GHG) emissions, frequency, and distribution of rainfall, and other weather extreme conditions such as flood, drought, and intensification of sea level and cyclone which have negative impact on agricultural economic growth. Since the 1980s, around about 400-500 natural disasters have occurred due to climate change (Intergovernmental Panel on Climate Change[2].

According to estimates in advance, agriculture will need to feed an additional 3.5 billion people over the next 50 years[3]. To feed the world's rising rural and urban population, production of the three major cereal crops of maize, wheat, and rice only would need to increase by 70% by 2050. As a result, maize (Zea Mays) is one of the developing crops that is most affected by climatic conditions. Maize is regarded as the queen of cereal.After wheat, cotton, and rice, maize is Pakistan's fourth most significant crop of*Kharif* season that starts in June and remains till November in Khyber Pakhtunkhwa.

The scientific name *Zea mays L*, popularly known as maize, are utilized as a staple meal, Fodder, and raw material in a variety of manufacturing processes all over the world. Maize contributes to a balanced diet by containing approximately 3% basic minerals, 4% fats, and fiber, 9% calcium, and almost 80% starches[4]. The third most valuable cereal crop in Pakistan after wheat and rice is maize. Since the majority of the rural population maize is the staple food crops, feed and industrial crop around the world. It contributes towards food security in several developing countries of Asia and Africa. Maize crop is called “the other gold” due to its diversified industrial consumption. Food energy yielded by maize estimated at about 6.9 million calories per hectare which is fairly high as compared to wheat (3.7 million) and rice (4.9 million). Maize is the main crops in the farming system. In many rich and developing nations, Pakistan included, low soil fertility is a significant yield-limiting factor for cereal production. Some of the by- products were used in poultry and animal feed. Around 60% of maize grain is used in poultry/ animals feed industry. The industrialized world will cope with low soil fertility by providing sufficient nutrients in the form of chemical fertilizers. However, due to the high cost of fertilizers, this is not feasible in the majority of countries. As a result, farmers use both available organic sources and a sufficient amount of chemical fertilizers to minimize chemical fertilizer costs and increase crop yields. However, because of energy scarcity, rising pesticide costs, deteriorating soil quality, and environmental issues, organic manures have resurfaced as a viable option[5]. Organic origins, according to studies, will assist in sustaining a stronger N: P ratio and higher yield[6,7]. Organic sources were shown to be effective at much higher rates, while this could be out of control for small or low-income producers[8,9].

As we know that climate change has adversely affected all sectors, as far agriculture workers is concerned, Climate Smart Agricultural efforts involve the adoption of measures that promote agricultural resilience and stability, hence assisting farmers in adapting to climate change risk.[10]. several studies have found that farmers have a poor degree of acceptance and application of climate change approaches. Globally, agricultural extension agents are tasked with disseminating technology and programmes to farmers. Agricultural extension services include all elements of providing timely information, connectingfarmers with sources of farming supplies and financial facilities, and, most crucially, transferring technology and providing education services to farmers in all parts of agriculture[11].

2. Materials and methods

This study was conducted in district Shangla on "The farmers' view of maize-growing extension workers" This chapter will discuss several methods and procedures to be applied to achieve the study objectives necessary, sample selection, data collecting methodology, and statistical approach.The majority of the farmers cultivated maize and the researcher belongs to the study region by himself which makes the collecting of data easy and convenient. Two villages were selected at random from three

union councils in Tehsil Besham, where the most of the farmers cultivated maize. The acquired data was evaluated via statistical package of social science tools (SPSS v.20). A Chi-square test was used to determine the relationship between two variables, and the link between variables was investigated (1). Likert scale was used.

$$\chi^2 = \sum_{i=1}^{r}\sum_{j=1}^{c}\frac{(O_{ij}-e_{ij})^2}{e_{ij}}$$

……(1)

$\boldsymbol{x^2}$= Chi-square value

O= observed frequency while, e=expected frequency

3. Results and discussion

Age, education, household size, family structure, land size, tenancy, and source of income were the key demographic characteristicsfor the present research study. These characteristics are quite useful for collecting data and obtaining the essential information from respondents. Demographic traits always have an impact on other attributes, which is why data collecting in these areas is important[12–16]. Keeping in view the importance of these characteristics, data were collected about these important aspects.

3.1. Age

The adoption or rejection of contemporary farming practices is strongly influenced by age. When compared to older people, younger people are more likely to adopt innovations[14]. The adoption of agricultural advances is directly influenced by age[17]. Data regarding age of the respondents are given below asclassified into four groups. Results indicated that out of 204 respondents, 65 (31.9%) responders ranged in age from 26 to 35year, 58 (28.4%) were from the category of 36-45 years, 51 (25.0%) were age more than 46 year and the remaining 30 (14.7%) of the respondents were found less than 25 years (Table 1).

Table 1. The data of respondent's age

Respondent Age (year)	Respondent amount	Percentage (%)
Below 25	30	14.7
26-35	65	31.9
36-45	58	28.4
Above 36	51	25

3.2. Literacy status

Literacy has a significant role in the adoption of latest farming technology. A person's aptitude toward acceptance of better farming techniques might be influenced through education. Education is a method of bringing about desired changes in people's behavior. An educated person is more likely to keep up with the newest information on the changes in his environment. As a result, an educated farmer is regarded to be more aware of agricultural innovations and to approach farm operations more scientifically[18]. Ponniah[19]stated that the adoption of modern extension services and methods is strongly influenced by farmer education, according to the findings. Farmers who are literate are more open to new ideas than those who are illiterate. Data aboutliteracy of the respondents is exhibited as under. The data about literacy status of the respondent gathered in the study is presented in Table 2.

Table 2. The data of respondent's literacy status

Literacy status	Respondents	Percentage (%)
Illiterate	86	42.2
Literate	118	57.8
Primary	40	19.6
Middle	19	9.3
Matric	41	20.1
Intermediate	9	4.4
Inter and above	9	4.4

3.3. Area under maize crop

Area under maize crop is important aspect for mechanized farming as these field operations depend on size of the allocation for particular crop which aim is to increase farm production[20].As perprior studies, inclination of correlated with land size[21,22]the size of the farm has an impact on the farmers' willingness to accept new technologies[23]. Data regarding area under maize of the respondents were presented here. Majority of the respondents 95 (46.6%) had 1-2 Acres land under maize crop cultivation, 59 (28.9%) of the respondents were found having 2-4 Acres land on which maize was cultivated.However, the 50 respondents constituting 24.5% were involved in maize cultivation on more than 4 acres (Table 3).

Table 3. The data of area under maize crop

Area under maize crop (acre)	Respondents	Percentage (%)
1-2	95	46.6
2-4	59	28.9
Above 4	50	24.5

3.4. Total production of maize

Maize is the highest yielding crop in the world and ranks third amongst the cereal crops. About two third of national output is produced during *Kharif*season and it is the only cereal crop that grows in both *Kharif* and *Rabi* season. Data regarding Maize crop production presented below whichrevealed thetotal production of maize crop in kg/ acre in the study area. Majority of the respondents 86 (42.2%) found that net production was up to 6400 kg and 82 (40.2%) respondents reported that their total production was between 6400-12800 kg. About 33 (16.2%) of the respondents reported 12800-19200 kg production of their crop, while only 3 (1.5%) respondents reported 19200 kgs production of maize crop in the study area (Table 4).

Table 4. The data of the maize total production

Maize production (kg)	Respondents	Percentage (%)
Up to 6400	86	42.2
6400-12800	82	40.2
12800-19200	33	16.2
Above 19200	3	1.5

3.5. Farmers' visit to agriculture extension office

Farmers in the study area were mostly interested to take the advice of agriculture extension office for their guidance in maize production due to mutual confidence on them. For this purpose visiting the Agriculture Extension Office was a proper channel for respondents to address their concerns and acquire fast and appropriate information. Data shows the visit of farmers to agriculture extension office for assistance. Mostly respondents 80 (39.2%) reported that they visited monthly to agriculture extension office for assistance, 26 (12.7%) of the respondents reported their weekly visit. About51 (25.0%) of the

respondents paid an annual visit to agriculture extension office, while47 (23.0%) respondents reported that they could not visit agriculture extension office due to limited resources for reaching the agriculture extension office for taking useful information regarding maize production (Table 5).

Table 5. The data of farmer's visit to agriculture extension office

Farmer visit frequency	Respondents	Percentage (%)
Weekly	26	12.7
Monthly	80	39.2
Annually	51	25
No Visit	47	23

3.6. Capabilities of Extension Workers regarding Climate Change from Farmers Point of views

It is commonly stated that certain of the newly-developed indices of climate change sensitivity are more susceptible to its harmful effects by changing their own environment factors[24]. Various researches have studied the disparity between climate change duty and ability to contribute, on the one side, and climate change economic effects, on the other as revealed by[25]. Data regarding farmers' perception about extension workers' capabilities regarding climate change is presented in Table 6.

Table 6. Farmers' perception about extension workers' capabilities regarding climate change

Capability regarding climate change	1	2	3	4	5	Mean	S.D	Ranks
Record keeping on climate change issue	30(14.7)	40(19.6)	60(29.4)	28(13.7)	46(22.5)	3.11	1.345	I
Promoting cultivation of improved maize varieties	37(18.1)	50(24.5)	70(34.3)	25(12.3)	22(10.8)	2.73	1.21	II
Evaluation of adoption option to climate change	50(24.5)	37(18.1)	65(31.9)	30(14.7)	22(10.8)	2.69	1.28	III
Familiarity with climate change	56(27.5)	31(15.2)	60(29.4)	38(18.6)	19(9.3)	2.67	1.31	IV

Scale: 1= Very Low 2= Low 3= Medium 4= High 5= Very High S.D Standard deviation

Awareness of the concept of climate change is the need of the day for farming communities to be exposed to this new concept of climate which needs for incorporation of meteorological information in extension messages to maize growers. Agricultural Extension workers can embrace more innovative and participatory approaches of providing services. Table 4.28 shows the ranking of agricultural extension workers' capabilities in climate change as per farmers' point of view was done on the basis of mean and standard deviation (SD). Record keeping on climate change issues was ranked I with highest mean value 3.11 and SD1.34, followed by promoting cultivation of improved maize varieties as ranked II with mean value 2.73and SD1.21. Furthermore, evaluation of adoption option to climate change was ranked III with mean value 2.69 and SD1.28 while familiarity with climate change was ranked IV with lowest meant value 2.67 and SD1.31. This was good to know that farmers were aware about the capabilities of extension workers that extension workers can keep the record on climate change issues and can guide us accordingly by telling the suitable time of maize sowing and recommended varieties as per climate change issues in their record.

4. Conclusions and recommendations

It is sum-ups from the current research study that middle age respondents were in majority, literate, owners and living in joint families with small landholding where business was the main source of income. Association of education withmaize growers' problems was highly significant. Awareness of growers about climate change was the need of the day as meteorological information in extension messages was their demand. Record keeping on climate change issues was ranked by them and familiarity with climate change wasleast important which concludes that farmers were aware about the capabilities of extension workers that they can keep the record on climate change issues and can guide for suitable time of maize sowing and recommended varieties as per climate change issues. No/annual visit of extension workers was revealed by overwhelming majority. It is recommended that extension workers may be sensitized about climatic issues and regular visits to the maize growers for increasing their yield in maize.

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