

AN INVESTIGATION INTO THE ROLE OF EXTENSION WORKERS REGARDING TOMATO PRODUCTION IN NANGARHAR PROVINCE- AFGHANISTAN

Waseeullah Ibrahim Khil* and Urooba Pervaiz*

Department of Agricultural Extension Education and Communication, Faculty of Rural Social Sciences, The University of Agriculture, Peshawar-Pakistan

ABSTRACT

The role of extension workers regarding tomato production in Nangarhar Province-Afghanistan was investigated with the objectives to know the current situation of tomato cultivation and production, study the role of extension services in creating awareness regarding improved practices to increase tomato production and pinpoint the constraints hindering tomato cultivation and production in the study area. A multistage sampling technique was used to select the sample for this study. Four villages were purposively selected i.e. Qalai Janan Khan, Qalai Ishaq, Khushgumbad and Saracha Ali Khan based on tomato cultivation. Proportionate allocation technique was followed, total of 114 respondents were selected as a sample. Data were collected through well-designed interview schedule, which were analyzed through SPSS v.20 and excel. The demographic attributes revealed that majority of the respondents were illiterate (51.8%), 50% respondents were from age group of up to 30 years, having household size of above 12 members (53.5%). Majority (65.8%) respondents were tenants with 54.4% having farming experience of 10 years and above. Area under tomato cultivation of 42.1% respondents was 1.1-2 acres, majority (92.9%) tomato growers used traditional method of tomato cultivation. Majority (57.1%) respondents' tomato yield was between 10,001-12,000 kg/acre, while 32.5% respondents' net income was above 160,001 AFN/acre. Only 37.7% respondents reported visits of extension staff to farmers' field, while only 41.2% respondents received trainings from extension department. It is concluded that majority of the farmers were using HYVs, but they did not adopt the whole package of recommended technology of tomato in the study area. Farmers-Extension contact was un-satisfactory. The role of extension agents regarding tomato production in the study area was poor. Non-availability of quality seeds, lack of fertilizers, pest and diseases, improper marketing, lack of cold storage, high prices of inputs, lack of credit, insufficient information were the major problems tomato farmer in the study area were confronting. The study recommends that Afghan government should subsidize costly inputs like fertilizers, pesticides, fungicides, quality seeds, and modern agricultural machinery and should made it available at reasonable prices and timely in local market. Extension staff should make regular and frequent visits to ensure the dissemination of latest farming practices to farming community.

Key Words: Tomato production, extension staff, Farmer- Extension contact

INTRODUCTION

Agriculture accounts for the majority of Afghans' economic output, making it the foundation of the country's economy. In 2020, the agriculture sector contributed approximately 31% of Afghanistan's Gross Domestic Product (GDP), over 60% of the workforce in Afghanistan is employed in the agriculture and 80% of the country's rural population is directly or indirectly dependent on agriculture (Rasooli *et al.*, 2020).

Globally, tomato (*Solanum lycopersicum* L.) is one of the most widely grown vegetable with a production of 182.3 million tonnes obtained from 4.85 million ha annually (FAO, 2017). It ranked sixth amongst the most consumed crops worldwide (Ntonifor *et al.*, 2013; Ddamulira *et al.*, 2021). Asia accounts for 61.1% of global tomato production, with 13.5%, 13.4%, and 11.8% coming from Europe, North America, and Africa respectively. Tomato consumption per capita ranges from 61.9 to 198.9 kg per capita, with the majority of tomato consumption occurring in China, India, North Africa, the Middle East, the US, and Brazil (Quiant *et al.*, 2019).

Tomato is one of the most valuable vegetable crop in the world, both economically and nutritionally (Vasile *et al.*, 2020; Bai and Lindhout, 2007; FAOSTAT, 2018) along with being a key component of human diet and subsequent importance in human health (Willcox *et al.*, 2003; Arah, 2015). It is one of the most common crops in the world today along with being a major cash crop and industrial product (Babalola *et al.*, 2010; Hou *et al.*, 2020; Onuwa and Folorunsho, 2022). Tomatoes are a good source of lycopene which is a vital antioxidant that prevents cancer along with potassium, iron, folate, and vitamin C among the minerals and phytochemicals (Beckles, 2012; Ddamulira *et al.*, 2021). In addition to lycopene and vitamin C, tomatoes also include flavonoids, hydroxycinnamic acid, chlorogenic, homovanillic, and ferulic acids, as well as additional antioxidants like beta-carotene (Adenuga *et al.*, 2013).

Tomatoes are used both domestically and commercially by contributing significantly to a healthy diet and can be eaten raw or cooked without losing their nutritional content. Almost 80% of all tomatoes grown for commercial purposes are used to make processed foods like ketchup, soup and juice (Tandi *et al.*, 2014; Ddamulira *et*

al., 2021). Many health advantages of a diet high in tomatoes and tomato-based products have been linked to their antioxidant content (Collins *et al.*, 2022).

Being one of the world's highest yielding edible crops, tomato is considered as a significant crop for the food industry as well as fresh vegetables. It can be grown and produced in open fields as well as under greenhouse production systems (Nyamwamu, 2016). Up to 16% of Afghanistan's horticulture crops are tomatoes. In 2019, the total area under tomato cultivation was 19,788 ha and the production was 385,822 tons. The statistic department of Ministry of Agriculture, Irrigation and Livestock of Afghanistan reported that there is a remarkable increase in the production of vegetables such as potato, onion, carrot, tomato, pepper, okra, cucumber, cauliflower, pumpkin and eggplant (Ministry of Agriculture, Irrigation and Livestock of Afghanistan, 2019).

Afghanistan in the year 2021 exported \$ 40.8M tomatoes making it 23rd largest exporter of tomato in the world and tomato became the 11th most exported product of Afghanistan. It is mainly exported to Pakistan. In the same year Afghanistan imported \$9.57M tomatoes, becoming 54th largest importer of tomatoes in the world and making tomato the 98th most imported product of Afghanistan. Tomato is primarily imported from Pakistan, United Arab Emirates, Uzbekistan, Tajikistan and Brazil (The Observatory of Economic Complexity, 2022).

Farmers receive direct information from the market and nearby producers regarding customer demand and tomato price trends. Because of the large production and cheap price of fresh tomatoes, and the lack of storage facilities and processing facilities, farmers in Afghanistan receive a small profit from the market. The price of tomatoes is low during the harvest season when there is large production, which is a significant loss for the farmers. However, during the winter when there is less tomato production and tomatoes are imported from Pakistan then the prices increases (Tokhi, 2011).

Agricultural development can be speed up by efficient and effective agricultural extension services. Agricultural extension services play a key role in disseminating modern techniques to the farmers and creating awareness and interest so enabling them to adopt it. Agricultural extension helps farmer to get the required knowledge and information, assists them in developing their skills and practices to obtained higher returns within the available resources.

Ahmad *et al.* (2007) observed that most of the farmers are not aware of modern and recommended practices employed for getting profitable tomato production resulting in low yield. Agricultural extension services utilize various techniques and methods to disseminate new ideas and practices to the farming communities. These methods help in dealing with the issues of low yield by providing knowledge, increasing awareness and improving technical efficiency by upgrading the required skills which helps in adoption (Rogers, 2003).

Despite the fact that local government and non-governmental organizations have been running a number of initiatives to increase tomato crop production, which was mostly profitable for farmers but still they are unable to get enough tomato production from their field. One of the reasons for low tomato production might be due to inappropriate knowledge, skills and expertise of the farmers such as seasonal needs, marketing aspects, post-harvest management and problems. The study focuses on finding the role of extension agent in disseminating modern and improved techniques regarding tomato production to the farmers and to know the problems faced by tomato growers in tomato cultivation. The study will try to find out ways in helping farmers to increase tomato yield, so that their socio economic conditions and standard of living could be improved along with creating awareness among farming community to encourage other farmers to get involve in tomato farming. Keeping in view the importance of tomato, the current study will be conducted to investigate the role of extension workers regarding tomato production in the Nangarhar province, Afghanistan. Moreover, this research will be helpful for planners and policy makers to make better decisions in the future for enhancing the tomato production in the study area.

Objectives

Objectives of the study are to:

1. Know the current situation of tomato cultivation and production in the study area.
2. Study the role of extension services in creating awareness regarding improved practices to increase tomato production in the study area.
3. Pinpoint the constraints hindering tomato cultivation and production in the study area.
4. Devise recommendations for further improved tomato production.

MATERIALS AND METHODS

Province of Nangarhar-Afghanistan was universe of the study. The whole area of Nangarhar Province is 7727 square kilometers, while total population of 1.7 million. Vegetables like tomato, cucumber, okra, eggplant, carrot, spinach, legumes, potato, pumpkin, garlic, onion and mint etc. are mostly sown in Nangarhar Province. For the present investigation, a multistage sampling technique was used. When a sample is taken in multiple stages this sample is called multi stage sample and at each stage the sample is sub-sampled from the previous one (Cochran, 1977). There are 22 districts in Nangarhar, and Behsood was specifically chosen for this study. There are 12 villages in the Behsood District; four villages were specifically chosen with tomato farming in mind. The selected villages are Qalai Janan Khan, Qalai Ishaq, Khushgumbad and Saracha Ali Khan based on tomato cultivation. Using the proportional allocation approach, 114 respondents in total were chosen as a sample for the village-level sample selection. For convenience, the respondents were questioned in Pashto and Dari (the native languages). Both primary and secondary data were gathered. While secondary data were gathered from a variety of published, unpublished, semi-published, and government sources, primary data were gathered using a pre-tested interview plan. The Statistical Package for Social Sciences (SPSS) was used to analyze the main data. After the software processed the gathered data, counts and percentages of the findings were shown. However, for further analysis chi-square tests were used for association among different variables.

Chi-square test is expressed in equation (1):

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

This test under the null hypothesis (H_0) follows a χ^2 -distribution with $(r-1)(c-1)$ degrees of freedom, in equation (3.2), O_{ij} indicates the observed frequency and e_{ij} shows the expected frequency.

RESULTS AND DISCUSSION

Demographic Attributes

Demographic attributes play key role in social sciences studies which have effect on other characteristics (Sanaullah *et al.*, 2020). Demographic characteristics of the respondents are given in Table 1.

Age has an effect on a person's behaviour, comprehension, and way of thinking in both positive and negative ways. Age is a logical component that is also discussed throughout investigation (Khan *et al.*, 2021). Age of the respondents' were divided into four groups i.e. up to 30 years, 31-40 years, 41-50 years and above 50 years' age respectively. Table 1 indicates that out of 114 tomato growers in the study area 50% tomato growers were of the age group of up to 30 years, whereas 24.6%, 23.7% and 1.8% respondents were from the category of 31-40 years, 41-50 years, 41-50 years and above 50 years' age respectively.

Table 1: Demographic Characteristic of the Respondents

Characteristic	Category	Frequency %
Age (Years)	upto 30	57 (50)
	31-40	28(24.6)
	41-50	27 (23.7)
	Above 50	2 (1.7)
Education	literate	59 (51.8)
	Illiterate	55 (48.2)
Household size	1-4	2 (1.8)
	5-8	16 (14.0)
	9-12	35 (30.7)
	Above 12	61 (53.5)
Farming Experience (Years)	1-5	29 (25.4)
	5.1-10	23 (20.2)
	10.1and above	62 (54.4)
Tenancy	Owner Cultivator	20 (17.5)
	Owner-cum-tenant	19 (16.7)
	Tenant	75 (65.8)

Source: Field data survey 2023

Note: Figures in parenthesis are percentages

Learning, adoption, intellectual capacity, and knowledge are all directly and indirectly influenced by education. In contrast to illiterate people, who find it difficult to

deal with new situations, make decisions, and implement new, systematic guidelines and policies regarding farming, the majority of literate people are courteous, knowledgeable, and visionary when it comes to solving problems, interpreting results, and having a more positive responsive attitude towards agriculture practises (Pervaiz *et al.*, 2020). Table 1 depicted the literacy status of the tomato growers, 51.8% of the tomato growers were illiterate, while 48.2% were literate. These findings are consistent with Muhammadi *et al.* (2023), who found an overwhelming majority (69%) of respondents as illiterate in the study area. Our results are also in line with Sanaullah *et al.* (2020) who stated that 64% of illiterate respondents were actively involved in farming activities.

The size of a household has a negative relationship with socioeconomic factors. The number of respondents in the household includes both young and old individuals as well as children. (Belay *et al.*, 2012). Adoption of innovation is significantly associated with family size (Sanaullah *et al.*, 2020). Table 1 also depict data regarding household size, shows that 53.5% tomato growers having household size above 12 members and the 30.7% of the respondents having household size 9-12 members, while the 14.0% and 1.8% tomato growers were having household size 5-8 members and 1-4 members respectively. Our results are in line with Sanaullah *et al.* (2020), who reported that 61% respondents in the study area laid in the family size category of 10 and above.

Farming experience is a typical aspect of a farmers learning process. Experience plays a crucial role in the acceptance of innovations in agriculture (Hidayat *et al.*, 2023). As a farmer gains more experience, he could become more inflexible (Sanaullah *et al.*, 2020). In the study area on the basis of farming experience the tomato growers were divided into 3 different categories. Data presented in Table 1 show farming experience in years, that 54.4% of the sample respondents had farming experience of above 10 years, whereas 25.4% respondents had farming experience of 1 to 5 years, and 20.2% respondents fell under farming experience of 5.1-10 years. These results are more or less in line with Sanaullah *et al.* (2020) who observed that 63% of sample respondents in the study area were involved in agriculture from last 11-20 years.

The motivation of farmers to adopt new agricultural technology is influenced by their tenancy status (Sanaullah and Pervaiz, 2019). According to Ali *et al.* (2019) the SFP model-2 estimated findings showed that among the selected respondents, tenants were technically more efficient than owners. Three categories—owner cultivators,

owner-cum tenants, and tenants—were used to organise the study's respondents. Table 1 shows data regarding tenancy status in the study area, 65.8% tomato growers were Tenants, while Owner cultivators were 17.5% and Owner-cum-tenant were 16.7%. Our results are in contrast with that of Sanaullah *et al.* (2020) who reported that 75% respondents were owner cultivators. The results of this study showed that 65.8% tomato growers were tenant, this might be the fact that Afghanistan is war affected country and people migrated to different countries and the land is rental by left over people.

The working circumstances for farmers differ from those of workers in other sectors (Pervaiz *et al.*, 2020). The agriculture sector is unpredictable and risky because of the various natural conditions that agricultural practises are susceptible to, including disease/insects, drought, cold, floods, and technology advancements (Sanaullah *et al.*, 2020). Increasing farmer-extension contact is essential to mitigate these obstacles and raise understanding of the economic and technical elements of farming within the agricultural community (Pervaiz *et al.*, 2020). Khan *et al.* (2019) reported that registered farmers have more contact with extension staff, thus more aware than unregistered farmers, 80% extension staff claimed that they diffused improved practices to the registered farmers in their respective areas.

Area under Tomato Cultivation

For high agricultural productivity, the area under cultivation is crucial to the acceptance and spread of modern technology (Hassan, 2022).

Table 2: Distribution of Sample Respondents on the basis of Area under Tomato Cultivation in the Study Area

Villages	Area under tomato cultivation					Total
	up to 1 acre	1.1-2 acre	2.1-3 acre	3.1-4 acre	4.1 and above	
Khushgumbad	7(22.6)	16(51.6)	7(22.6)	0(0.0)	1(3.2)	31
Qalai Ishaq	14(51.9)	8(29.6)	4(14.8)	1(3.7)	0(0.0)	27
Qalai Janan Khan	13(43.3)	10(33.3)	5(16.7)	2(6.7)	0(0.0)	30
Saracha Ali Khan	5(19.2)	14(53.8)	6(23.1)	1(3.8)	0(0.0)	26
Total	39(34.2)	48(42.1)	22(19.3)	4(3.5)	1(0.9)	114

Source: Field data survey 2023

Note: Figures in parenthesis are percentages

Table 2 presents the results of a question posed to the respondents on the area under tomato cultivation. Out of the total 114 respondents, 42.1% reported that their area under tomato cultivation was between 1.1-2 acre, 34.2% reported that they were having tomato cultivation area up to 1 acre. It is concluded from these results that 95.6% respondents' area under tomato cultivation was up to 3 acres. Our results are more or less in line with Pervaiz *et al.* (2020) who claimed that area under tomato cultivation of 92% tomato growers were between 1-3 acres.

Method of Tomato Cultivation

Table 3 depicts the method of tomato cultivation in the research area. It is important to note that 92.9% of tomato growers used traditional method, while only 7.6% of the respondents adopted vertical method of tomato cultivation.

Table 3 Distribution of Sample Respondents on the Basis of Method of tomato Cultivation

Villages	Method of tomato cultivation		Total
	Vertical	Traditional	
Khushgumbad	2(6.5)	29(93.5)	31
Qalai Ishaq	1(3.7)	26(96.3)	27
Qalai Janan Khan	1(3.3)	29(96.6)	30
Saracha Ali Khan	4(15.3)	22(84.6)	26
Total	8(7.1)	103(92.9)	114

Source: Field data survey 2023

Note: Figures in parenthesis are percentages

Our results were in contrast with Hassan (2022) who reported that 100% respondents adopted vertical method of tomato cultivation.

Production of Tomato Crop

Table 4 indicates production of tomato in kg in the study area. Out of the total 114 tomato growers, 29.8% reported that their total tomato production was 24001 kg and above, 28.9%, reported that their total production was up to 12000 kg, while remaining 19.3% and 21.9% respondents reported that their total production was 12001-18000 kg and 18001-24000 kg respectively.

Table 4 Distribution of Sample Respondents on the Basis of Tomato Yield kg/acre in the Study Area

Villages	Production of tomato crop				Total
	up to 12000 kg	12001-18000 kg	18001-24000 kg	24001 kg & above	
Khushgumbad	7(22.6)	8(25.8)	7(22.6)	9(29.0)	31
Qalai Ishaq	10(37.0)	6(22.2)	5(18.5)	6(22.2)	27
Qalai Janan Khan	11(36.7)	3(10.0)	5(16.7)	11(36.7)	30
Saracha Ali Khan	5(19.2)	5(19.2)	8(30.8)	8(30.8)	26
Total	33(28.9)	22(19.3)	25(21.9)	34(29.8)	114

Source: Field data survey 2023

Note: Figures in parenthesis are percentages

Our results are in line with Salam (2018) who reported that 27% respondents had up to 12000 kg tomato production, while 22% respondents reported that their tomato production was above 21000 kg.

Net Income from Tomato Production (In Afghani AFN/acre)

Farming has always been done for financial gain—that is, revenue generated over a specific time period. Thus, question on the net revenue from tomato farming in the research area were posed to the respondents.

Table 5 Distribution of Sample Respondents on the Basis of Net Income from Tomato Production

Villages	NET Income from tomato production (In Afghani AFN/acre)				Total
	up to 80,000	81,000-120,000	121,000-160001	above 160001	
Khushgumbad	5(16.1)	7(22.6)	10(32.3)	9(29.0)	31
Qalai Ishaq	9(33.3)	6(22.2)	4(14.8)	8(29.6)	27
Qalai Janan Khan	11(36.7)	3(10.0)	5(16.7)	11(36.7)	30
Saracha Ali Khan	5(19.2)	5(19.2)	7(26.9)	9(34.6)	26
Total	30(26.3)	21(18.4)	26(22.8)	37(32.5)	114

Source: Field data survey 2023

Note: Figures in parenthesis are percentages

The investigation leads us to the conclusion that tomato cultivation is lucrative in the investigated location. Tomato output and, eventually, net revenue from tomato cultivation may rise if adequate attention is paid to educating tomato producers in the study region about HYVs and contemporary technical production procedures. Pervaiz *et al.* (2018) provided support for these findings, noting a noteworthy rise in the sample respondents' tomato production net revenue (i.e., 115832.01 Rs) subsequent to receiving instruction from the extension department.

High Yielding Varieties

Due to the availability of high yielding varieties, agricultural productivity rises significantly (Sanaullah and Pervaiz, 2019). When compared to local variety, improved cultivars provide a higher yield. High yield varieties (HYVs) are the name given to these varieties (Haq *et al.*, 2022).

Table 7 displays data related the adoption of high-yielding tomato varieties. It is clear from data that 92.1% of tomato growers were cultivating various high-yield varieties, 15.8% of tomato growers mentioned that they cultivated Roma-Vf as a high-yielding variety, while 16.7% of the respondents stated that they used Dollar as a high-yielding variety. Moreover, 14.9% of the respondents reported that they opted for Marjan as their high-yielding variety, and 12.3% of the respondents mentioned that they grew Robeno as a high-yield variety. The remaining 23.7% of the respondents noted that they utilized Majic as their chosen high-yield varieties concurrently.

Table 7 Distribution of sample Respondents on the Basis of Adoption of High Yield Varieties

Villages	Adopted HYVs		Total	If yes name of variety you have used						Total
	NO	Yes		Roma-Vf	Dollar	Marjan	Atlas	Robeno	Majic	
Khushgumbad	1(6.7)	30(93.5)	31	6(19.4)	7(22.6)	3(9.7)	3(9.7)	3(9.7)	8(25.8)	31
Qalai Ishaq	0(0.0)	27(100.0)	27	3(11.1)	7(25.9)	6(22.2)	1(3.7)	0(0.0)	10(37.0)	27
Qalai Janan Khan	2(6.7)	28(93.3)	30	3(10.0)	3(10.0)	6(20.0)	4(13.3)	10(33.3)	2(6.7)	30
Saracha Ali Khan	6(23.1)	20(76.9)	26	6(23.1)	2(7.7)	2(7.7)	2(7.7)	1(3.8)	7(26.9)	26
Total	9(7.9)	105(92.1)	114	18(15.8)	19(16.7)	17(14.9)	10(8.8)	14(12.3)	27(23.7)	114

Source: Field data survey 2023

Note: Figures in parenthesis are percentages

Our results are more or less similar to Haq *et al.* (2022) who reported that 100% of tomato growers adopted HYVs of both tomato and bitter gourd.

Source of Information

Knowledge and understanding of contemporary agricultural technology are critical to the adoption process. It is essential to have access to technology and information in order to raise awareness and alter perceptions of adoption (Hidayat *et al.*, 2023). Research stations, farmer unions, cooperatives, extension services, and other mass media outlets have been identified as contemporary information sources and services that impact adoption in the agricultural sector (Adolwa *et al.*, 2012).

Data regarding source of information about tomato cultivation were presented in Table 8. Among the 114 tomato growers surveyed, 33.3% mentioned that they acquired knowledge about improved tomato varieties from fellow farmers, whereas 30.1% reported their source of information as input dealer, 28.1% indicated that extension workers played a significant role in disseminating information about these improved varieties. A small percentage of 0.8% relied on the media as their primary source of information, while 7.8% of tomato growers reported that they were unaware of the names of the improved varieties.

Table 8 Distribution of Sample Respondents on the Basis of Source of Information about HYVs

Villages	Source of information about HYVs					Total
	Don't know the variety	Extension worker	Media	Input Dealer	Fellow farmers	
Khushgumbad	1(3.2)	8(25.8)	0(0.0)	14(45.2)	8(25.8)	31
Qalai Ishaq	0(0.0)	5(18.5)	1(3.7)	8(29.6)	13(48.1)	27
Qalai Janan Khan	2(6.7)	7(23.3)	0(0.0)	11(36.7)	11(36.7)	30
Saracha Ali Khan	6(23.1)	12(46.2)	0(0.0)	2(7.6)	6(23.1)	26
Total	9(7.8)	32(28.0)	1(0.8)	35(30.1)	38(33.3)	114

Source: Field data survey 2023

Note: Figures in parenthesis are percentages

Our results are in contrast with Sanaullah *et al.* (2020) who reported that more than Half i.e. 58% respondents had trust in extension department for getting information about HYVs in the study area.

Major Problems in Adoption of Recommended Tomato Technologies

Table 9 presents data on the primary challenges faced by tomato cultivators regarding adoption of recommended tomato technologies in the study area, 46 respondents identified pest and disease as the most significant issue. In contrast, 58 tomato growers indicated that the major concern was the unavailability of high-quality seeds, 67 respondents expressed concerns about inadequate marketing strategies, while 107 (93.8%) highlighted the high costs associated with agricultural inputs. Lack of access to credit as a notable problem was reported by 61 respondents. The remaining 78 respondents pinpointed a shortage of fertilizers as a significant challenge in tomato cultivation within the research area.

Table 9 Major Problems in Adoption of Recommended Tomato Technologies in the Study Area

Villages	Major problems in tomato farming						Total
	Non availability of quality seed	Lack of fertilizer	Pest and diseases	Lack of credit	Improper marketing	High price of inputs	
Khushgumbad	16	20	12	22	18	31	119
Qalai Ishaq	11	17	12	12	19	27	74
Qalai Janan Khan	14	22	13	16	14	26	105
Saracha Ali Khan	17	19	9	11	16	23	95
Total	58	78	46	61	67	107	417

Source: Field data survey 2023

Note: The total may not tally due to multiple answers

Our findings are in line with those of Pervaiz *et al.* (2018), who came to the conclusion that poor information, high input costs, and a lack of quality seeds and fertilizers were the main reasons for the low adoption rate in tomatoes.

Visit of Extension Worker

The primary task of extension workers involves conducting on-site visits to farmers' fields with the objectives of providing education, understanding their challenges, and offering solutions (Khan *et al.*, 2022). These field visits serve a dual purpose: educating farmers and facilitating feedback and follow-up on various activities (Khan, 2012). Farmers must visit fields in order to receive practical knowledge from extension agents through discussions and demonstrations in the local language (Khan *et al.*, 2023).

The regularity with which extension workers visit farmers' fields in the research region was one of the study's questions.

Table 10 displays the distribution of responses regarding whether extension agents had visited the respondents' fields and, if yes, how often. The data reveal that 37.7% of the respondents reported that extension worker visited their fields, while majority i.e. 62.3% reported that they had not received such visits in the study area. The respondents were further asked about the frequency of visits in which 29.8% mentioned visits upon request, 5.3% reported annual visits, and the remaining 2.6% of respondents stated that extension workers visited them on a monthly basis.

Table 10 Distribution of Sample Respondents on the Basis of Extension Worker Visit the Field

Villages	Worker visited your field		Total	If yes, how often				Total
	No	Yes		Don't visit	Monthly	Annually	Upon request	
Khushgumbad	26(83.9)	5(16.1)	31	26(83.9)	0(0.0)	1(3.2)	4(12.9)	31
Qalai Ishaq	18(66.7)	9(33.3)	27	18(66.7)	0(0.0)	0(0.0)	9(33.3)	27
Qalai Janan Khan	10(33.3)	20(66.7)	30	10(33.3)	3(10.0)	4(13.3)	13(43.3)	30
Saracha Ali Khan	17(65.4)	9(34.6)	26	17(65.4)	0(0.0)	1(3.8)	8(30.8)	26
Total	71(62.3)	43(37.7)	114	71(62.3)	3(2.6)	6(5.3)	34(29.8)	114

Source: Field data survey 2023

Note: Figures in parenthesis are percentages

It is concluded from the results that extension workers visit to farmers' fields were limited. Due our results were supported by Khan *et al.* (2023) who stated that 72% respondents reported no extension visits, they further reported that not only frequency of extension visits to farmer's fields was poor but was irregular.

Farmers' Visit to the Agriculture Officer

Establishing a strong and effective connection and collaboration between the agricultural extension department and farmers can greatly benefit farmers by reducing economic losses through timely access to information and knowledge about innovative farming practices (Khan *et al.*, 2023). Sanaullah and Pervaiz (2019) have noted that

farmers evaluate extension workers based on their ability to provide solutions to their problems.

Table 11 illustrates the frequency of farmers' visits to the agricultural office for guidance within the research area. The findings indicate that 57.9% of the respondents did not make visits to the extension office, while 42.1% of them did seek advice from the extension office in the study area. A significant majority of the respondents, specifically 57.9%, refrained from visiting the extension office. Furthermore, 37.7% reported visiting the office when they needed assistance, while the remaining 4.4% of respondents made annual visits to the extension office in the study area. In contrast, Haq (2020) found that 81.7% of the respondents visited the office on an annual basis, and 13.3% visited only when they required specific guidance.

Table 11 also presents the reasons why farmers in the study area did not seek guidance from agricultural officer offices, 66 respondents i.e. 57.9% who did not visit the extension office, reported the reasons for No visits, in which 56.1% of the respondents mentioned that the agricultural staff were uncooperative, while 21.2% reported that the agricultural officers lacked interest in tomatoes. only 12.1% of the respondents stated that farmers were occupied in the field, and the remaining 10.6% pointed out access issues as the reason for not visiting the agricultural officers' office.

Table 4.11 Distribution of Sample Respondents on the basis of Farmers' Visit to Extension Department

Villages	Do you visit extension dept. for problem?		Total	If Yes, how often			Total	If no, What are the reasons?				Total
	No	Yes		No visit	Annually	Need base		No interest	Access problems	Busy in the field	Non cooperative staff	
Khushgumbad	23(74.2)	8(25.8)	31	23(74.2)	0(0.0)	8(25.8)	31	2(8.7)	1(4.4)	3(13.0)	17(73.9)	23
Qalai Ishaq	16(59.3)	11(40.7)	27	16(59.3)	3(11.1)	8(29.6)	27	5(31.3)	0(0.0)	2(12.5)	9(56.2)	16
Qalai Janan Khan	7(23.3)	23(76.7)	30	7(23.3)	2(6.7)	21(70.0)	30	2(28.6)	3(42.8)	1(14.3)	1(14.3)	7
Saracha Ali Khan	20(76.9)	6(23.1)	26	20(76.9)	0(0.0)	6(23.1)	26	5(25)	3(15)	2(10)	10(50)	20
Total	66(57.9)	48(42.1)	114	66(57.9)	5(4.4)	43(37.7)	114	14(21.2)	7(10.6)	8(12.1)	37(56.1)	66

Source: Field data survey 2023

Note: Figures in parenthesis are percentages

Association of Education with Yield of Tomato kg/acre

Table 13 shows the comparative analysis between education tomato yield of the sample respondents. The presented data indicate that the relationship between tomato output and farmers' education was non-significant ($P > 0.05$).

Table 13 Association of Education with Yield of Tomato kg/acre

Variables	Categories	Yield kg/acre			Total
		Up to 10000	10001-12000	12001-14000	
Education	Illiterate	13	23	23	59
	Literate	11	30	14	55
	Total	24	65	46	114

$$\chi^2 = 10.504$$

$$P \text{ value} = 0.231^{NS}$$

It was concluded from the results that yield was not affected by education, yield may be affected by other factors i.e. high yielding varieties (HYV), sowing methods, seed rate, proper application of fertilizers, timely irrigation, crop management and preventive measures against pest/disease etc. Our findings support the findings of Sanaullah *et al.* (2020), who found no correlation between yield and education. However, our results were not in line with those of Haq *et al.* (2022), they came to the conclusion that the production of tomato and bitter gourds and the literacy of the sample respondents were extremely significantly correlated.

Association of Tomato Yield and Area under Tomato Cultivation with Extension Staff Visits

Table 14 Association of Yield (kg/acre) and Area under Tomato Cultivation with Extension Staff Visits

Variables	Visit of Extension staff		Total	
	Categories	No		Yes
Yield kg/acre	Up to 10,000	14	10	24
	10,001-12,000	32	21	53
	12,001-14,000	25	12	37
	Total	71	43	114
		$\chi^2 = 0.681$		P value = 0.711^{NS}
Area under tomato cultivation (acres)	Up to 1	22	17	39
	1.1-2	33	15	48
	2.1-3	13	9	22
	3.1-4	3	1	4
	4.1 and above	0	1	1
	Total	71	43	114
	$\chi^2 = 12.514$		P value = 0.486^{NS}	

Source: Calculated by Author, 2023

^{NS} Indicates non-significant

Table 14 indicates association of tomato yield (kg/acre) and area under tomato cultivation with visits of extension staff to farmer's fields. It is clear from results that there was non-significant association among tomato yield and area under tomato cultivation with extension staff visits to farmer's fields. These results indicate that extension staff visits to farmer's field were irrespective of area under tomato cultivation. It is also concluded from the results that yield of tomato was not affected with extension visits, which shows that extension staff visits were either limited or useless. Our results were in line with Hassan (2022) who reported that there were non-significant association among size of land holding and tenancy level with extension visits.

Conclusions and Recommendations

Following conclusions were drawn on the basis of study results:

It is concluded that majority of the farmers were using HYVs, but they did not adopted the whole package of recommended technology of tomato in the study area. Adoption of improved practices was mainly affected by un-availability and high prices of inputs. Almost all the respondents adopted traditional method, while very limited tomato growers adopted vertical method of tomato cultivation. Farmers-Extension contact was un-satisfactory. Non-availability of quality seeds, lack of fertilizers, pest and diseases, improper marketing, lack of cold storage, high prices of inputs, lack of credit, insufficient information, transportation problem and low prices of tomato were the major problems tomato farmer in the study area were confronting.

On the basis of conclusions of the study; following recommendations were made:

- The government of Afghanistan should subsidize expensive inputs such as fungicides, insecticides, fertilizers, high-quality seeds, and contemporary farming equipment and ensure their timely availability at reasonable prices in local market.
- The Afghan government should give small farmers financial help in the form of interest-free loans.
- Extension personnel should visit farming communities on a regular and frequent basis to ensure that the farming community is informed on the most recent farming practises.
- Cold storage facility should be provided at least district level in order to store surplus tomato in the study area.

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