

CHALLENGES FOR EXTENSION WORKERS IN SOIL HEALTH FOR CITRUS PRODUCTION IN DISTRICT BATI KOT, NANGARHAR- AFGHANISTAN

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ABSTRACT

Soil is a fundamental component in citrus production and plays a key role in determining the health, growth and yield of citrus trees and quality of fruits. The type, structure, nutrient content, and pH of the soil influence the overall success of citrus cultivation along with production. Understanding the soil's significance and implementation, appropriate soil management practices are essential for maximizing the production of citrus fruits. A study was conducted in District Bati Kot, Nangarhar-Afghanistan in 2023 for assessing the citrus growers concern about skills of extension workers in soil health for citrus production in Afghanistan. Multistage sampling technique was used for selection of 120 respondents. Moreover, rank order, mean and standard deviation were used for knowing the strength of the extension workers' expertise, while chi-square test was used to find the association between different variables. Information on various variables of socio-economic characteristics were collected through well-structured interview schedule. The results revealed that most of the respondents were in middle age of 40-50 years, with land holding size of 1–6 acres. About 55 percent respondents were found illiterate where 45 percent have formal education of different levels with prominent category of primary to inter level education. The ranking skills of extension workers in soil health as per citrus growers' point of view in the proper use of farmyard manure was on top with highest mean 3.42 and SD 1.034 and in understanding of soil fertility practices for citrus was at lowest rank with lowest mean 2.79 and SD 1.236. Highly significant association was found between the skills of extension workers in soil health and average yield of citrus production. It is suggested that extension workers may be trained in the health of soil regarding the production of citrus who in turn can train citrus growers in getting their better yield of citrus fruits to improve their socio-economic status.

Keywords: *Skills of extension workers, soil health, multistage sampling, citrus production, Nangarhar, Afghanistan*

INTRODUCTION

Citrus production is a significant agricultural activity in many parts of the world, and the role of agriculture extension workers is crucial in supporting citrus growers to enhance their productivity, quality and sustainability. Agriculture extension workers' skills come into play in

citrus production and may need their strong understanding about the cultivation practices including the soil preparation, planting, irrigation, fertilization, pest and disease management along with their harvesting techniques of the citrus fruits. It has been found that municipal solid wastes (MSW) of Peshawar city contains considerable amounts of N and K, and a small amount of P (Shah and Anwar, 2003; Shah *et al.*, 2007). They provide accurate and up-to-date information to citrus farmers to ensure by following the best practices for better production of citrus. Extension workers help citrus farmers to choose the most suitable citrus varieties based on factors like, soil type, market demand, and disease resistance. Proper variety selection can significantly impact yield and quality of citrus. Moreover, skilled extension workers educate farmers on proper planting techniques of spacing, depth and proper handling of citrus saplings for ensuring the healthy tree establishment.

Skillful agriculture extension workers offer guidance on soil testing, nutrient management, and soil improvement strategies to optimize citrus tree growth and fruit production as well as helping citrus growers in developing the efficient irrigation schedules and methods to ensure that citrus trees receive adequate water without causing waterlogging or stress. Citrus crops are susceptible to various pests and diseases. Extension workers teach farmers about integrated pest management (IPM) approaches, which involve monitoring, using natural predators, applying bio pesticides, and judicious use of chemical treatments when necessary. Proper pruning and training techniques help in shaping the citrus trees for better sunlight exposure, airflow and ease of management. Extension workers demonstrate the right methods to enhance yield and reduce disease incidence. Moreover, skilled extension workers guide farmers on the correct timing of harvest, proper fruit handling and storage practices to maintain fruit quality and extend shelf life.

Extension workers also educate the citrus growers for maintaining the accurate records of their activities, including input use, pest and disease observations, and yield data. This information is essential for making informed decisions and improving future management practices for citrus production. They can connect citrus farmers to markets and provide information on value addition like processing techniques for helping them to increase the profitability of citrus production by needing themselves to stay updated on the latest advancements in citrus research and practices. They often organize workshops, seminars and training sessions for both farmers and fellow extension professionals.

By possessing a strong foundation in citrus cultivation practices, effective communication skills and the ability to adapt knowledge to local conditions of soil, agriculture extension workers can play a pivotal role in improving the citrus production, boosting farmer income and ensuring sustainable citrus farming practices. The low production is attributed to various reasons identified by various researchers. These reasons are widespread to socio-economic conditions of citrus growers, research status, technology transfer activities and extension field work. Likelihood of poor adoption of improved practices also intensifies the constraints by taking into account the special concern of soil health for citrus production.

Soil serves as a reservoir of essential nutrients as required by citrus trees for growth and fruit production. Nutrients like nitrogen, phosphorus, and potassium are crucial for healthy tree development and high-quality fruit formation. Adequate nutrient levels in the soil are necessary

to prevent deficiencies or excesses that can hinder tree growth and fruit yield. The structure and composition of the soil, influence the root system's development. Well-drained soils with good aeration encourage healthy root growth, enabling trees to access.

(Tariq *et al.*, 2007) described adoption of poor management practices like inadequate fertilizer and nutrients management plights responsible for lower production of citrus. (Mattos *et al.*, 2006) highlighted nutrients deficiency in Pakistani citrus orchards pertinent to inappropriate supply of micronutrients; essential for the bearing and non-bearing trees.

Soil is a natural resource primary to farming and nutritional status of soil does matter in production process. Soil nutritional status has been reported as a significant problem in the past by (Quaggio *et al.*, 1998) Excessive or non-judicious utilization of fertilizer may be held responsible for dwindling soil nutritional status. (Khanna *et al.*, 2000) were of the view that variation in soil nutritional condition becomes the cause of low production in citrus particularly. Similar findings were stated by (Sing *et al.*, 2006) that decreasing the soil fertility and inadequate management of plant nutrients have made production rehabilitation more difficult. Moreover, imbalanced application of fertilizer and micronutrients is a major top reason for declining productivity.

Soil in Pakistan is commonly found deficient in multiple nutrients including N, P, Fe, Mn and Zn. Therefore, traditional application of nutrients management strategies has not been found much successful. In this context, application of micronutrients is assumed as better strategy. Small amount of micronutrient is required as compared to those of primary nutrients, yet these are equally important for plant metabolism (Katyal and Datta, 2004). Deficiency of these nutrients can occur because of numerous unfavorable operations i.e. Zn deficiency may occur by heavy phosphate application and excessive use of Fe, Cu and Zn in soil while excessive liming persuades Cu deficiency. (Malewar, 2005). Farmers utilize excessive nitrogenous fertilizers to get maximum production that cause soil degradation hindering nutrients availability which cause the nutrients deficiency (Bala *et al.*, 2005). (Catara, 1987) had reported that farmers do not apply nutrients according to requirement and recommendation resultantly citrus plants face physiological disorders. Citrus production can be doubled in Pakistan with little management and concern of growers. The present study was conducted to explore the extension workers' skills in soil health from citrus growers' point of view, with the following objectives:

- 1- To know the socio-economic characteristics of citrus growers.
- 2- To know the skills of extension workers in soil health for citrus production in improving the socio- economic status of citrus growers.
- 3- To give policy recommendations for further improvement.

MATERIALS AND METHODS

The universe of the present study was Nangarhar Province-Afghanistan was the universe of this particular study in the year 2023. The required sample was drawn through Multi Stage Sampling Technique MST as practiced by (Cochran, 1977). At stage I, Province of Nangarhar and then District Bati Kot was selected purposively from the 22 Districts by keeping in view the citrus cultivation. District Bati Kot consists of 12 villages, out of these 5 villages were purposively

selected due to citrus cultivation at stage II. For selection of respondents at village level, a list of citrus growers was obtained from Agriculture Extension Department consisted of 200 citrus growers in the selected villages. Proportionate allocation technique was used to select 60% of the citrus growers for data collection, giving a total of 120 respondents. For collection of data, a well-developed interview schedule was used which was prepared in English but the interviews were conducted in local language "Pashto". Obtained data was analyzed using SPSS, results were presented in results and discussion chapter.

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Citrus Growers

Household Size of the Citrus Growers

There may be a shortage of food and other basic requirements will be expected due to world's rapidly growing population. To solve these problems, population of the world needs to be controlled. The size of the household is crucial in adoption process (Sanaullah *et al.*, 2020). Table 1 reveals that 43.3% of respondents have household size with 12 or more members where only 9% citrus growers were in four members of household size. It is evident that large household size has a rich number of members who have adequate persons and can overcome labor shortage for diversified citrus production activities. Our conclusions are similar with Ayat, (2014) who revealed that 39% were living in a size of 11-20 members as our results also showed that majority respondents' household size was of above 12 members.

Land Holding of the Citrus Growers

The size of land holding of citrus growers varies significantly as they have a low acreage of land available for orchards of citrus which makes their harvests limited and they mostly use farm products for their own needs and requirements. Less interaction with extension agents is due to their small land holding and modern cultural practices into their farming are limited. Since they cannot afford new technologies for improved output while remaining an expensive lifestyle, farmers with larger landholdings are often thought to be more enthusiastic about adopting innovations (Ajayi *et al.*, 2000). They have more access to agricultural knowledge than individuals who own tiny and limited plots of land for cultivation (Chaudhary, 2006). Table 1 illustrates that 67% participants in the current study area had small land holdings of 1-6 acres, while minimum 8% citrus growers had 13-18 acres of land holdings. About 12% respondents had land holdings of more than 18 acres, in contrast to 13.3% of the respondents who owned between 7 to 12 acres of land specified for citrus cultivation. These results are in alignment with those of Sanaullah (2020), who found the limited land ownership of the maize growers in the study area. Our findings are in agreement with Safdar (2005), who also reported that most of the growers (60%) had small less than an acre for tomato cultivation in District Malakand, Khyber Pakhtunkhwa- Pakistan. This might be due to diversification in the crop and neighboring country location.

Tenancy Status of the Citrus Growers

The term tenancy is said to the part and parcel of land that has been assigned to farming by the farming community which plays a distinctive role in the adoption of new technologies (Idrees, 2000). Land is not only a source of sustenance for the farming community with a symbol of social standing in society, prestige and economic success along with source of employment for those who work full time in the agricultural industry. The history of land reforms has shown that tenancy is significant impediment to agricultural development, as seen by the fact that agricultural growth remains slow and sluggish. Data in Table 1 revealed that majority of the respondents constituting 60.8% belongs to the group of owner cultivator while 26.7% respondents were tenants and only 12.5% citrus growers were found owner-cum-tenant. The adoption of contemporary technology is positively correlated with the size of the land holding (Mirza, 1993). Tenants are less receptive to new ideas than owner-growers. In order to promote agricultural activities in a sustainable manner, extension professionals may increase tenant farmers' enthusiasm for implementing new technology in their farms. Our findings are consistent with those of Aziz *et al.* (2018), who discovered that owner cultivators made up the majority of respondents (71%) in the research area.

Table 1 *Socio-Economic Characteristics of Citrus Growers*

Household Size (Members)	Frequency	%	Land Holding Size (in acre)	Frequency	%
1 to 4	11	9.2	1 to 6	80	66.7
5 to 8	24	20.0	7 to 12	16	13.3
9 to 12	33	27.5	13 to 18	10	8.3
Above 12	52	43.3	Above 18	14	11.7
Total	120	100	Total	120	100
Tenancy Status	Frequency	%			
Owner cultivator	73	60.8			
Owner-cum-tenant	15	12.5			
Tenants	32	26.7			
Total	120	100			

Source: Field Survey data 2023

Farmers' Perception Regarding Extension Worker' Skills in Soil Health for Citrus Production

Soil is an important and significant basic factor for producing various crops, vegetables and fruits which directly affect the yield of all crops, vegetables and fruits. Most of the farmers lack knowledge about soil health and availability of different nutrients in the soil (Postel and Carpenter, 1997). Data in Table 2 depicts ranking of extension worker's skills regarding soil health from citrus growers' point of view on the basis of mean and standard deviation. Data about proper use of farmyard manure was ranked first with highest mean 3.42 and standard deviation 1.034 and understanding the basics of soil health information was ranked second with the mean value of 3.40 and standard deviation 1.155. Moreover, suitable selection of soil for citrus cultivation was ranked third with the mean value of 3.13 and standard deviation 1.068 while utilization of organic matter and its management was ranked lower with lower mean value of

2.90 and standard deviation 1.246. The understand of soil fertility practices for citrus was ranked at lowest with lowest mean value of 2.79 and standard deviation 1.236. Our results are almost similar to that of Saddam (2021), who found that capability of extension workers regarding effective use of FYM for tomato in District Peshawar, Khyber Pakhtunkhwa- Pakistan was ranked 2nd by farmers in his study area.

It is concluded that extension workers may be trained in the utilization of organic matter and its management along with know-how of soil fertility practices for citrus production to get better production in citrus fruits for making the country self sufficient in citrus.

Table 2 *Perception of Citrus growers about Extension Worker' Skills in Soil Health regarding Citrus Production*

Skills of Ext. Workers in Soil Health	1	2	3	4	5	Mean	S.D	Ranks
Proper use of Farmyard Manure	6(5.0)	15(12.5)	37(30.8)	46(38.3)	16(13.3)	3.42	1.034	I
Understanding the Basics of soil health information	7(5.8)	18(15.0)	41(34.2)	28(23.3)	26(21.7)	3.40	1.155	II
Suitable Selection of soil for citrus cultivation	10(8.3)	19(15.8)	48(40.0)	31(25.8)	12(10.0)	3.13	1.068	III
Utilization of organic matter and its management	20(16.7)	25(20.8)	36(30)	25(20.8)	14(11.7)	2.90	1.246	IV
Understand soil fertility practices for citrus	22(18.3)	28(23.3)	35(29.2)	23(19.2)	12(10.0)	2.79	1.236	V

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

Association between Average Yield of Citrus and Skills of Extension Worker in Soil Health

Citrus trees are surprisingly hardy, but they do have some soil preferences having good drainage facility in nearly any soil. The best growth of citrus is recorded in loamy or sandy loam soil with the use of Ammonium Sulphate, Ammonium Phosphate or citrus food fertilizer. The amount of fertilizer depends on the age, the size, and the type of tree. Chi-square test was used to find out the association between average yields of citrus with skills of extension workers in soil health in the study area. Highly significant association ($p=0.000$) was found between the average yield of citrus with skills of extension workers in soil health as evident in Table No.3. The findings indicated that as the skills of extension workers in soil health improve farmers' production needing vital attention for better production.

Table 3 Association between Average Yield of Citrus & Skills of Extension Workers in Soil Health

Average yield of citrus (Kg/Acre)	Skills of Extension Workers in Soil Health					
	Very low	Low	Medium	High	Very High	Total
Up to 3000	17(14.2)	10(8.3)	3(2.5)	0(0)	0(0)	30
3001 to 6000	19(15.8)	27(22.5)	8(6.7)	1(0.8)	0(0)	55
6001 to 8000	2(1.7)	10(8.3)	5(4.2)	4(3.3)	0(0)	21
Above 8000	0(0)	0(0)	11(9.2)	3(2.5)	0(0)	14
Total	38(31.7)	47(39.2)	27(22.5)	8(6.7)	0(0)	120
	$\chi^2 = 57.813$					P-value=0.000***

Data source: Calculated by Author

CONCLUSIONS AND RECOMMENDATIONS

Agriculture extension workers with expertise in soil health and citrus production play a pivotal role in promoting sustainable farming practices in enhancement of citrus production. Majority citrus growers were found in joint families of 12 member's household size by specifying the 1-6 acres of land for citrus cultivation. Skills of extension workers in soil health has significant role in citrus production as proper use of farmyard manure was the top rank skills as perceived by citrus growers showing their interest and commitment with the citrus production. Special training needs may be given to extension workers in utilization of organic matter and its management along with know-how of soil fertility practices for citrus production to get better production in citrus fruits for making the country self-sufficient in citrus by keeping in view the present financial crises in the world. The research highlights the importance of a general approach for enlightening the socio-economic status of citrus growers in the study area. Modern agricultural practices, technological advancements, improved market access along with supportive government policies mutually donate the enhancement of citrus growers' livelihood. This research is useful for policymakers and stakeholders in implementing the effective measures for promoting the sustainable citrus production and elevates the poverty of citrus growers in the region.

It is recommended that:

- Agriculture Extension workers play a critical role in suggesting and educating the soil necessary for citrus production by bridging the gap between scientific knowledge and practical application on the ground to the citrus growers. Their skills and expertise are essential for disseminating information, providing guidance and implementing the best practices for enhancement of soil health which ultimately improve citrus production and leading towards self-sufficiency in citrus fruits
- Extension workers may educate citrus growers regarding the awareness of soil health for better citrus production practices to improve their socio- economic conditions.

- Youth should be trained in the various aspects of soil health for tackling the various hindrance of soil that can play their role in alleviation of poverty by spending their life efficiently. More formal trainings in soil testing regarding different aspects of citrus cultivation and production may be arranged by Extension Department especially in soil health to motivate youth towards citrus farming on large scale and sustainable basis.
- Youth may be sent in other parts of the country for testing the soil training who can play their role for the better future of Afghanistan which is more damaged due to war through financial assistance by the international agencies facilitating the manpower to be trained in soil health due to their major share in citrus production.

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