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ASSESSMENT OF FARMERS' KNOWLEDGE REGARDING THE ADOPTION OF WATER-SAVING TECHNOLOGIES IN DISTRICT FAISALABAD

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ABSTRACT

Water-saving irrigation behavior is most significant for sustainable financial and social status. The global water insufficient situation is presenting a serious threat to food security for coming generations. To tackle this situation, steps are being taken for the effective use of water resources all over the world so we need to improve irrigation techniques and avoid the current and future worst situations. Pakistan is facing serious water scarcity, especially for irrigating the agricultural fields and smallholder farmers are most vulnerable to this water crisis. In this context, this study aims to understand the farmers' awareness and adaptive behavior toward water-saving technologies in the district of Faisalabad through a Mult-stage sampling technique. This Quantitative study was conducted in Tehsil Jaranwala from which two Union councils were selected. For this process, the target population was Tehsil Jaranwala out of which six villages were selected conveniently.1:- Union council no 19 villages 73 RB-Karianwala, 74 RB-Bandal, 76 RB-Rasool Pura, 2:- UC 28 Villages Chak no, 96 RB-Mari Chak no, 97 RB-Johal Chak no, 98 RB-Bange were selected conveniently. The results of this research will help administrators, scholars, especially development experts in the development of successful methods and treatments. Adequate efforts may be done to encourage the widespread use of water-saving equipment by considering farmers' viewpoints and acknowledging the limitations they experience.

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INTRODUCTION

The global populace is growing and emerging nations are contributing more growth compared to nations with advanced economies. Pakistan is a developing nation, in the fifty years since 1960, the population of the country has risen by over threefold (170 million presently) while that figure is expected to double by 2025 (Qasim and Knerr, 2010). The people of the country have to be fed, the requirement for agricultural commodities has risen; the increasing need for food requirements the unfair treatment of new agricultural lands or additional efficient methods of farming for both massive and small-scale farming. Although academic institutions have worked hard to generate novel varieties of several commodities that are more successful than earlier types, the variation in yield in Pakistan remains significant. Inadequate access to water, along with poor utilization of water in sectors constitutes a few of the causes of low crop yields (Ahmad et al., 2010). The world population is going to double and to feed this population irrigation cultivated extended from 40 million hectares to just about 300 million hectares today a seven-crease increment. This revolution in water innovation improved harvest yields and empowered farmers to grow extra crops every year. China, India, Indonesia, and Pakistan together record for practically a large portion of the world's irrigation territory and they depend on the water system for the greater part of their production (Kay, 2011).

Water proficiency and related strategies for its improvement to elevate genuine answers for complex water executives' issues, including developing requests for rivalry over, limited water assets, just as the physical, financial and natural requirements to fostering extra supplies. They aimed to move new and imaginative ideas that could address key food security and ecological difficulties and along these lines started another time of water the board productivity is customarily perceived as a proportion that indicates yield per unit. Water efficiency in its fundamental structure, measures creation per unit of water uses like land and work productivity (Giordano et al., 2021). Excessive water use has led to water shortages in numerous Asian nations. This pattern will proceed: the gap between water interest and supply is projected to increment because of populace development and monetary turn of events. The conceivable approaches to locally build the inventory of water system water by utilizing wastewater collected water and flashflood water. Then at that point, present mechanical and agronomical progressions and their conceivable effect on water system water use productivity included saltiness and dry season (Dinar et al., 2019). Shortage of the water system initiates a continuous water shortfall: due to the exhaustion of soil water holds, joined by a decrease in harvestable yields particularly in soils with a significantly low water shortage capacity (Galindo et al., 2018).

The distribution and evaluation of water are as of now talked about in scholarly and political fields with the expectation to support the advancement and reception of water-saving technologies (Zhang et al., 2019). Because, growing water scarcity places irrigated agriculture and associated reliable food production systems at risk, which requires serious effort and investment to modernize irrigation systems and diversify agriculture.

Pakistan has the world's fourth most noteworthy pace of water use. No country's economy is more water-concentrated than that of Pakistan. Agricultural technology is the basic way to transform agriculture into a productive water system that permits the farmer to utilize less water to develop a similar measure of harvest. All the more positively, farm larger spaces of land by utilizing a similar measure of water to develop higher worth, more water-concentrated. The use of water-saving technologies by poor farmers is very expensive. To tackle water scarcity, the federal system of governance in place in the country has been instrumental in granting significant autonomy to the provinces. The 18th amendment to the constitution has further strengthened this decentralization process, allowing for more effective policy implementation at the local level. In line with this, the water management and sustainability policy serve as a nationwide framework that guides provinces on how to develop their master plans. This approach ensures that local needs and contexts are taken into account while still aligning with national goals. By adopting this approach, the country is better equipped to tackle the complex challenges of water management and sustainability, while also promoting greater collaboration and coordination between different levels of government. Ultimately, this will help ensure that water resources are used efficiently and sustainably, benefitting both present and future generations. The major objective of study was to explore the awareness of farmers about the water conservation practices and establish the relationship between the demographic attributes and the awareness level.

METHODOLOGY

This study was conducted in District Faisalabad. Out of total six tehsils, one tehsil Jaranwala was selected randomly as a study area. The target population for this study encompassed the entire farming community in Tehsil Jaranwala, from which six villages were conveniently selected for the sample selection. These villages were as follows: Union Council No. 19, comprising villages 73 RB-Karianwala, 74 RB-Bandal, and 76 RB-Rasool Pura, and Union Council No. 28, comprising villages Chak No. 96 RB-Mari, Chak No. 97 RB-Johal, and Chak No. 98 RB-Bange. The convenient selection of these villages aimed to ensure representation from various geographical areas within the Tehsil and practically facilitate the research process. The researcher conducted a face-to-face interview to gather data from selected farmers. Total 25 farmers were interviewed from each of the selected villages, thereby making a sample size of 150 farmers. Data were collected using structured questionnaire, which was administered face to face. Collected data were analyzed using Statistical Package for Social Sciences (SPSS).

RESULTS AND DISCUSSION

Hypothesis: Younger respondents have a higher awareness of water-saving practices in agriculture compared to older respondents.

Table 1 shows the highest proportion of respondents who considered themselves very aware of water saving for agriculture were in the age group above 50 years, with 14.0% indicating high awareness. Similarly, respondents in the age group 41-50 years had a relatively high proportion (9.3%) claiming to be very aware. In contrast, the youngest age group (less than 20 years) had the lowest percentage (7.3%) of respondents considering themselves very aware of water saving for agriculture. The percentage of slightly aware respondents was similar across all age groups, ranging from 6.7% to 7.3%. The percentage of respondents claiming to be unaware of water saving for agriculture decreased with increasing age, from 3.3% for the youngest age group to 2.7% for the oldest age group.

The chi-square value of 16.701 and a p-value of 0.033 indicates a significant association between the age of respondents and their awareness of water saving for agriculture. Age is a factor influencing respondents' level of awareness regarding water conservation practices in agriculture. The gamma value of 0.420 indicates a positive relationship between respondents' level of awareness and their age. There is a relationship between respondents' age and their awareness of water saving for agriculture. Older age groups tend to have a higher level of awareness, while younger respondents show relatively lower levels of awareness.

Table 1. relationship between the age of farmers and awareness level.

Age (in years)	How much you are aware of water saving for agriculture			Total
	Very aware	Slightly aware	Unaware	
Less than 20	11 7.3%	10 6.7%	5 3.3%	26 17.3%
21-30	11 7.3%	10 6.7%	0 0.0%	21 14.0%
31-40	12 8.0%	11 7.3%	12 8.0%	35 23.3%
41-50	14 9.3%	10 6.7%	11 7.3%	35 23.3%
Above 50	21 14.0%	8 5.3%	4 2.7%	33 22.0%
Total	69 46.0%	49 32.7%	32 21.3%	150 100.0%

Statistics: Chai square = 16.701 df = 8 P – Value = 0.033 Gamma = .420

Table 2. Relationship between educational level and awareness.

Educational level	How much you are aware of water saving for agriculture			Total
	Very aware	Slightly aware	Unaware	
Illiterate	4 2.7%	3 2.0%	5 3.3%	12 8.0%
up to primary	12 8.0%	7 4.7%	4 2.7%	23 15.3%
up to matric	18 12.0%	7 4.7%	1 0.7%	26 17.3%
Intermediate	19 12.7%	9 6.0%	4 2.7%	32 21.3%
graduation and above	16 10.7%	23 15.3%	18 12.0%	57 38.0%
Total	69 46.0%	49 32.7%	32 21.3%	150 100.0%

Chai square = 20.829 df = 8 P – Value = 0.008 Gamma = 0.029

Hypothesis: The level of education among respondents positively influences their awareness of water-saving techniques and practices in the context of agriculture.

According to the Table 2, respondents who had more education were generally more knowledgeable about agricultural water-saving techniques. The results of the chi-square test showed a significant association, with a chi-square value of 20.829 and a corresponding p-value of 0.008, respectively. The ordinal association is represented by the gamma coefficient, which was calculated to be 0.029. This suggests a very weak positive relationship between educational attainment and knowledge of water-saving techniques for agriculture. The results indicate that respondent's awareness of water-saving techniques for agriculture is significantly associated with their level of education. Higher-educated respondents frequently display higher awareness levels. However, the correlation is not very strong. These findings highlight the value of education and knowledge. As a result, the hypothesis "More education makes certain responders more conscious of water conservation in agriculture" is accepted. (Zhang et al., 2019) indicated that education appeared to have a positive effect on the adoption of water-saving irrigation technology. Farmers who have better educated have a greater ability to process the technology.

Table 3. Relationship between annual income and awareness among farmers.

Educational level	How much you are aware of water saving for agriculture			Total
	Very aware	Slightly aware	Unaware	
less than 20000	7 4.7%	8 5.3%	3 2.0%	18 12.0%
20000 to 30000	17 11.3%	8 5.3%	17 11.3%	42 28.0%
31000 to 40000	28 18.7%	12 8.0%	4 2.7%	44 29.3%
41000 and above	17 11.3%	21 14.0%	8 5.3%	46 30.7%
Total	69 46.0%	49 32.7%	32 21.3%	150 100.0%

Chai square = 21.009 df = 6 P – Value = 0.002 Gamma = .502

According to the Table 3, 78.8% of respondents with an annual income of up to Rs.20000 believe that they are aware of the need for water conservation in agriculture. 18.7%, 8.0 %, and 2.7 % of respondents with incomes between Rs.31000 and Rs.40000 said they were highly aware, little aware, and oblivious, respectively, of the need for water conservation in agriculture. Where 30.7 % of respondents with an income of more than Rs.40000 demonstrate a high level of awareness about water conservation in agriculture.

A significant relationship is indicated by the chi-square value of 21.009 and the p-value of 0.002. The gamma value is 0.502 which indicates a modest positive correlation between family income and knowledge of water-saving practices in agriculture. In conclusion, the results have been associated with the hypothesis that respondents' overall income influences their awareness of water-saving techniques for agriculture. Higher family earnings are typically associated with more aware respondents. As a result, the hypothesis "respondents with higher wealth are more aware of water conservation for agriculture" is accepted. According to (Zhang *et al.*, 2019) financial worth affects the farmer's adoption of water-saving irrigation technologies.

Table 4 presents data on the association between the farming experience of respondents and their awareness of water saving for agriculture. Respondents with 20 or more years of farming experience had the highest percentage (13.3%) of those considering themselves very aware of water saving for agriculture. They also had relatively higher percentages of respondents claiming to be slightly aware (10.7%) and unaware (10.0%). Respondents with 1-5 years and 11-20 years of farming experience had similar percentages of those considering themselves very aware (8.0% and 13.3%, respectively), but differed in the percentages of those claiming to be slightly aware and unaware. Respondents with 10 years of farming experience had a relatively lower percentage

(11.3%) of those considering themselves very aware, but a lower percentage of those claiming to be slightly aware (7.3%) and unaware (5.3%). The chi-square value of 13.881 and a p-value of 0.031 indicates a significant association between the farming experience of respondents and their awareness of water saving for agriculture. Farming experience plays a role in influencing respondents' level of awareness regarding water conservation practices in agriculture. The gamma value of 0.456 indicates a moderate positive relationship between farming experience and awareness of water saving for agriculture.

The association between farming experience and awareness is statistically significant and moderately strong. These findings highlight the importance of experience in shaping farmers' knowledge and understanding of water conservation practices. It implies that farmers with more experience are more likely to be aware of the importance of water saving in agriculture.

Table 4. Relationship between farmers experience and awareness.

Years of experience	How much you are aware of water saving for agriculture			Total
	Very aware	Slightly aware	Unaware	
1-5 years	12 8.0%	17 11.3%	3 2.0%	32 21.3%
10 years	17 11.3%	11 7.3%	8 5.3%	36 24.0%
11-20	20 13.3%	5 3.3%	6 4.0%	31 20.7%
20 and above	20 13.3%	16 10.7%	15 10.0%	51 34.0%
Total	69 46.0%	49 32.7%	32 21.3%	150 100.0%

Chai square = 13.881 df = 6 P – Value = 0.031 Gamma = .456

Table 5. adoption of water saving techniques in different crops.

Crops	Adoption water saving techniques					
	Often		Seldom		Never	
	Respondents	Percentage	Respondents	Percentage	Respondents	Percentage
Wheat	5	3.3	12	8.0	133	88.3
Rice	4	4.0	6	4.0	140	93.3
Maize	15	10.0	101	67.3	34	22.7
Sugarcane	8	5.3	87	58.0	55	36.7
Cotton	52	34.7	83	55.3	15	10.0
Gram	49	32.7	33	22.0	68	45.3
Sunflower	92	61.3	43	28.7	15	10.0
Potato	103	68.7	32	21.3	15	10.0
Onion	107	71.3	30	20.0	13	8.7
Total	150	100.0	150	100.0	150	100.0

Hypothesis: The distribution of respondents varies based on their adoption of water-saving techniques for different crops.

Table 5 provides insights into the adoption of water-saving techniques for various crops and a comprehensive overview of the agricultural practices related to water conservation and sheds light on the different levels of adoption among farmers. By examining the data, we can understand the prevailing trends and patterns regarding the implementation of water-saving techniques in crop cultivation. The majority of respondents, 88.3%, never utilize water-saving techniques for wheat crops. Only a small percentage, 3.3%, often use these techniques, and 8.0% seldom use them. Similarly, a significant proportion of respondents, 93.3%, never adopt water-saving techniques for rice cultivation. Only 4.0% often use these techniques, and 4.0% seldom use them. For maize cultivation, 67.3% of respondents seldom use water-saving techniques, while 22.7% never utilize them. A smaller proportion, 10.0%, often adopts these techniques. Among the respondents growing sugarcane, 58.0% seldom use water-saving techniques, and 36.7% never use them. A minority, 5.3%, often adopt these techniques. For cotton cultivation, a significant proportion, 55.3%, seldom uses water-saving techniques. 10.0% of farmers never adopt them, while 34.7% often use these techniques. The majority of respondents growing gram, 45.3%, never utilize any water-saving techniques. 32.7% often use these techniques, and 22.0% seldom adopt them. For sunflower cultivation, a high percentage of respondents, 61.3%, often use water-saving techniques. 28.7% seldom adopt them, and 10.0% never use these techniques. Among respondents growing potatoes, 68.7% often use water-saving techniques. 21.3% seldom adopt them, while 10.0% never use these techniques. The majority of respondents growing onions, 71.3%, often use water-saving techniques. 20.0% seldom adopt them, and only 8.7% never use these techniques.

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