

Farmers' Knowledge, Attitude and Practice Regarding Onion Cultivation at Faridpur District in Bangladesh

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ABSTRACT

The study was conducted to determine farmers' knowledge, attitude, and practice regarding onion cultivation and to explore the contribution of their selected characteristics to their knowledge, attitude, and practice regarding onion cultivation. Data were collected from 240 onion farmers of Modhukhali and Sadar Upazillas under Faridpur district with the help of pretested interview schedule during the period from 01 March to 10 April 2024. The majority (59.2%) of the onion farmers had medium knowledge, compared to 26.3% and 14.6% of them had high and poor knowledge on onion cultivation. The majority (73.8%) of the onion farmers had a low favorable, compared to 19.6% and 4.6% had medium and high favorable attitude towards onion cultivation. Above half (51.25%) of the farmers had high practice, compared to 28.75% and 20.0% of them had moderate and low practice of modern onion cultivation. Each of knowledge, attitude and practice regarding onion cultivation had a significant relationship with others. Onion cultivation practice, group contact, BCR, individual contact, time spent in onion farm, commercialization of onion, and attitude towards onion cultivation of the farmers had a significant contribution to their onion cultivation knowledge. Group contact, onion cultivation practice, and onion cultivation knowledge of the farmers had significant positive contribution to their attitude towards onion cultivation. Knowledge on onion cultivation, commercialization of onion, onion farming experience, and attitude towards onion cultivation of the farmers had a significant positive contribution to their onion cultivation practices. Proper onion cultivation knowledge can form favorable attitude towards onion cultivation which can increase more modern onion cultivation practices.

Keywords: Knowledge, attitude, practice, onion cultivation, Faridpur.

INTRODUCTION

Onion is one of the most crucial spice and condiment in Bangladesh. It contributes to the national economy and is a significant source of income for local farmers. Onion plays a vital role in daily diets. Traditionally, onion farming has relied on inherited practices and knowledge passed down through generations. However, with evolving agricultural techniques and the challenges posed by climate change, pests, and market dynamics, farmers need to adopt modern practices.

Onion is used daily in cooking by all Bangladeshi families. Short-day brown and red-scaled onion cultivars are widely cultivated in Bangladesh [6].

The main edible portion of onion is the bulb, which is constituted by the fleshy sheath and stem plate. The onion bulb is rich in phosphorus, calcium, carbohydrates, etc. The most important character of onions is its flavor which increases the taste of food. Onion is also used for medicinal purposes. Onion is also widely used in some other food items, such as gravies, soups, stew stuffing, fried fish, and meat [2] and [9].

[17] reported that onion production during 2018-2019 was 2330 thousand metric tons with a demand of 3600 thousand metric tons. As such the annual production deficit in Bangladesh was 1270 thousand metric tons. [16] reported in The Daily Dhaka Tribune that Bangladesh's agriculture ministry declared that the country had surpassed all previous records in onion production, hitting a 3.3 million tons in production in 2020-21 - a record of 27% surge over what was the spice's previous fiscal yield. Officials claimed on record that relegating the United States a spot behind, Bangladesh had now emerged as the world's 3rd largest producer of onions after China and India. According to [5], the production of onions in Bangladesh was 4.25 Million Metric Ton from a 2,80 lakh hectares of land.

[18] reported that the top five onion producing districts of Bangladesh are Pabna (42476 ha, 22.86% of the acreage), Faridpur (33186 ha, 17.86%), Rajbari (26169 ha, 14.08%), Rajshahi (11162 ha, 6.01%) and Kustia (10415 ha 5.61%). The total coverage of these five districts is 66.41% of the total onion acreage in Bangladesh. Commercial farming of onion seeds is gradually increasing in Faridpur as demand for this spice is rising day by day. The seeds are known to farmers as black gold. In Bangladesh, besides to add taste to the curries, onion is used in preparing pickling, chutney, sauces [17].

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Proper knowledge on onion production, attitude towards onion production and practices of onion production can play a crucial role in producing onion properly. Many other factors of the farmers might influence their knowledge, attitude and practices regarding onion production. Much research work has been done on the production technologies on onion. But no research work has been done on the knowledge, attitude, and practices regarding onion cultivation.

Top five onion-producing districts of Bangladesh are Faridpur, Pabna, Rajbari, Rajshahi, and Kustia. As Faridpur district is one of the larger onion producing districts of Bangladesh, the present research was conducted on "Farmers' Knowledge, Attitude and Practice regarding Onion cultivation at Faridpur district in Bangladesh" with following objectives:

- To assess the extent of farmers' knowledge, attitude, and practices regarding onion cultivation
- To determine and describe some selected characteristics of the onion farmers
- To explore the inter-correlation among farmers' knowledge, attitude, and practices regarding onion cultivation
- To explore the contribution of the selected characteristics of the farmers to their knowledge, attitude, and practices regarding onion cultivation

METHODOLOGY

Locale of the study

Faridpur district was purposively selected for the study as one of the larger onion producing districts of Bangladesh [7]. Two upazillas namely Modhukhali and Faridpur Sadar were then selected randomly. Again, four villages namely Mothurapur & Korokdi from Modhukhali Upazilla and Pierpur & Norsingsodia from Faridpur Sadar Upazilla were selected randomly as the locale of the study.

Population of the study

Onion producing farmers of these selected four villages were considered as the population of the study. Thus, a total of 603 onion producing farmers of the selected four (4) villages were selected as the population of the study.

Sample of the study

Due to time and fund constraints, data were collected from the sample farmers rather than population. Sample size was determined as 240 by using the sample size calculating formula developed by [19]. Samples were selected proportionately and randomly from the four (4) selected villages.

Data Collecting Instruments and data collection

Data were collected from the onion farmers by using a structured interview schedule in a face-to-face situation. A draft interview schedule was prepared considering the variables of this study and it was pre-tested with 24 onion farmers by taking 6 from each of the selected villages who were included in the population but excluded from the sample. After analyzing pre-test result, necessary corrections, modifications, additions, deletions, and adjustments were done to prepare the final interview schedule for collecting final data for the study. For collecting items of the scale of knowledge, attitude, and practice of the farmers regarding onion cultivation, ten (10) Key Informant Interviews (KIIs) were conducted by involving Additional Director and Deputy Director of the Department of Agricultural Extension (DAE), Faridpur; Respective Upazilla Agriculture Officers, Sub-Assistant Agriculture Officers; and four (4) progressive farmers from four selected villages. Final data were collected during the period from 01 March to 10 April 2024.

Measurement of variables

Measuring procedures of the variables of the study are briefly presented below:

Variables	Measuring procedures
Age	Actual age in complete years at the time of the interview from the date of birth
Education	One (1) score for one (1) year of successful schooling, zero (0) for illiterate and 0.5 for can sign only
Onion farm size	Onion farm size in decimal
Benefit-Cost Ratio (BCR) from onion cultivation	Ratio of monetary benefit derived from selling the produced onion to the onion production cost
Commercialization of onion	Ratio of the value of sold onion to the value of produced onion and expressed as a percentage
Onion farming experience	Onion farming experience in complete years
Time spent in onion farm	Hour(s)/week spent in onion farming
Individual contact	Scores as 3, 2, 1 and 0 for regular, occasional, rare, and not at all contact with each of five (5) selected individual extension media contact like model farmers, input dealers, NGO workers, Sub-Assistant Agriculture Officer, and Upazilla level Agriculture Officers
Group contact	Scores as 3, 2, 1 and 0 for regular, occasional, rare, and not at all contact with each of three (3) selected group extension media contacts, like group meeting, field day, and method/result demonstration
Mass contact	Hour(s)/week reading print materials (agricultural information from newspapers, books, magazines, etc.), watching agricultural programs on television, and listening to agricultural programs on the radio
Knowledge on onion cultivation	After thorough consultation with relevant experts and related literatures, conducting Key Informant Interview (KII), and pretesting with 24 onion farmers, a total of 18 questions of onion cultivation were Selected. Each question had three alternative responses containing one correct answer. A score of one (1) was assigned to each correct answer and Zero (0) for wrong or no answer. Knowledge score of a respondent onion farmer was determined by adding the scores of that farmer by adding his/her score against all the 18 questions. Thus, the possible range of scores of onion cultivation knowledge of the farmers could be Zero (0) to 18, where zero (0) indicated very poor knowledge and 18 indicated very high knowledge on onion cultivation. [3], [10], [4], [1], [14], [15], [13], [8] and [11] developed knowledge scale by using this procedure.
Attitude towards onion cultivation	After thorough consultation with relevant experts and related literatures, conducting KII, and pretesting with 24 onion farmers, a total of 10 statements including five (5) were positive and five (5) negative regarding attitude towards onion cultivation were administered with the respondent onion farmers with five alternation responses. Scores of 2, 1, 0, -1, and -2 were assigned to the responses 'strongly agree', 'agree', 'neutral', 'disagree', and 'strongly disagree' of each positive statement towards onion cultivation, respectively. Reverse scores were assigned to each of the negative statements towards onion cultivation. Score of a farmer's attitude toward onion cultivation was determined by adding the scores of that farmer by adding his/her scores against all the 10 statements. Thus, the possible range of scores of farmers' attitude toward onion cultivation could be -20 to +20, where '-20' indicated highest unfavorable attitude, zero (0) indicated neutral attitude, and '+20' indicated highest favorable attitude towards onion cultivation. [12], [15], [13], [8] and [11] developed attitude scale by using this procedure for their respective studies.
Onion cultivation practice	After thorough consultation with relevant experts and related literatures, conducting KII, and pretesting with 24 onion farmers, a total of 15 items of onion cultivation practices were considered for the study. Respondent onion farmers were asked to indicate their extent of practice of each item with four (4) alternative responses as 'practice in full land', 'practice in majority of land', 'practice in small portion of land', and 'no practice' with assigned scores as 3, 2, 1, and 0 respectively. Score of onion cultivation practice of a respondent farmer was determined by adding the scores of that respondent farmer by adding his/her scores against all the 15 practice items. Thus, the possible range of scores of onion cultivation practice of the farmers could be Zero (0) to 45, where Zero (0) indicated no practice and 45 indicated highest practice of onion cultivation. [15], [13], [8] and [11] used these procedures to developed practice scale for their respective studies.

RESULTS AND DISCUSSION

Knowledge on onion cultivation

Observed range of knowledge on onion cultivation scores of the farmers was 4 to 17 against the possible range of 0 to 18 with the mean and standard deviation of 12.53 and 2.69 respectively. Respondent onion farmers were classified into three categories based on their onion cultivation knowledge as shown in Table 1.

Table 1: Distribution of the farmers based on their onion cultivation knowledge

Categories	Basis of categorization (Score)	Number of Farmers	Percent of farmers	Mean	Standard deviation
Poor knowledge	Upto half of the possible score, i. e. 0-9	35	14.6	12.53	2.69
Medium Knowledge	Third one-fourth of possible score, i. e. 10-14	142	59.2		
High knowledge	Highest one-fourth of possible score, i. e. 15-18	63	26.3		
Total		240	100		

Table 1 revealed that majority (59.2%) of the farmers had medium knowledge, compared to 26.3% and 14.6% of them had high and poor knowledge on onion cultivation. It was again revealed that about three-fourth (73.8%) of the farmers had low to medium knowledge on onion cultivation and rest one-fourth (26.3%) of them had high knowledge on onion cultivation. Though the farmers of the study areas were highly experienced in onion cultivation, based on the findings, it may be said that there is steel scope to increase their knowledge on onion cultivation.

[15] showed that 86.8% of the farmers had poor to moderate knowledge on agricultural mechanization. [13] found that majority (54 percent) of the farmers possessed medium knowledge while 27.4 and 14.6 percent of them possessed low and high knowledge on strawberry cultivation, respectively. [8] found that the bulk (61.67 percent) of the farmers possessed medium knowledge, while 20 percent of the farmers possessed low knowledge and only 18.33 percent of the farmers had high knowledge on commercial vegetable cultivation. [11] reported that majority (64.3 %) of the farmers possessed 'medium knowledge' while 20.7 and 15.0 percent of them 'low' and 'high knowledge' respectively on watermelon cultivation.

Attitude towards onion cultivation

Observed range of attitude towards onion cultivation scores of the farmers was 0 to 18 against the possible range of -20 to +20 with the mean and standard deviation of 4.37 and 4.01, respectively. Respondent onion farmers were classified into four categories based on their attitude towards onion cultivation as shown in Table 2.

Table 2: Distribution of the farmers based on their attitude towards onion cultivation

Categories	Basis of categorization (Score)	Number of Farmers	Percent of farmers	Mean	Standard deviation
Neutral attitude	0	5	2.1	4.37	4.01
Low favorable attitude	Lower one-third of possible favorable score, i. e. 1-6	177	73.8		
Moderate favorable attitude	Middle one-third of possible favorable score, i. e. 7-13	47	19.6		
High favorable attitude	Higher one-third of possible favorable score, i. e.14-20	11	4.6		
Total		240	100		

Findings revealed that overwhelming majority (97.9%) of the farmers had favorable and only 2.1% of them had neutral attitude towards onion cultivation. None of the farmers had unfavorable attitude towards onion cultivation. Among the farmers having favorable attitude, majority (73.8%) of them had low favorable, compared to 19.6% and 4.6% had medium and high favorable attitude towards onion cultivation. Based on these findings, it may be concluded that attempts should be taken by the agricultural advisory service providers to increase favorable attitude towards onion cultivation of the farmers by necessary cooperation and suggestions as onion is a high value crop.

[12] reported that highest proportion (61.01%) of the farmer had medium favorable attitude towards climate smart agriculture (CSA) as compared to 18.65% and 20.34% having low favorable and high favorable attitude towards CSA, respectively. [15] showed that 63.21% of the farmers low favorable attitude towards agricultural mechanization. [13] found that all most all (97.3 percent) of the farmers had favorable attitude towards strawberry cultivation and rest 1.8 percent and 0.9 percent of the respondents had neutral and unfavorable attitude towards strawberry cultivation. [8] showed that majority (63.33%) of the farmers had neutral attitude towards commercial vegetable cultivation, while the proportions of unfavorable and favorable were 26.67% and 10% respectively. [11] reported that majority (62.1 %) of the watermelon farmers had favorable attitude compared to 31percent had unfavorable and only 9.2 percent had unfavorable attitude towards watermelon cultivation.

Onion cultivation practices

Observed range of onion cultivation practice scores of the farmers was 4 to 41 against the possible range of 0 to 45 with the mean and standard deviation of 26.99 and 10.17, respectively. Respondent onion farmers were classified into three categories based on their onion cultivation practice as shown in Table 3.

Table 3: Distribution of the farmers based on their onion cultivation practices

Categories	Basis of categorization (Score)	Number of Farmers	Percent of farmers	Mean	Standard deviation
Low practice	Upto half of the possible score, i. e. 0-22.5	48	20.00	29.99	10.17
Moderate practice	Third one-fourth of possible score, i. e. 22.51-33.75	69	28.75		
High practice	Highest one-fourth of possible score, i. e. >33.75	123	51.25		
Total		240	100		

Data presented in Table 3 revealed that above half (51.3%) of the farmers had high practice, compared to 28.75% and 20.00% of them had moderate and low practice of modern onion cultivation. As an onion producing area, the farmers had medium to high knowledge on onion cultivation, as a result, overwhelming majority (80.1%) of the farmers had medium to high practice of modern onion cultivation. On the other hand, about half (48.75%) of them had low to medium knowledge on modern onion cultivation. Therefore, there is scope to increase of the modern onion cultivation practice of the lower and moderate practiced farmers.

[15] showed that 77.4% of the farmers had medium level practice of agricultural mechanization. [13] found that majority (69.9 percent) of the strawberry farmers had medium practice, while 17.7 percent farmers had high practice and 12.4 percent farmers had low practice on strawberry cultivation. [8] revealed that majority (57.5%) of the farmers had medium practice, 25.83% of them had low practice and only 16.67 percent of them had high practice of commercial vegetable cultivation. [11] reported that majority (71.3 %) of the watermelon farmers had 'medium practice', while 16.1 percent farmers had 'high practice' and 12.6 percent farmers had 'low practice' of improved watermelon cultivation.

Selected characteristics of the onion farmers

Salient features like possible range, observed range, mean and standard deviation of the selected characteristics of the onion farmers are shown in Table 4.

Table 4: Salient features of the selected characteristics of the onion farmers

Characteristic	Possible range	Observed range	Mean	Standard Deviation
Age (Years)	Unknown	18-65	43.06	10.28
Education (Schooling years)	Unknown	0-17	4.93	3.98
Onion farm size (Decimal)	Unknown	8-500	102.44	86.60
Benefit-Cost Ratio (BCR) from onion cultivation	Unknown	1.15-5.33	1.86	0.71
Commercialization of onion (%)	Unknown	40-99	90.11	7.23
Onion farming experience (Years)	Unknown	2-31	12.57	6.06
Time Spent in onion farm (Hours/week)	Unknown	8-56	29.96	8.51
Individual contact (Score)	0-15	3-12	6.52	1.24
Group contact (Score)	0-9	1-8	2.69	1.60
Mass contact (Hours/week)	Unknown	1-5	2.13	0.85

Distribution of the onion farmers based on each of their selected characteristics are shown in Table 5.

Table 5: Distribution of the farmers according to their selected characteristics

Characteristic	Categories	Basis of categorization	Number of farmers	Percent of farmers
Age	Young	Up to 35 years	62	25.8
	Middle aged	> 35 – 50 years	122	50.8
	Old	> 50 years	56	23.3
Education	Illiterate	0	13	5.4
	Can sign only	0.5	67	27.9
	Primary	1-5	67	27.9
	Secondary	6-10	84	35.0
	Above secondary	>10	9	3.7
Onion farm size	Very Small	Up to 50 decimals	87	36.3
	Small	> 50 -100 decimals	74	30.8
	Medium	> 100 – 250 decimals	64	26.7
	Large	> 250 decimals	15	6.3
Benefit-Cost Ratio (BCR) from onion cultivation	Low	1.15 – 1.50	75	31.3
	Medium	> 1.50 - 2.00	118	49.2
	High	> 2.00	47	19.6
Commercialization of onion	Low	<Mean -0.5Sd (< 86.5)	52	21.7
	Medium	Mean -0.5Sd (86.5 – 93.72)	103	42.9
	High	>Mean -0.5Sd (>93.72)	85	35.4
Onion farming experience	Low	<Mean – 0.5 SD (< 9.54)	74	30.8
	Medium	Mean + 0.5SD (9.54 – 15.6)	118	49.2
	Hugh	> Mean + 0.5 SD (>15.6)	48	20.0
Time Spent in onion farm	Low	<Mean - 0.5SD (< 25.71)	75	31.3
	Medium	Mean + 0.5SD (25.71-34.22)	82	34.2
	High	>Mean + 0.5 SD (> 34.22)	83	34.6
Individual contact	Low	1-5	34	14.2
	Medium	5-10	202	84.2
	Hugh	11-15	4	1.7
Group contact	Low	1-3	188	78.3
	Medium	4-6	41	17.1
	Hugh	7-9	11	4.6
Mass contact	Low	Upto 2	178	74.2
	Medium	> 2	62	25.8
Total			240	100

Findings revealed that above half (50.8%) of the onion farmers were middle aged, compared to 25.8% and 23.3 % were young and middle aged, respectively. Majority (62.9%) of them had primary to secondary level of education, compared to 27.9 % could sign their name only, 3.7 % had above secondary level of education and 5.4% were illiterate. Above Two-third (67.1%) of the farmers had very small to small onion farm size of <1 acre, compared to 26.7% had medium farm size of >1 – 2.5 acre and 6.3% had large onion farm size of >2.5 Acre. About half (49.2%) of the onion farmers obtained medium BCR of >1.5 to 2.0, compared 31.3% obtained low BCR of 1.15 to 1.5, and rest 19.6% obtained high BCR of >2.0 from onion cultivation. Majority (42.9%) of the farmers had medium commercialization, compared to 21.7% and 25.4% had low and high commercialization of onion. About half (49.2%) of the farmers had medium experience, compared to 30.8% and 20% of them had low and high experience in onion farming, respectively. One-third (34.2%) of the farmers spent medium amount of time, compared to 31.3% and 34.6% of them spent low and high time in their onion filed, respectively. Overwhelming Majority (84.2%) of the onion farmers had medium individual contact, compared to 14.2% and 1.7% of them had low and high individual contact, respectively. Majority (78.3%) of the onion farmers had low group contact, compared to 17.1% and 4.6% of them had medium and high group contact, respectively. Majority (74.2%) of the onion farmers had low mass contact, compared to 25.8% of them had medium mass contact.

Inter-correlation among farmers' knowledge, attitude, and practices regarding onion cultivation

Knowledge on onion cultivation, attitude towards onion cultivation, and onion cultivation practice were the focus variables of the study. Attempt was made to explore the intercorrelation among these three variables. Inter-Correlation co-efficient among these three variables are show in Table 6.

Table 6: Inter-correlation co-efficient among farmers' knowledge, attitude, and practices regarding onion cultivation

	Onion cultivation knowledge	Attitude towards onion cultivation	Onion cultivation practice
Onion cultivation knowledge	-		
Attitude towards onion cultivation	0.601**	-	
Onion cultivation practice	0.626**	0.497**	-

*Significant at 0.05 level, **Significant at 0.01 level

Findings revealed that onion cultivation knowledge of the farmers had significant relationship with their attitude towards onion cultivation and onion cultivation practices.

Attitude towards onion cultivation of the farmers had significant relationship with their onion cultivation knowledge and practices. Onion cultivation practices of the farmers had significant relationship with their onion cultivation knowledge and attitude towards onion cultivation. These findings were supported by knowledge, attitude, and practice (KAP) studies of [15], [13], [8] and [11].

Contribution of the selected characteristics of the farmers to their knowledge on onion cultivation

To explore the contribution of the selected characteristics of the farmers to their knowledge on onion cultivation, step-wise multiple regression analysis was run by involving the selected characteristics of the farmers like age (X₁), education (X₂), onion farm size (X₃), BCR (X₄), Commercialization (X₅), onion farming experience (X₆), time Spent in onion farm (X₇), individual contact (X₈), group contact (X₉), mass contact (X₁₀), attitude towards onion cultivation (X₁₂), and onion cultivation practice (X₁₃) as independent variables and knowledge on onion cultivation (X₁₁) as dependent variable. Results of stepwise multiple regression analysis showing the contribution of the selected characteristics of the farmers to their knowledge on onion cultivation are shown in Table 7.

Table 7: Summary of stepwise multiple regression analysis showing the contribution of the selected characteristics of the farmers to their knowledge on onion cultivation

Variables entered	Standardized Partial 'b' coefficient	Value of 't' (with probability level)	Adjusted R ²	Increase in R ²	Variation explained in percent
Onion cultivation practice (X ₁₃)	0.314	5.802 (0.000)	0.389	0.389	38.9
Group contact (X ₉)	0.177	2.280 (0.024)	0.504	0.115	11.5
BCR (X ₄)	0.212	4.716 (0.000)	0.533	0.029	2.9
Individual contact (X ₈)	0.120	2.408 (0.017)	0.547	0.014	1.4
Time Spent in onion farm (X ₇)	0.128	2.808 (0.005)	0.558	0.011	1.1
Commercialization of onion (X ₅)	0.106	2.250 (0.025)	0.565	0.007	0.07
Attitude towards onion cultivation (X ₁₂)	0.177	2.205 (0.028)	0.572	0.007	0.07
Total				0.572	57.2
Constant = 0.802, Multiple R = 0.765, R-square = 0.585, Adjusted R - square = 0.572 F-ratio = 46.678 at 0.000 level of significance					
The remaining variables i.e., age (X ₁), education (X ₂), Onion farm size (X ₃), Onion farming experience (X ₆), and mass contact (X ₁₀) were not entered into the regression equation.					

Data presented in Table 7 indicated that the multiple R, R² and adjusted R² in the step-wise multiple regression analysis were 0.765, 0.585 and 0.572 respectively, and the corresponding F-ratio of 46.678 was significant at 0.000 level. The regression equation so obtained is presented below:

$$X_{11} = 0.802 + 0.314X_{13} + 0.177X_9 + 0.212X_4 + 0.120X_8 + 0.128X_7 + 0.106X_5 + 0.177X_{12}$$

This indicated that the whole model of 12 independent variables explained 57.2 percent of the total variation in knowledge on onion cultivation of the farmers. But since the standardized regression coefficient of seven (7) variables formed the equation and were significant, it might be assumed that whatever contribution was there, it was due to these seven (7) variables.

Results of stepwise multiple regression analysis again indicated that onion cultivation practice (X_{13}) of the farmers was by far the most important characteristic which strongly and positively influenced their knowledge on onion cultivation (X_{11}). Group contact (X_9), BCR (X_4), Individual contact (X_8), Time Spent in onion farm (X_7), Commercialization of onion (X_5), and Attitude towards onion cultivation (X_{12}) of the farmers also had remarkable positive contribution to their onion cultivation knowledge (X_{11}). Since the rest five (5) variables or characteristics of the farmers did not enter the regression model, it was inferred that these five (5) characteristics either had multi-collinearity problem or had minimum contribution to the total explained variation of 57.2 percent. These results were supported by the studies of [12], [15], [13], [8] and [11].

Contribution of the selected characteristics of the farmers to their attitude towards onion cultivation

To explore the contribution of the selected characteristics of the farmers to their attitude towards onion cultivation, step-wise multiple regression analysis was run by involving the selected characteristics of the farmers like age (X_1), education (X_2), onion farm size (X_3), BCR (X_4), commercialization (X_5), onion farming experience (X_6), time Spent in onion farm (X_7), individual contact (X_8), group contact (X_9), mass contact (X_{10}), Knowledge on onion cultivation (X_{11}), and onion cultivation practice (X_{13}) as independent variables and attitude towards onion cultivation (X_{12}) as dependent variable. Results of stepwise multiple regression analysis showing the contribution of the selected characteristics of the farmers to their attitude towards onion cultivation are shown in Table 8.

Table 8: Summary of stepwise multiple regression analysis showing the contribution of the selected characteristics of the farmers to their attitude towards onion cultivation

Variables entered	Standardized Partial 'b' coefficient	Value of 't' (with probability level)	Adjusted R ²	Increase in R ²	Variation explained in percent
Group contact (X_9)	0.707	16.787 (0.000)	0.683	0.683	68.30
Onion cultivation practice (X_{13})	0.132	2.966 (0.003)	0.711	0.028	2.80
Knowledge on onion cultivation (X_{11})	0.115	2.343 (0.020)	0.716	0.005	0.5
Total				0.716	71.6

Constant = -4.099, Multiple R = 0.848, R-square = 0.720, Adjusted R - square = 0.716
 F-ratio = 202.085 at 0.000 level of significance
 The remaining variables i.e., age (X_1), education (X_2), onion farm size (X_3), BCR (X_4), commercialization (X_5), onion farming experience (X_6), Time Spent in onion farm (X_7), individual contact (X_8), and mass contact (X_{10}) were not entered into the regression equation.

Data presented in Table 8 indicated that the multiple R, R² and adjusted R² in the stepwise multiple regression analysis were 0.848, 0.720 and 0.716 respectively, and the corresponding F-ratio of 202.085 was significant at 0.000 level. The regression equation so obtained is presented below:

$$X_{12} = - 4.099 + 0.707X_9 + 0.132X_{13} + 0.115X_{11}$$

This indicated that the whole model of 12 independent variables explained 71.6 percent of the total variation in attitude towards onion cultivation of the farmers. But since the standardized regression coefficient of three (3) variables formed the equation and were significant, it might be assumed that whatever contribution was there, it was due to these three (3) variables.

Results of stepwise multiple regression analysis again indicated that Group contact (X_9) of the farmers was by far the most important characteristic which strongly and positively influenced their attitude towards onion cultivation (X_{12}). Onion cultivation practice (X_{13}) and onion cultivation knowledge (X_{11}) of the farmers also had remarkable positive contribution to their attitude towards onion cultivation (X_{12}). Since the rest 10 variables or characteristics of the farmers did not enter the regression model, it was inferred that these 10 characteristics either had multi-collinearity problem or had minimum contribution to the total explained variation of 71.6 percent. These results were supported by the studies of [12], [15], [13], [8] and [11].

Contribution of the selected characteristics of the farmers to their onion cultivation practices

To explore the contribution of the selected characteristics of the farmers to their onion cultivation practices, stepwise multiple regression analysis was run by involving the selected characteristics of the farmers like age (X_1), education (X_2), onion farm size (X_3), BCR (X_4), commercialization (X_5), onion farming experience (X_6), time Spent in onion farm (X_7), individual contact (X_8), group contact (X_9), mass contact (X_{10}), knowledge on onion cultivation (X_{11}), and attitude towards onion cultivation (X_{12}) as independent variables and onion cultivation practice (X_{13}) as dependent variable. Results of stepwise multiple regression analysis showing the contribution of the selected characteristics of the farmers to their onion cultivation practices are shown in Table 9.

Table 9: Summary of stepwise multiple regression analysis showing the contribution of the selected characteristics of the farmers to their onion cultivation practices

Variables entered	Standardized Partial 'b' coefficient	Value of 't' (with probability level)	Adjusted R ²	Increase in R ²	Variation explained in percent
Knowledge on onion cultivation (X_{11})	0.456	7.435 (0.000)	0.389	0.389	38.9
Commercialization (X_5)	0.178	3.554 (0.000)	0.420	0.031	3.1
Onion farming experience (X_6)	0.130	2.607 (0.010)	0.440	0.020	2.0
Attitude towards onion cultivation (X_{12})	0.149	2.440 (0.015)	0.452	0.012	1.2
Total				0.452	45.2

Constant = -18.708, Multiple R = 0.679, R-square = 0.461, Adjusted R - square = 0.452
 F-ratio = 50.256 at 0.000 level of significance
 The remaining variables i.e., age (X_1), education (X_2), onion farm size (X_3), BCR (X_4), Time Spent in onion farm (X_7), individual contact (X_8), group contact (X_9) and mass contact (X_{10}) were not entered into the regression equation.

Data presented in Table 9 indicated that the multiple R, R² and adjusted R² in the stepwise multiple regression analysis were 0.679, 0.461 and 0.452 respectively, and the corresponding F-ratio of -18.708 was significant at 0.000 level. The regression equation so obtained is presented below:

$$X_{13} = - 18.708 + 0.456X_{11} + 0.178X_5 + 0.130X_6 + 0.149X_{12}$$

This indicated that the whole model of 12 independent variables explained 45.2 percent of the total variation in onion cultivation practices of the farmers. But since the standardized regression coefficient of four (4) variables formed the equation and were significant, it might be assumed that whatever contribution was there, it was due to these four (4) variables.

Results of stepwise multiple regression analysis again indicated that Knowledge on onion cultivation (X_{11}) of the farmers was by far the most important characteristic which strongly and positively influenced their onion cultivation practices (X_{13}). Commercialization (X_5), onion farming experience (X_6), and attitude towards onion cultivation (X_{12}) of the farmers also had remarkable positive contribution to their onion cultivation practices (X_{13}). Since the rest nine (9) variables or characteristics of the farmers did not enter the regression model, it was inferred that these nine (9) characteristics either had multi-collinearity problem or had minimum contribution to the total explained variation of 45.2 percent. These results were supported by the studies of [15], [13], [8] and [11].

CONCLUSIONS

Based on the findings of the study and their logical interpretations, following conclusions were made:

- Three-fourth (73.8%) of the farmers had low to medium knowledge on onion cultivation and rest one-fourth (26.3%) of them had high knowledge on onion cultivation. Onion cultivation practice, group contact, BCR, individual contact, Time Spent in onion farm, commercialization of onion, and attitude towards onion cultivation of the farmers had significant contribution to their onion cultivation knowledge. Therefore, it might be concluded that onion cultivation knowledge of the farmers might be increased by increasing their onion cultivation practice, group contact, BCR, individual contact, time spent in onion farm, commercialization of onion, and attitude towards onion cultivation.
- Majority (73.8%) of the onion farmers had low favorable attitude, compared to 19.6% and 4.6% had medium and high favorable attitude towards onion cultivation. Rest 2.1% of them had neutral attitude towards onion cultivation. Group contact, onion cultivation practice, and onion cultivation knowledge of the farmers had significant positive contribution to their attitude towards onion cultivation. Therefore, it might be concluded that favorable attitude towards onion cultivation of the farmers might be increased by increasing their group contact, onion cultivation practice, and onion cultivation knowledge.
- Above half (51.25%) of the farmers had high practice, compared to 48.75% of them had low to medium practice of modern onion cultivation. Knowledge on onion cultivation, commercialization of onion, onion farming experience, and attitude towards onion cultivation of the farmers had significant positive contribution to their onion cultivation practices. Therefore, it might be concluded that modern onion cultivation practice of the farmers might be increased by increasing their knowledge on onion cultivation, commercialization of onion, onion farming experience, and attitude towards onion cultivation.

RECOMMENDATIONS

Based on the conclusions of the study, following recommendations were made:

- Agricultural advisory service providers of the study area should increase their contact with the onion farmers and provide required training on onion cultivation as group contact, so that they might be motivated to spend more time in onion field for modern onion cultivation practices and they could form favorable attitude towards onion cultivation, increase commercialization of onion, and obtained more Benefit-cost Ration from onion cultivation to increase onion cultivation knowledge of the farmers.
- To form favorable attitude towards onion cultivation of the farmers, agricultural advisory service providers of the study area should increase their contact with the farmers and provide necessary training to the farmers so that they can increase their knowledge on onion cultivation and adopt modern scientific onion cultivation practices.
- Modern onion cultivation practice of the farmers might be increased by providing motivational campaigning and necessary training to the lower and moderate experienced farmers by the advisory service providers of the study area so the farmers could increase their knowledge on onion cultivation and commercialization of onion and form a favorable attitude towards onion cultivation.

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