ISSN: 2518-2021 (Print), 2415-4474 (Online) Fundam Appl Agric 2017, 2(1): 212-217

Fundamental and Applied Agriculture

Journal homepage: www.f2ffoundation.org/faa

Agricultural Extension
ORIGINAL ARTICLE

Assessment of farmers' indigenous knowledge and attitude towards summer tomato cultivation in Mymensingh region of Bangladesh

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ARTICLE INFO

Article history:

Received: 22 December 2016
Received in revised form: 20 January 2017
Accepted: 20 January 2017
Available online: 25 January 2017

Academic Editor: Md Anwarul Abedin

Keywords:

Practice
Indigenous Knowledge
Attitude
Farmers
Summer Tomato
Cultivation
Bangladesh

ABSTRACT

The purposes of the study were to investigate the assessment of farmers' indigenous knowledge and attitude towards summer tomato cultivation in Mymensingh region of Bangladesh and also to explore the relationships between the selected characteristics of the farmers and use their indigenous knowledge. There is a wealth of knowledge at the disposal of farmers which they have been using generation after generation in Bangladesh. In the present study, Indigenous knowledge and attitude has been defined as the traditional knowledge of the farmers of Bangladesh in the production, protection and preservation of crops generated by their ancestors and internalized by the local people. Some identified indigenous knowledge and attitude in this study show colossal potential which has a direct positive influence on maintaining the ecosystem in Bangladesh. Micro-data from a farm-level survey conducted by the first author was the main source of data. Data were collected through personal interview from 101 randomly selected farmers growing summer tomato from the six villages under Sadar Upazila of Mymensingh district during 20th March to 25th April 2016. Appropriate scales were developed in order to measure the variables. With respect to indigenous knowledge, it was found that the majority (52.4 percent) of the farmers possessed high indigenous knowledge, while 42.6 percent of the farmers possessed medium indigenous knowledge and only 5 percent of the farmers had low indigenous knowledge on summer tomato cultivation. Regarding attitude, the study showed that about 49.5 percent of the farmers had favorable attitude, while 37.6 percent farmers had unfavorable attitude and 12.9 percent farmers showed neutral attitude towards summer tomato cultivation. Education, land possession, annual family income, extension contact of the farmers had positive significant relationship with farmers' indigenous knowledge on summer tomato cultivation, while problem faced had negative relationship with their indigenous knowledge. Land possession of the farmers had positive significant relationship with their attitude towards summer tomato cultivation. Recommendations were forwarded to the extension personnel should provide regular visit to the farmers so that they can make effective communication with them for their summer cultivation.

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INTRODUCTION

Bangladesh, basically an agro-based country, is considered one of the world's most densely populated countries (1063 persons per square km) with an annual population growth rate of 1.37% (AIS 2015). In such a setting, the pressure on the land for

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agricultural production and the demand for job is increasing day by day. This has led to rapid changes in the country's socio-economic and demographic characteristics in the recent years. Against this backdrop, it is reasonable to expect that the nature and pattern of agricultural production have also been changing with the passage of time. Agriculture not only employs most of the national labor force, but also supplies food for the people, raw materials for the use of domestic industries and industrial development sustaining rural society and preserving land and natural environment. The farmers have a tendency to follow 'Modern agriculture' for better production in Bangladesh. Vegetable production can help farmers to generate income which eventually alleviate poverty.

Tomato is one of the most important vegetables in terms of acreage, production, yield, commercial use and consumption. According to FAOSTAT (2015), in 2013 tomato ranked 10th worldwide in terms of production value (US$ 59.9 billion) amongst all crops and was the 11th most-produced food commodity, with 164 million tones (t) produced. China was the largest producer in 2015, followed by India and the United States. Bangladeshi farmers produced only 577,000 t in 2013 (FAOSTAT, 2015), and are often reluctant to cultivate horticultural crops during the summer monsoon season (June to October) for fear of crop damage due to strong rains and wind, and localized flooding. In Bangladesh good-natured atmosphere remains for tomato production during low temperature winter season that is early November is the best time for tomato planting in our country (Hossain et al. 1986). It is a good source of vitamin C (31 mg per 100g), vitamin A, calcium, iron etc. (Matin et al. 1996). Although tomato plants can grow under a wide range of climatic conditions, they are extremely sensitive to hot and wet growing conditions, the weather which prevails in the summer to rainy season in Bangladesh. But limited efforts have been given so far to overcome the high temperature barrier preventing fruit set in summer-rainy (hot-humid) season. Its demand for both domestic and foreign markets has increased manifold due to its excellent nutritional and processing qualities (Hossain et. al. 1999). Considering the growing demand and importance of tomato, Bangladesh Agricultural Research Institute (BARI) has taken initiative to develop off-season summer and rainy season tomatoes. So far BARI has developed and released 3 hybrid tomato varieties i.e. BARI hybrid tomato-3, BARI hybrid tomato-4 and BARI hybrid tomato-8 which can be grown during summer and rainy season under polytunnel. But, in Bangladesh very little information has so far been generated regarding the profitability and adoption of hybrid tomato cultivation technologies by the farmers in the country. Generalization from studies conducted by home and abroad regarding the tomato production may not be always applicable due to considerable variation in attributes of the technologies and also for many others factors (Mohiuddin et al. 2007; Zaman et al. 2006). Fortunately, the farmers of sadar upazila, Mymensingh started to adopt this technology as pioneer farmer since 2005. It is recognized that in order to expand the area of this crop as well as to fit this crop in the farmers cropping system, studies are needed to ascertain its cost and return situation in relation to profitability, input use and farmer's resource use efficiency. Yet, no or little systematic study to assess farmers' knowledge and attitude towards summer tomato cultivation has so far been conducted. Majority of the respondents conducted studies for their own requirements and very few common studies could be found, which is not enough to assess the overall farmers' knowledge and attitude towards summer tomato cultivation. Considering the above facts, the researchers undertook the study to get answers of the following research questions.

- What is the extent of knowledge of farmers in summer tomato cultivation?
- What is the attitude of farmers towards summer tomato cultivation?
- Is there any relationship between farmers' selected characteristics and their knowledge and attitude towards summer tomato cultivation?

MATERIALS AND METHODS

Study area

Six villages (Shambhuganj, Sheshmore, Sutiakhali, Uzan Khasiar Char, Char Nilakshmia, and Bot-tola) from Mymensingh Sador upazila in Bangladesh were locales for the study and they were selected purposively because most of the farmers in these areas are engaged in vegetables cultivation and animal husbandry besides the agricultural operation. The population comprised 1,145 household heads of those 6 villages. Thus, the total sample size stood at 101. Moreover, a reserved list of 17 summer tomato farmers was prepared for use when the summer tomato farmers under sample were not available during data collection.

Collection of data

Data were collected personally by the researcher himself through face to face farmer interview. Interview schedules were used for collecting data from a sample of 101 households out of 1,145 households from 20 March to 25 April, 2016. The researcher made all possible efforts to explain the purpose of the study to the farmers. Rapport was established with the farmers prior to interview and the objectives were clearly explained by using local language as far as possible.

Statistical Analysis

Pearson's Product Moment Coefficient of Correlation (r) was used in order to explore the relationships between the concerned variables. Five percent (0.05) level of probability was the basis for rejecting any null hypothesis throughout the study. The SPSS computer package was used to perform all these processes.

Measurement of farmers' characteristics

Four characteristics namely age, education, tomato cultivation experience and land possession were measured by using the measuring units of year, year of schooling, year of experience and hectare respectively**.** The annual family income and training exposure were measured by using the measuring units of Taka and number of day of training respectively. Four-point rating scale ranging from 'regularly', 'occasionally', 'rarely' to 'never' was used to measure the extension contact in this study. Four point scales was used for measuring problem faced. The scoring techniques are severe problem, moderate problem, low problem and not at all problem and score was assigned as 3, 2, 1 and 0 respectively.

Indigenous knowledge on summer tomato cultivation

After thorough consultation with relevant experts and reviewing of related literature, 13 question regarding summer tomato cultivation were selected and those were asked to the respondent summer tomato farmers to determine their indigenous knowledge on summer tomato cultivation. Two (2) score was assigned for each correct answer and zero (0) for wrong or no answer. Score was also assigned for partially correct answer. Thus, the knowledge on summer tomato cultivation score of the respondents could range from 0 to 26, where zero indicating no knowledge and 26 indicates the very high knowledge on summer tomato cultivation.

Attitude towards summer tomato cultivation

Attitude of a respondent towards summer tomato cultivation was measured by developing an attitude scale through Puttaswamy (1977) given scale that developed a scale to measure the attitude of village extension workers towards training and visit system in Indian context. Here five-point Likert, Rensis *(1932)* method of summated ratings was used to find out the tomato farmers' attitude towards summer tomato cultivation. Nine statements expressing positive and negative feelings towards summer tomato cultivation were constructed. A statement was considered positive if it indicated a favorable attitude towards summer tomato cultivation. If the case was reverse, it was considered as a negative statement. Out of these nine statements five were positive and four were negative. Scoring was done by assigning 4, 3, 2, 1 and 0 scores to the five alternative responses as "strongly agreed", "agreed", "undecided", "disagreed", and "strongly disagreed", respectively in case of a positive statement. Reverse score was assigned for a negative statement. However, attitude towards summer tomato cultivation of a farmer was obtained by summing up his/her scores for all the nine statements in item no. 10 in the interview schedule. Attitude score, thus, obtained for a respondent could range from zero (0) to 36, where zero (0) indicated very unfavorable attitude and 36 indicated highest level of favorable attitude.

RESULTS AND DISCUSSION

Characteristics of farmers

The selected characteristics of the farmers are presented in Table 1.

Age: The highest proportion (50 percent) of the summer tomato farmers were middle aged compared to 42 percent of them being young and only 9 percent old. The overwhelming majority (91 percent) of the summer tomato farmers were young to middle aged. This means that summer tomato cultivation in the study area is being managed by comparatively younger farmers. Islam (1996) conducted a study on farmers' use of indigenous technical knowledge (ITK) in the context of sustainable agricultural development. He found that age of the farmers had significant negative relationship with their extent of use of ITK.

Table 1. Distribution of the respondents according to their selected characteristics

Characteristics	Scoring method	Possible score	Observed score	Categories	Respondents N= 101		Mean	SD	CV
					Number	Percent			
Age	No of years	-	25-55	Young age (up to 35) Middle age (36-50) Old age (>50	42 50 9	41.6 49.5 8.9	38.66	8.24	21.31
Level of Education	Years of schooling	-	0-12	Illiterate (0) Can sign only (0.5) Primary level (1-5) Secondary level (6-10) Above secondary level (above 10)	3 24 1 49 24	3 23.8 1 48.5 23.8	7.51	4.57	60.85
Land possession	Hectare	-	0.07-1.25	Marginal (up to 0.2) Small (0.21-1) Medium (1.1-3) Large (>3)	14 75 4 0	13.9 74.2 7.9 0	0.45	0.29	64.44
Annual family income	'000' Tk	-	73-275	Low income (up to 100) Medium income (101-220) High income (above 220)	4 89 8	4 88.1 7.9	156.86	40.91	26.08
Training exposure	No. of days	-	1-3	One day training (1 day) Three days training (3days)	19 82	18.8 81.2	2.62	0.79	30.15
Extension contact	Score	0-24	10-22	Low extension contact (up to 14) Medium extension contact (15-18) High extension contact (above 18)	12 77 12	11.9 76.2 11.9	16.79	1.72	10.24
Tomato cultivation experience	No. of years	-	5-12	Low experience (upto 7 years) Medium experience (8-10 years) High experience (above 10 years)	39 23 39	38.6 22.8 38.6	8.66	2.20	25.50
Problem faced in summer tomato cultivation	Score	0-21	3-13	Low (upto 6) Medium (7-10) High (above 10)	2 77 22	2 76.2 21.8	9.42	1.61	17.09

Education: The highest proportion (49 percent) of the summer tomato farmers had education up to secondary level compared to 24 percent of them having above secondary level education. About 24 percent of them could sign only while only 3 percent of the summer tomato farmers were illiterate. The proportion of summer tomato farmers having primary level education was

only 1 percent. Thus, the overwhelming majority (72 percent) of the summer tomato farmers had education ranging from secondary to above secondary level. Education is the process of producing desired change in behaviour of the farmers and educated farmers are more conscious of using of environmentally friendly IKAs in their field. The findings thus, indicate that the current literacy rate in the study area is higher than that of the national average of 58 percent (MSVS project info 2014; AIS, 2015). Alam (1997) observed that the level of education of the farmers had a positive and significant relationship with the use of improve farm practices.

Land possession: Three – fourth (74 percent) of the summer tomato farmers possessed small land compared to 14 percent of them having marginal land and only 8 percent had medium land possession. Islam (1996) found that there was significant and negative relationship between the farm size of the farmers and their extent of use of indigenous technical knowledge.

Annual family income: The majority (88 percent) of the summer tomato farmers had medium income compared to 8 percent of them having high income and 4 percent low income. Thus, the vast majority (92 percent) of the summer tomato farmers had low to medium income, indicating that tomato cultivation is usually practiced by the farmers of comparatively lower economic standings. Hossain (2003) found that income of the rural women farmers had negative relationships with their knowledge of modern Boro rice cultivation.

Training exposure: About 81 percent of the summer tomato farmers receive three days training while the rest 19 percent of them received one day training. Training increases knowledge and skills of the summer tomato farmers in a specific subject matter area. Individuals who gain high training exposure are likely to be more competent in performing in different activities. But the fact that summer tomato farmers who received low training, needs attention of the authorities of extension services (GOs and NGOs) in the country. Providing adequate training on appropriate subject matter is likely to increase the knowledge and attitude of the tomato farmers. Manjunatha (1980) found that training exposure of the farmers had a positive significant relationship with their knowledge.

Extension contact: A proportion of 76 percent of the summer tomato farmers had medium extension contact compared to 12 percent of them having low extension contact. Only 12 percent of the summer tomato farmers had high contact. Thus, overwhelming majority (88 percent) of the summer tomato farmers had low to medium extension contact. Extension contact is a very effective and powerful source of receiving information about various new and modem technologies. The status of no or having low and medium contacts might have significant impacts on the knowledge and attitude of summer tomato farmers. Sana (2003) and Sarker (2002) found in their study that media exposure of farmers were highly positive significant relationships with their indigenous knowledge in the context of sustainable agricultural development.

Tomato cultivation experience: About 39 percent of the summer tomato farmers had high experience on summer tomato cultivation & while the rest 39 and 23 percent of them had low and medium experience on summer tomato cultivation. Rayaparaddy and Jayaranaiah (1989) found that experience of the farmers had a positive significant relationship with their knowledge.

Problem faced in summer tomato cultivation: About 76 percent of the summer tomato farmers had medium problem compared to 22 percent of them having high problem and only 2 percent having low problem. Thus, the vast majority (78 percent) of the summer tomato farmers had low to medium problem. Ali (1999) concluded that problems of the farmers had a significant relationship with their knowledge.

Indigenous knowledge of the farmers on summer tomato cultivation

Summer tomato farmers' knowledge scores could theoretically range from 0 to 26. But their observed knowledge scores ranged from 3 to 26, the mean being 22 and standard deviation 3. Based on the theoretical scores, the farmers were classified into three categories as: "low knowledge" (upto 18), "medium knowledge" (19 to 22), "high knowledge" (above 22).The distribution of the farmers according to their knowledge level is shown in Table 2.

Table 2. Distribution of the farmers according to their knowledge on summer tomato cultivation

Knowledge level (scores)	Summer tomato farmers (n=101)	
	Number	Percent
Low knowledge (upto 18)	5	5
Medium knowledge (19-22)	43	42.6
High knowledge (above 22)	53	52.4

About 43 percent farmers possessed medium knowledge, 52 percent of the farmers possessed high knowledge and only 5 percent of the farmers had low knowledge. Thus, a proportion of 95 percent of the farmers had medium to high knowledge on various aspects of summer tomato cultivation.

Attitude of the Farmers towards Summer Tomato Cultivation: Attitude scores of the respondents towards summer tomato cultivation could theoretically range from 0 to 36. However, their observed scores ranged from 15 to 25 with an average of 19, standard deviation of 3, and coefficient of variation 8. Based on these attitude scores, the respondents were placed under three categories namely, unfavorable, neutral, and favorable. The distribution of the respondents under each of the three categories has been shown in Table 3.

Table 3. Distribution of the farmers according to their attitude towards summer tomato cultivation

Extent of attitude (scores)	Summer tomato farmers (n=101)	
	Number	Percent
Unfavorable(up to 17)	38	37.6
Neutral (18)	13	12.9
Favorable (Above 18)	50	49.5

Data presented in Table 3 reveal that about half (50 percent) of the respondents held favorable attitude towards the summer tomato cultivation, while the proportions of neutral and unfavorable were 13 and 38 percent, respectively.

Relationship between the selected characteristics of the farmers with their indigenous knowledge and attitude towards summer tomato cultivation:

The results of the correlation analysis between each of the selected characteristics of the farmers with their knowledge and attitude are shown in Table 4.

Relationship between the selected characteristics of the farmers and their indigenous knowledge on summer tomato cultivation

The Table 4 shows that age of the farmers had no significant relationship with their knowledge on summer tomato cultivation and education of the farmers had significant positive relationship with their knowledge on summer tomato cultivation. Table 4 also indicates that land possession of the farmers had significant positive relationship with their indigenous knowledge on

summer tomato cultivation. Annual family income and knowledge on summer tomato cultivation as shown in Table 4 indicates that annual family income of the farmers had significant positive relationship with their knowledge on summer tomato cultivation. Training exposure and knowledge on summer tomato cultivation as shown in the Table 4 indicates that training exposure of the farmers had no significant relationship with their knowledge on summer tomato cultivation. Extension contact of the farmers had a significant positive relationship with their knowledge on summer tomato cultivation. But tomato cultivation experience of the farmers had no significant relationship with their knowledge on summer tomato cultivation. It is clear from Table 4 that problem faced by the farmers had a significant negative relationship with their knowledge on summer tomato cultivation.

Relationship between the selected characteristics of the farmers and their attitude towards summer tomato cultivation

Age and attitude of farmers towards summer tomato cultivation as shown in Table 4 indicates that age of the farmers had no significant relationship with their attitude towards summer tomato cultivation. Education and attitude towards summer tomato cultivation as shown in Table 4 indicates that education of the farmers had no significant relationship with their attitude towards summer tomato cultivation. Land possession of the farmers had significant positive relationship with their attitude towards summer tomato cultivation. Annual family income of the farmers had no significant relationship with their attitude towards summer tomato cultivation.

Relationship between farmers' indigenous knowledge and attitude towards summer tomato cultivation

To ascertain the relationships between farmers' indigenous knowledge and attitude towards summer tomato cultivation, correlation analysis was used. Various relationships regarding the above aspects were depicted in Table 5. It is evident that knowledge and attitude of the farmers had significant positive relationship with each other. The results of correlation matrix of the dependent and independent variables "r" between knowledge on summer tomato cultivation and attitude towards summer tomato cultivation are presented Table 5.

Table 4. Co-efficient of correlation (r) of selected characteristics of the summer tomato farmers' with their i) knowledge on summer tomato cultivation and ii) attitude towards summer tomato cultivation (n=101)

Characteristics of the Farmers	Correlation of co-efficient (r) with knowledge	Correlation of co-efficient (r) with Attitude	Table value significant at (df= 99)	
			0.05 level	0.01 level
Age	0.006^{NS}	0.009^{NS}	0.195	0.254
Level of Education	0.267**	0.017^{NS}		
Land possession	0.285**	0.202*		
Annual family income	0.233*	0.134^{NS}		
Training exposure	0.066^{NS}	0.041^{NS}		
Extension contact	0.211*	0.048^{NS}		
Tomato cultivation experience	0.086^{NS}	0.005^{NS}		
Problem faced in summer tomato cultivation	-0.0.200*	-0.136^{NS}		

^{NS} Not significant, * Significant at 0.05 level of probability, ** Significant at 0.01 level of probability

Table 5. Correlation Matrix of the dependent and independent variables (N = 101)

Variables	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}
X_1	1.000									
X_2	-0.686	1.000								
X_3	0.035	0.098	1.000							
X_4	0.033	0.115	0.610**	1.000						
X_5	-0.205	0.076	0.073	0.176	1.000					
X_6	0.069	0.173	0.183	0.199*	0.401**	1.000				
X_7	0.158	-0.070	0.086	0.044	0.111	0.172	1.000			
X_8	0.122	-.213*	-0.142	-0.034	0.078	-0.179	0.207*	1.000		
X_9	0.006	0.267**	0.285**	0.233*	0.066	0.211*	0.080	-0.200*	1.000	
X_{10}	0.009	0.017	0.202*	0.134	0.041	0.048	0.005	-0.136	0.306**	1.000

* = Correlation is significant at 0.05 level of probability ** = Correlation is significant at 0.01 level of probability
X_1 = Age, X_2= Education , X_3= Land possession , X_4= Annual family income, X_5=Training exposure, X_6= Extension contact, X_7=Tomato cultivation experience , X_8= Problem faced in summer tomato cultivation , X_9= Knowledge on summer tomato cultivation X_{10}= Attitude towards summer tomato cultivation.

CONCLUSION

Majority of the farmers (95 percent) had medium to high knowledge on summer tomato cultivation. Knowledge of the farmers had significant positive relationship with their

education, land possession, annual family income and extension contact. It may be concluded that it would be a judicious thinking to improve the overall situation of knowledge by taking care of the factors related to the increase of knowledge among the farmers. Attitude of the farmers is not up to mark. A proportion of 51 percent of the farmers had unfavorable to neutral attitude towards various aspects of summer tomato cultivation. It concluded that the cultivation of summer tomato will not be possible to improve to a significant extent unless the concerned authorities take proper steps to improve farmers' attitude towards summer tomato cultivation and farmers' indigenous knowledge is dependent with their problem faced.

CONFLICT OF INTEREST

The author declares that there is no conflict of interests regarding the publication of this paper.

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