ISSN: 2617 – 8338 (Online)
: 2617 – 832X (Print)

EBAUB Journal
An Academic Journal of
EXIM Bank Agricultural University Bangladesh

Adoption of Different Farming Technologies by the Vegetable Farmers of Chapainawabganj, Bangladesh

Mujibur Rahman Khan[1]*, Md. Ferdous Parvez[2], Md. Samiul Haque[3], Farhan Masud Tassine[3], Md. Milon Ali[3], Tunjara Khatun[3]

[1]Department of Horticulture, EXIM Bank Agricultural University Bangladesh, Chapainawabganj-6300, Bangladesh
[2]Department of Agricultural Engineering, EXIM Bank Agricultural University Bangladesh, Chapainawabganj-6300, Bangladesh
[3]Faculty of Agriculture, EXIM Bank Agricultural University Bangladesh, Chapainawabganj-6300, Bangladesh

ARTICLE INFO

Received date: April 18, 2021
Accepted date: Nov. 26, 2021

ABSTRACT

This research work is focused on analyzing the socio-economic characteristics of the farmers in relation to adoption of farming technologies by vegetable farmers of Chapainawabganj. Appropriate scales were developed to measure the dependent and independent variables. Data were collected randomly from selected 63 farmers from different unions of Chapainawabganj sadar upazila by utilizing a prepared questionnaire. Descriptive statistics such as mean, standard deviation, range and percentage were used to describe the variables. Attempt was also made to explore the relationship between selected characteristics and their adoption of farming technologies in vegetable cultivation. This study expressed that, majority of the respondents (63.5%) in the study area were young to middle aged. In case of education, 76.2% of the respondents have primary to higher level of education. Among the respondents, 77.8% had small farm size, 77.8% of the respondent had low annual income and 79.4% of farmers had no training experiences, so the farm size, annual income and training exposure of the respondents were low. The findings indicate that 60.3% of the respondents were experienced vegetable farmers and 76.2% showed innovativeness in vegetable farming. Among the farmers, 90.5% occasionally and 7.9% rarely adopted vegetable farming technologies. Rest 1.6% rarely adopted vegetable farming technologies which includes using of inorganic fertilizers with organic fertilizers, using tractor and different types of sprayers and smart phones occasionally. Regression analysis revealed that education and farm size of the respondents positively contributed to adoption of vegetable farming technologies significantly at 95% level of confidence. According to the findings, most of the respondents exhibited medium innovativeness, which influenced technology adoption positively; this indicates that, the greater the farmers' innovativeness with various technologies, the greater the use and adoption of vegetable farming technologies. Therefore, the current study could contribute to improve better policies aimed at expediting the adoption of various farming technologies by vegetable farmers.

Keywords: Adoption, Farming technologies, Innovativeness, Socio-economic characteristics, Vegetable cultivation

***CORRESPONDENCE**
mujiburkhan.bd@gmail.com
Department of Horticulture, EXIM Bank Agricultural University Bangladesh, Chapainawabganj-6300, Bangladesh

To Cite: Khan, M. R., Parvez, M. F., Haque, M. S., Tassaine, F. M., Ali, M. M. & Khatun, T. (2022). Adoption of different farming technologies by the vegetable farmers of Chapainawabganj, Bangladesh. *EBAUB J.*, 4, 90-95

1. INTRODUCTION

Bangladesh is an agricultural country whose 40.6% inhabitants directly or indirectly are involved in agricultural activities for their livelihood (BBS, 2019). Agriculture is one of the key production sectors of the economy which comprises around 13.02% of GDP (BBS, 2019). Agriculture has been playing as a pioneer in the growth and stability of the national economy of Bangladesh (Sharmin et al., 2018). The main agricultural commodities of our country are rice, wheat, pulse, jute and different vegetables.

Vegetables are considered as one of the most important food crops due to their high nutritive value, relatively higher yield and higher return. Apart from nutritional importance, it helps in employment generation, income increase and poverty reduction in developing countries like Bangladesh (Mitra & Yonus, 2018; Weinberger & Genova II, 2005). Vegetables having much high-income elasticity than other crop like field crops there is therefore a natural trend to go for increased farming under the commercialization process. Vegetable production has experienced tremendous growth in last 40 years in Bangladesh. A result showed that out of 4,70,19071employed people, 2,43,92878 were engaged in agricultural sector followed by 1,44,39231 in service and 81,8,7493 in industrial sector (ARSS, 2017).

In Chapainawabganj, about 9,530 hectares land was cultivated to produce about 1,57,245 metric tons vegetables in winter season of the year 2018 (Mahmud, 2018). The vegetable farmers of this area face several obstacles that constraints the development of the farmers. Low productivity of agricultural commodities leads to low income generation. Different vegetable farming technologies such as farming of hybrid varieties of vegetables, using quality seeds for vegetable farming, intercultural operation practice like weeding, mulching, training, pruning and rouging, widely use of inorganic fertilizer in field such as TSP, MoP, DAP, Gypsum etc., along with irrigation and drainage facilities are supposed to increase productivity of vegetable chronologically. Hence, the present study was designed to describe the adoption of farming technologies and to assess the extent of socio-demographic characteristics of vegetable farmers, to determine the innovativeness of the farmers in vegetable farming and to explore the relationship between selected characteristics of the vegetable growers and their adoption of different vegetable farming technologies.

The study will aid extension workers regarding the production constraints of vegetables in Bangladesh and therefore they will be able to suggest the farmer suitable farming technologies to overcome them.

2. MATERIALS AND METHODS

2.1. Location of the Study

The locale of the study was Chapainawabganj district of Rajshahi division. Chapainawabganj is situated between the latitude $24^0$22' to $24^0$57' and longitude $87^0$23' to $88^0$23'. The Sadar upazila consists of 1 municipality, 15 wards, 82 mahallas, 14 unions, 178 populated mauzas and 342 villages. Tikrampur, Namotikrampur, Chormohonpur, Namochormohanpur and Chorisalambad villages of Chapainawabganj municipality, Moharajnogor and Mollan villages of Sundorpur union, Husendaing and Boropukuria villages of Jhilim union, Shakpara and Chamagram villages of Moharajpur union and Barorossia village of Islampur union was randomly selected for the study.

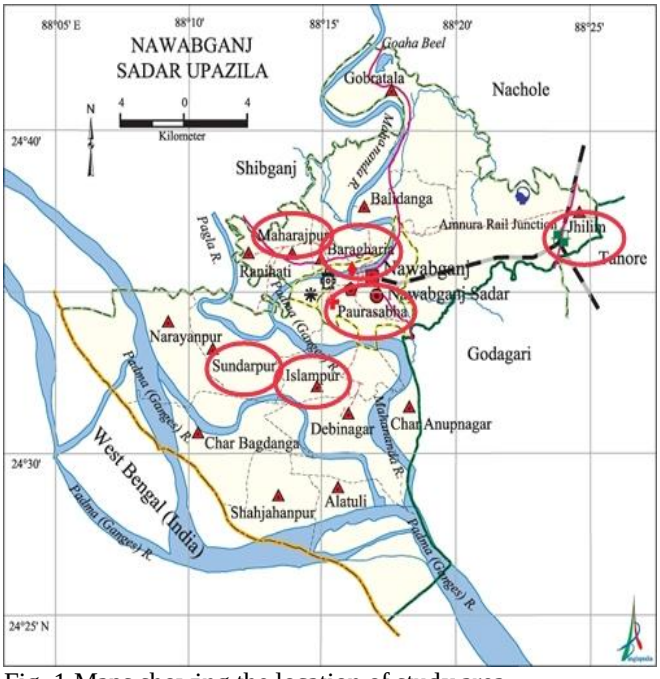

Fig. 1 Maps showing the location of study area.

2.2. Data Collection Procedure and Analysis

A list of all farmers was collected from the upazila Agricultural Extension Office, NGOs and with the help of Sub Assistant Agriculture Officers (SAAOs). The samples of 63 vegetable farmers from 12 villages were randomly selected from different unions. Data were collected through face to face interview using a pre-structured questionnaire. The analysis was performed using Statistical Package for Social Science (SPSS) computer package. Statistical tests like frequency counts, percentage, mean, standard deviation (SD) were used for analysis and interpretation of data. Regression analysis at 95% level of confidence was performed to explore the relationship between the concerned variables.

2.3. Independent Variables and their Measurement Technique

Nine independent variables were selected and scaled for the study according to their nature:

1) The age of an individual is one of the important factors pertaining to his personality make up which can play an important role in adoption behavior (Smith et al., 1970). Age of the respondents was scaled in terms of years on the basis of his/her response. A score of one was assigned for each year of age.

2) Educational qualification of a respondent was scored in terms of degree he/she obtained in formal education

system (i.e., primary school, high school). It was expressed in terms of year of schooling. A score of one (1) was assigned for each year of schooling completed. Similarly, a respondent who could not read and write fell under 'can't read and write' criteria with a score of 0.

3) Farm size of the farmer was scaled by the land area possessed by him. Farm size was computed by using the following formula: Farm size = A_1 + A_2 + A_3 + 1/2 (A_4 + A_5); where, A_1 = Homestead Area, A_2 = Own land under own farming, A_3 = Land taken from others on borga system, A_4 = Land given to others on borga system, A_5 = Land taken from others on lease. The unit of measurement was hectares.

4) Annual income of a respondent was determined based on his/her total earnings from different sources, like agriculture, service, business and others. It was expressed in Taka.

5) Credit availability of vegetable farmers referred to the amount of money received by him as loan from different sources. It was expressed in Taka.

6) Farming experience was operationalized by computing the total number of years of agriculture related experience of a respondent.

7) Training exposure was determined by the total number of days a respondent received training in his/her entire life on vegetable farming from different organizations. A measuring score of 1 was assigned for each days of training.

8) In this study, innovativeness of a respondent was measured based on the period of practicing improved farming technologies among them. Score was assigned on the basis of time of an individual being practicing technologies in the following manner : period of practice within 3 years: 4 point, within 2 years: 3 point, within 1 year: 2 point, within 6months: 1 point, Not at all: 0.

9) A scale was prepared to indicate the extent to which problems regarding vegetable cultivation were applicable in the case of a respondent scoring from 0 to 36. The responses were obtained through a 4-point scale "high", "medium", "low" and "not at all" and weights were assigned to these responses as 3, 2, 1 and 0 respectively.

2.4. Dependent Variable and Its Measurement Technique

Adoption of farming technologies by the vegetable farmers in vegetable farming was the dependent variables in this study. It was measured by using 4-point rating scale. The respondents were asked to indicate their use of vegetable farming technologies commonly used in Bangladesh. The method of assigning scores to the respondents was as follows: for frequent adoption: 3, for occasional adoption: 2, for rare adoption: 1 and No adoption: 0. The extent of scores of a respondent could range from 0 to 36, 0 indicating low use of technologies and 36 indicating highest adoption of farming technologies.

2.5. Multiple Linear Regression Procedure

Due to the nature of the dependent and independent variables, the linear regression model was performed. The latent equation used in this study was:

$$y=\beta_o+\beta_1x_1+\beta_2x_2+\ldots+\beta_9x_9+\varepsilon \quad (1)$$

Where, y was the dependent variable, β_o was the intercept, $\beta_{1\text{-}9}$ were the coefficients, and $x_{1\text{-}9}$ were the independent variables as follows:

y = Adoption of different farming technologies by the respondents;
x_1 = Age of the respondents in years;
x_2 = Educational qualification of the respondents in years;
x_3 = Farm size of the respondents in ha;
x_4 = Annual income of the respondents in Taka;
x_5 = Credit availability of the respondents in Taka;
x_6 = Farming experience of the respondents in years;
x_7 = Training exposure on agriculture to the respondents;
x_8 = Innovativeness of the respondents;
x_9 = Problem faced by the respondents;

After gathering data from respondents in the study area, categorization and classification of the data according to the study's objectives were done. In addition, multiple regression analysis with significance levels of 0.5 was performed to estimate the impact of the attributes.

3. RESULTS AND DISCUSSION

3.1. Socio-demographic Characteristics of the Vegetable Farmers

Data presented in Table 1 shows that, most of the farmers belong to the age range of 38 years to 65 years, which means most of the farmers are from middle aged to the old aged and the number of young farmers is quite low. Nair (1963) found age as one of the factors that influence the farmer's participation process in improved technologies and farm practices in his study. Young people are generally receptive to new ideas and things. However, as the number of young farmers is quite low so the old ones might have added valuable option about use of vegetable farming technologies.

The majority, 30.2% of the farmers had secondary level of education while 31.7% farmers had primary level of education, 14.3% had higher level of education and 23.8% were illiterate. The findings revealed that the literacy rate in the study area seems to be higher than the national average which is 72.9% (BBS 2019). According to the farm size among the respondents, 78% of the farmers were small farmers which was the highest, 16% were medium farmers and large and marginal farms were 4.8% and 1.6% respectively.

The highest proportion, 77.8% of the respondents had low annual income, while 17.5% had medium income and 4.8% had high income. As a result, the most of the respondents (82.6%) in the study area were low to medium income earners.

The highest proportion, 87.3% of the farmers had low credit availability while 7.9% had medium credit availability and the rest of the farmers, 4.8% had high credit availability. The highest proportion 38.1% of the farmers had medium experience followed by 39.7% were low experienced and 22.2% had high experience in farming activities. Most of the farmers had no training exposure which comprises of about 79.4% and 19.0% farmers had low

Table 1 Distribution of the respondents according to their selected characteristics

Variable	Category	Frequency	%	Mean	SD
Age	Young	6	9.5	48.3	11.4
	Middle	34	54.0		
	Old	23	36.5		
Education	Cannot read and write	15	23.8	2.3	1.0
	Primary level (1-5)	20	31.7		
	Secondary label (5-10)	19	30.2		
	Above Secondary Level (above 10)	9	14.3		
Farm size	Marginal Farm (Up to 0.053) ha	1	1.6	2.2	0.55
	Small Farm (>0.053-1) ha	49	77.8		
	Medium Farm (>1-3) ha	10	15.9		
	Large Farm (>15) ha	3	4.8		
Annual income	Low Income (20-200)	49	77.8	15	90.7
	Medium Income (201-350)	11	17.5		
	High Income (351-400)	3	4.8		
Credit availability	Low (0-50)	55	87.3	28.2	78.9
	Medium (51-150)	5	7.9		
	High (151-500)	3	4.8		
Farming experience	Low farming experience (0-10)	25	39.7	16.9	11.6
	Medium farming experience (11-25)	24	38.1		
	High farming experience (26-40)	63	22.2		
Training exposure	No Training Exposure (0)	50	79.4	0.8	3.4
	Medium Training Exposure (1-15)	12	19.0		
	High Training Exposure (16-25)	1	1.6		
Innovativeness	Low Innovativeness (20-35)	15	23.8	42.2	9.8
	Medium Innovativeness (36-55)	42	66.7		
	High Innovativeness (56-70)	6	9.5		
Problem faced	Low problem faced (10-15)	18	28.6	18.0	4.1
	Medium problem faced (16-25)	43	68.3		
	High problem faced (26-30)	2	3.2		
Adoption of different farming technologies	Rarely use (0-21)	1	1.6	47.5	11.2
	Occasionally use (22-60)	57	90.5		
	Frequently use (61-100)	5	7.9		

training exposure and the rest 1.6% had higher training exposure. The majority, 68.3% of the respondents had medium level of problem faced, as compared to 3.2% had high and 28.6% had low level of problem faced.

3.2. Innovativeness of the Farmers in the Study Area

Based on the innovativeness scores, the farmers were classified into three categories as shown in Table 1.Significant number of farmers were categorized under medium innovativeness which was 66.7% on the other hand 9.5% and 24% of the farmers were categorized under high and low innovativeness respectively. Moullick et al. (1996) observed in their study that, the more a cultivator exhibited a general tendency towards accepting innovations, the higher would be his adoption score. The data also revealed that majority 90.5% of the respondents were under medium to low innovativeness. That means most of the farmers had innovativeness which is very much positive because the innovativeness refers to proneness of an individual to accept new ideas and practices.

3.3. Adoption Status of Vegetable Farming Technologies in the Study Area

Adoptions of different farming technologies indicate that wither the farmers are using many different farming technologies based on their innovativeness. Observed practices of use scores of the farmers ranged from 0 to 100 against the possible range of 0 to 48. The average and standard deviation were 47.5 and 11.2 respectively. Based on the possible scores, the farmers were classified into three categories as shown as Table 1. Data contained in the Table 1 also indicate that among the farmers 90.5% had occasionally and 7.9% had rarely adopted vegetable farming technologies. Rest 1.6% rarely adopted vegetable farming technologies which include using of inorganic fertilizers with organic fertilizers, using of tractor, different types of sprayers and smart phone occasionally.

3.4. Attributes Influencing Respondents' Adoption of Vegetable Farming Technologies

To determine the attributes influencing the respondents' adoption of vegetable farming technologies, nine independent variables i.e. education, farm size, annual income, credit availability, farming experience, training exposure, innovativeness and problem faced were subjected to full-model regression analysis against the dependent variables i.e. adoption of vegetable farming technologies by the respondents. The analysis revealed that, education of the respondents positively contributed to adoption of vegetable farming technologies significantly at 95% level of confidence (Table 2).

Education develops mental and psychological ability to understand, decide and adopt new practices and ideas. Hence, it is expected to have positive influence on the extent of farming technology adoption by the farmers. In case of farm size ,larger farm size among respondents encouraged adoption of vegetable farming technologies significantly at 95% level of confidence (Table 2) which is accentuated by Rahman & Hossain (1995), which states that the larger the farm size of the farmers the higher was their adoption.

From Table 2, innovativeness has significant positive relationship with technology adoption at 95% level of confidence. Moullick et al. (1996) observed similar pattern that innovation proneness significantly influenced the adoption of nitrogenous fertilizers among the North-Indian farmers. They stated that the more a cultivator exhibited a general tendency towards accepting innovations, the higher would be his adoption score.

Table 2 Multiple regression of the contributing variables related to vegetable farming technologies by the farmers

Dependent variable	Independent variable	β	t	*p*
Adoption of vegetable farming technologies	Education	0.27	2.79	0.007*
	Farm size	0.62	5.96	0.000*
	Annual income	0.01	0.09	0.927
	Credit availability	0.03	0.27	0.785
	Farming experience	0.03	0.33	0.743
	Training exposure	-0.12	-0.97	0.335
	Innovativeness	0.19	1.72	0.048*
	Problem faced	-0.11	-1.11	0.273

*Significant at $p<0.05$

Table 2 also shows that higher annual income and availability of credit aids in adoption of vegetable farming technologies (insignificant at 95% level of confidence).Therefore, it can be inferred that the more the annual income and credit availability possessed by the respondents, the higher would be favorable extent of technology usage. Among the respondents, experienced farmers tend to adopt vegetable farming technologies compared to novice farmers (Table 2).

Ntshangase et. al. (2018) observed similar pattern that, farming experience significantly influences farmers decision in production technology (No-Till Conservation Agriculture) adoption positively. Rahman & Hossain (1995) also reported that farming experience significantly influences farmers decision in production technology adoption. Problem faced during vegetable cultivation had insignificant ($p<0.05$) negative contribution to adoption of vegetable farming technologies by the respondents (Table 2). Training exposure is supposed to increase the possibility of technology adoption as training helps the farmers to get new ideas about technologies, yet respondents showed negative relationship (Table 2).

This is possibly due to the dominance of other independent variables over training exposure on adoption of farming technologies by vegetable farmers. 98.4% of the farmers had medium to no training exposure but 98.4% of the respondents occasionally and frequently used different farming technologies (Table 1). This may result in the negative relationship between adoption of farming technologies and training exposure. From Table 1, the literacy rate among the respondents was 72.2% and innovativeness ranged from medium to high for 76.2% of the respondents. These two independent variables may have dominated over training exposure for the respondents to decide upon adoption of farming technologies.

4. CONCLUSION

To increase the yield of vegetables, the farmers need to adopt suitable farming technologies to the highest extent. This study revealed that vegetable farmers had a satisfactory level of farming technology adoption. In case of problems faced by the farmers, there is not much impact found on the adoption of vegetable farming technologies; among those problems lack of capital was considered as the major problem to the farmers. Lastly, the findings indicated that most of the respondents had medium innovativeness which significantly ($p<0.05$) influenced the technology adoption positively that is revealed by the regression analysis. This means that the higher the innovativeness of the farmers with different technologies, higher the extent of use and adoption of vegetable farming technologies. The analysis also revealed that, higher education and larger farm size encourages respondents to adopt farming technologies (significant at 95% level of confidence). Though the level of adoption of vegetable farming technologies by the farmers in vegetable farming was encouraging, there is a need of continuous efforts for wide use of farming technologies. It is recommended that the extension worker should work with the farmers of all age groups to promote the farming of vegetable. However, they will have to focus more on middle aged farmers as majority of the farmers in the study area is of that range. It may be recommended that special attention should be given by the extension provides to the farmers, so that they become aware about the benefit of adoption farming technologies for vegetables production. It can be suggested to the agricultural extension agencies especially the DAE and relevant NGOs that they should critically review their training programs and make sound provisions so that the farmers understand the use of farming technologies for vegetable production. The findings may contribute to develop better policy towards accelerating the adoption of different farming technologies by the vegetable farmers.

ACKNOWLEDGEMENTS

Authors would like to acknowledge the contribution of 7th batches student of Faculty of Agriculture, EXIM Bank Agricultural University Bangladesh (EBAUB) regarding the present research. Authors are grateful to the SAAOs of Chapainawabganj sadar upazila and the farmers from whom data were collected.

REFERENCES

ARSS, (2017). *Report on Agriculture and Rural Statistics*. Statistic Division, Ministry of Planning. Government of People's Republic of Bangladesh. Dhaka.

BBS, (2019). *Statistical Yearbook of Bangladesh*. Statistic Division, Ministry of Planning. Government of People's Republic of Bangladesh. Dhaka.

Mahmud, N. (2018). "Winter is here, C'nawabganj farmers now busy cultivating vegetables", available at: https://unb.com.bd/category/Special/winter-is-here-cnawabganj-farmers-now-busy-cultivating-vegetables/4995 (accessed 25 October 2018).

Mitra, S., & Yunus, M. (2018). Determinants of tomato farmers efficiency in Mymensingh district of Bangladesh: Data Envelopment Analysis approach, *Journal of Bangladesh Agricultural University*, *16*(1), 93-97.

Moullick, T. A., Hraboszky, J. P., & Rao, C. S. S. (1996). Predictive values of some factors of adoption of nitrogenous fertilizers by north Indian farmers. *Rural Sociology*, *31*(4), 467-477.

Nair, S. P. (1963). Social Factors in the Acceptance of Improves Practices. AICC Economic Review, New Delhi, India.

Ntshangase, N. L., Muroyiwa, B., & Sibanda, M. (2018). Farmers' perceptions and factors influencing the adoption of no-till conservation agriculture by small-scale farmers in Zashuke, KwaZulu-Natal Province. *Sustainability*, *10*(2), 555.

Rahman, M., & Hossain, M. D. (1995). Analysis of socio-economic characteristics of the farmers in relation to adoption of improved farm practices in Boro rice cultivation. *Ann. Bangladesh Agric.*, *5*(1), 15-21.

Sharmin, S., Rashid, M. H. A., Begum, R., & Hoque, S. S. (2018). Relative profitability of farming systems research and development (FSRD) project farmers and non-project farmers of integrated farming systems in Tangail district of Bangladesh. *Journal of the Bangladesh Agricultural University*, *16*(1), 117-122.

Smith, J., Lynn, T., & Zopf, P. E. (1970). Principles of inductive rural sociology. F.A. Davis Company, USA.

Weinberger, K., & Genova II, C. A. (2005). *Vegetable production in Bangladesh: commercialization and rural livelihoods.* AVRDC Publication, Shanhua, Taiwan.