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CONSTRAINTS IN CULTIVATING BARI ALU25 (ASTERIX) IN MUNSHIGANJ AND RANGPUR DISTRICTS OF BANGLADESH

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ABSTRACT

BARI alu25 (Asterix) is a popular potato variety released by Bangladesh Agricultural Research Institute in 2005. The present research was carried out to identify the problems confronted by BARI alu25 growers. The study was carried out in Sirajdikhan and Tongibari upazilas under Munshiganj district, and Pirgacha and Mithapukur upazilas under Rangpur district. Data were collected from 80 growers including 40 from each district following disproportionate random sampling technique. Descriptive statistics, multiple regression and stepwise multiple regression analysis were used for expression of results. Findings reveal that majority of the respondents (68.8%) faced moderate problems in BARI alu25 cultivation followed by low (18.8%) and high problems (12.5%), respectively. Lack of proper management in cold storage and no arrangement for compensation were the top ranked problems followed by minimal price of potato during production boom, high cold storage charge and unavailability and high price of input, respectively. Respondents' level of education, training experience, extension contact and cosmopoliteness had significant contribution to their problems faced in BARI alu25 cultivation. Growers' training experience was the most significant contributing factor to their problems confrontation. The concerned authority may arrange more functional training, impart more agricultural advices and assistance, and arrange adult education facilities for the farmers to solve their problems.

Keywords: BARI alu25, Asterix, problems, cold storage, market price

Introduction

Potato (*Solanum tuberosum* L.) is a tuber crop. Potato is the most important non-cereal food crop worldwide and ranked the world's fourth most vital food crop after rice, wheat, and maize (Hong *et al*. 2017). The Irish Potato Famine which took place in 1845-1849 was caused by the failure of potato crop in successive years due to infestation of late blight of potato (*Phytophthora infestans*) (Britannica, 2021).

Potato is one of the popular and important vegetables, and cash crop in Bangladesh, (Haque *et al*. 2012). The production of potato in Bangladesh was 9655082 metric tons from 468395 hectares area in 2019 (FAOSTAT 2019). Till present Bangladesh Agricultural Research Institute (BARI) released 91 potato varieties all of which have distinct characteristics. Asterix potato variety was released by Bangladesh Agricultural Research Institute (BARI) as BARI alu25 in 2005. BARI alu25 variety is suitable for processing as well as popular for table potato (Azad *et al*. 2020), which are being widely used by the farmers. Limited researches have been conducted regarding farmers' problem confrontation in BARI alu25 cultivation. Therefore, the present study was conducted to identify the problems faced by BARI alu25 farmers and explore the possible suggestions to solve the problems as perceived by the potato growers.

Methodology

The study was purposively conducted in Sirajdikhan and Tongibari upazilas under Munshiganj district and Pirgacha and Mithapukur upazilas under Rangpur district taking two unions from each upazila of Rangpur district and Sirajdikhan upazila under Munshiganj district and four unions from Tongibari upazila under Munshiganj district based on the abundance of cultivation of BARI alu25 (DAE 2020a, DAE 2020b).

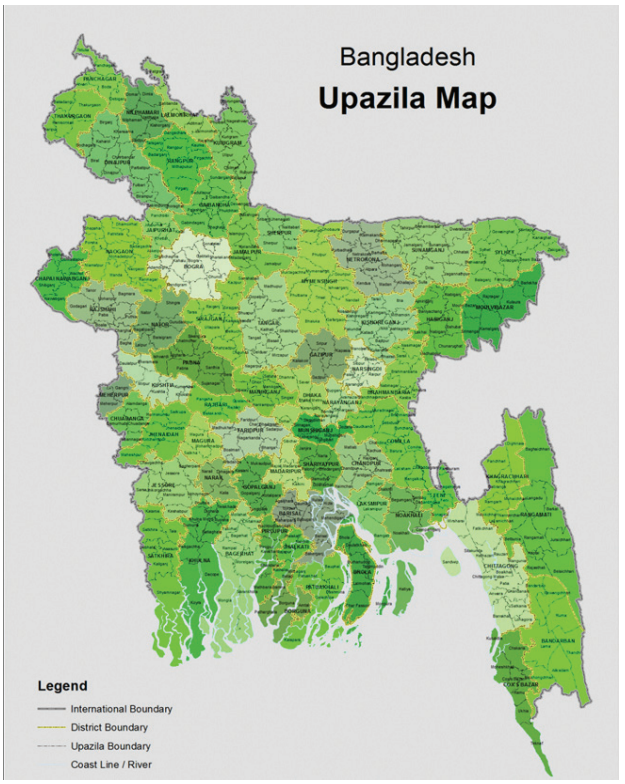


Figure 1: Map of Bangladesh showing the study areas

The population of the study was the BARI alu25 growers of the study areas who cultivated BARI alu25 for at least three years. The sampling population under study was 800 (330 and 100 in Sirajdikhan and Tongibari upazila, respectively under Munshiganj district and 220 and 150 in Pirgacha and Mithapukur upazila, respectively under Rangpur district). Among them 80 farmers (10.0% of population) were selected as respondent using disproportionate random sampling technique. Quantitative data were collected by the researchers through face-to-face interview using a semi-structured interview schedule during December 2020 to November 2021. The fifteen selected characteristics of the respondents were the independent variables of the study which were measured as follows: age and farming experience were measured in terms of years level of education, family size, farm size, annual income and training experience were measured in terms of years of schooling, number of family members, hectares, thousand BDT and number of days, respectively. Access to credit, off farm activities and availability of irrigation water were measured in ordinal scale such as if the respondents had access to credit, it was coded as one (1) and if he/she had no access to credit, it was coded as zero (0). Extension contacts, organizational membership, cosmopoliteness, innovativeness and knowledge on potato cultivation technique were measured in terms of scores. Problems confrontation in BARI alu25 cultivation was the focus variable of the study which was measured by using a scale consisting of 20 selected problem statements. The 20 selected problem statements were identified after consultation with BARI alu25 growers and related experts, review of literature and pre-testing of questionnaire. The problem confrontation score was measured using a five-point rating scale such as 'not at all', 'low', 'medium', 'high' and 'very high', and the corresponding assigned scores were '0', '1', '2', '3' and '4', respectively. Problem score for each respondent could range from '0' to '80', where, '0' indicated no problem and '80' indicated the highest problem confrontation. In order to investigate the intensity of each problem, Problem Confrontation Index (PCI) was measured using the following formula:

$$PCI = 4\times f_{vh} + 3\times f_{h} + 2\times f_{m} + 1\times f_{l} + 0\times f_{n}$$

Where,

f_{vh} = Very high problem confrontation
f_{h} = High problem confrontation
f_{m} = Moderate problem confrontation
f_{l} = Low problem confrontation
f_{n} = No problem confrontation

PCI of each problem could range from 0 to 320, where, 0 indicated no problem at all and 320 indicated very high problem confrontation in BARI alu25 cultivation. Percent distribution, range, rank order, mean, standard deviation etc. were used. Multiple regression analysis was carried out to examine the contribution of the respondents' selected characteristics to their problem confrontation in BARI alu25 cultivation.

Results and Discussion

Socio-demographic characteristics of the respondents: Results shown in Table 1 indicate that about half (46.3%) of the respondents were old. Big majority (82.5%) of them were literate and majority (42.5%) of them belonged to secondary education level with small family (45.0%). More than half (51.3%) of the respondents had medium farm. The average annual income of the respondents was BDT 649.4 thousand which was much higher than that of national average (BDT of 137.8 thousand) (BBS 2021) and

Table 1. Characteristic profile of the respondent potato growers

Characteristics (Measurement unit)	Possible and observed range	Respondents (n=80)		Mean (SD)
		Categories	%	
Age (Year)	Unknown (24-78)	Young (up to 35)	26.2	47.5 (12.9)
		Middle aged (36-50)	27.5	
		Old (above 50)	46.3	
Level of education (Years of schooling)	Unknown (0.5-18)	Can sign only (0.5)	17.5	7.8 (5.2)
		Primary (1-5)	20.0	
		Secondary (6-10)	42.5	
		Higher secondary (>10)	20.0	
Family size (Number)	Unknown (2-16)	Small family (up to 4)	45.0	5.3 (2.2)
		Medium family (5-6)	32.5	
		Large family (above 6)	22.5	
Farm size (Hectare)	Unknown (0.2-13.5)	Marginal (up to 0.2)	1.3	2.4 (2.3)
		Small (0.21-1.00)	23.7	
		Medium (1.01-3.00)	51.3	
		Large (above 3.00)	23.7	
Annual income ('000'BDT)	Unknown (10.0-3900.0)	Low (up to 291)	38.7	649.4 (716.5)
		Medium (292-1008)	42.5	
		High (above 1008)	18.8	
Training experience (Number of days)	Unknown (0-330)	No training	26.2	39.8 (85.5)
		Low (1-3)	18.8	
		Medium (4-6)	10.0	
		High (above 6)	45.0	
Extension contact (Score)	0 to 80 (11-56)	Low (up to 21)	20.0	31.7 (10.8)
		Medium (22-42)	63.8	
		High (above 42)	16.2	
Farming experience (Years)	Unknown (4-65)	Low (up to 13)	17.5	26.6 (13.6)
		Medium (14-40)	66.3	
		High (above 40)	16.2	
Access to credit	-	No	13.8	0.9 (0.3)
		Yes	86.3	
Off farm activities	-	No	55.0	0.5 (0.5)
		Yes	45.0	
Availability of irrigation water	-	No	0.0	1.0 (0.0)
		Yes	100.0	
Organizational membership (Score)	Unknown (0-216)	Low (up to 11)	36.2	37.7 (53.1)
		Medium (12-64)	48.8	
		High (above 64)	15.0	
Cosmopoliteness (Score)	0 to 15 (3-15)	Low (up to 8)	18.7	10.9 (2.9)
		Medium (9-14)	71.3	
		High (above 14)	10.0	
Innovativeness (Score)	0 to 21 (0-15)	Low (up to 3)	43.7	5.4 (4.0)
		Medium (4-7)	27.5	
		High (above 7)	28.8	
Knowledge on potato cultivation technique (Score)	0 to 30 (14-28)	Low (up to 19)	18.7	22.4 (3.2)
		Medium (20-26)	75.0	
		High (above 26)	6.3	

most of them (81.2%) belonged to medium to low annual income category. About half (45.0%) of the respondents had high training experience. The large majority of the respondents (73.8%) received agricultural training. The highest portion of the respondents (63.8%) had medium extension contact. Most of them (66.3%) had medium farming experience. Most of the respondents (86.3%) had access to credit. More than half (55.0%) of the respondents had no off-farm activities. All the respondents (100.0%) had the availability of irrigation water. Almost half of them (48.8%) had medium organizational membership. About three-fourth (71.3%) of them had medium cosmopoliteness. About half of them (43.7%) had low innovativeness. Majority of them (75.0%) had medium knowledge on potato cultivation techniques.

Extent of problem faced in cultivation of BARI alu25: Findings furnished in the Table 2 show that about three-fourth (68.8%) of the respondents faced medium problems while about one-fifth (18.8%) of them faced low problems and only 12.5 percent respondents faced high problems in BARI alu25 cultivation. It might be due to that BARI alu25 cultivation is not much complex and it has some special attributes too and therefore, the farmers did not face much problem regarding its cultivation. Similar findings have also been reflected in the study of Hossain *et al*. (2011) and Afrad *et al*. (2020a).

Problem confrontation index in cultivation of BARI alu25: Lack of proper management in cold storage and no compensation' was the highest ranked problem followed by 'market price reduces when supply is high', 'high cold storage charge' and 'unavailability and high price of input'. 'Lack of proper management in cold storage and no compensation was the highest ranked problem because most of the respondents reported that there are lack of proper management measures in cold storage and there is no compensation. 'Market price reduces when supply is high' and 'high cold storage charge', were the second ranked problem because majority of the respondents reported that they do not get the reasonable market price. 'Unavailability and high price of input' was the third ranked problem because seed and fertilizer prices are so high that it was unbearable for most of the farmers (Table 3). Islam *et al*. (2008), Chowdhury and Chowdhury (2015), Hajong *et al*. (2014) and Mukul *et al*. (2013) found similar findings.

Suggestions towards solution of BARI alu25 cultivation problem: The highest portion (80.0%) of the respondents suggested that 'timely availability of quality seed at fair price' followed by 'government intervention to ensure reasonable market price' (67.5%), 'judicial import and export of potato considering farmers' interest' (63.8%), and 'reduction of cold storage charge' (58.8%) (Table 4). These findings are in line with the studies of Chowdhury and Chowdhury (2015), Mukul *et al*. (2013) and Hajong *et al*. (2014).

Contribution of selected characteristics of the respondents to their problems confrontation in cultivation of BARI alu25: Results presented in Table 5 indicate that there are significant contribution of respondents level of education, training experience, extension contact and cosmopoliteness to their problem confrontation in BARI alu25 cultivation at 5% level of significance. The predictor variables level of education, training experience, extension contact and cosmopoliteness are related to increasing respondents' agricultural knowledge and thereby increasing awareness regarding their problems in BARI alu25 cultivation. Respondents level of education and cosmopoliteness had positive significant contribution to their problem confrontation. It might be due to that the respondents

Table 2. Distribution of the respondents according to their problems faced in cultivation of BARI alu25

Categories	Respondents		Mean	SD
	Number	Percent		
Low problem (up to 31)	15	18.8	46.7	16.0
Medium problem (32-63)	55	68.8		
High problem (>63)	10	12.5		
Total	80	100.0		

Table 3. Rank order of selected problems confronted by the respondents in cultivation of BARI alu25

Problems	Extent of Problem Confronted					PCI*	Rank Order
	*NAA (0)	L (1)	M (2)	H (3)	VH (4)		
Lack of proper management in cold storage and no compensation	9	3	5	7	56	258	1
Market price reduces when supply is high	9	3	11	11	46	242	2
High cold storage charge	10	3	11	7	49	242	2
Unavailability and high price of input	14	3	3	12	48	237	3
No purchase by government	13	0	11	10	46	236	4
Labour price increases in peak period	9	2	19	7	43	233	5
Bacterial wilt and Late Blight disease infestation	15	6	7	7	45	221	6
Susceptible to unfavorable weather	11	6	18	6	39	216	7
High production cost	18	4	10	10	38	206	8
Farmers do not get reasonable market price	20	1	9	14	36	205	9
Potato is imported during potato harvest	24	3	4	8	41	199	10
Unavailability of good quality seed	23	3	7	9	38	196	11
Presence of few traders in the market	22	2	14	17	25	181	12
Disease and insect infestation	13	11	23	9	24	180	13
Natural disaster	21	9	17	3	30	172	14
Damage in water logging condition/rain	21	9	16	7	27	170	15
Need for immediate sale	39	3	11	10	17	123	16
Lack of storage facility	50	6	7	7	10	81	17
Agricultural machinery crisis	48	6	12	6	8	80	18
Lack of technical knowledge	52	5	18	2	3	59	19

*NAA= Not at all, L= Low, M= Moderate, H= High, VH= Very high, PCI = Problem Confrontation Index

Table 4. Rank order of suggestions provided by the respondents

Suggestions	Respondents (%)	Rank
Timely availability of quality seed at fair price	80.0	1
Government intervention to ensure reasonable market price	67.5	2
Judicial import and export of potato considering farmers' interest	63.8	3
Reduction of cold storage charge	58.8	4
Incentive/subsidy in input price	52.5	5
Ensuring proper management in cold storage and compensation	51.3	6
Timely availability of adequate quality input	48.8	7
Government can purchase potato and arrange marketing and export	48.8	7
Fair input price	47.5	8
Diseases and insects management	33.8	9
Arrangement of training	25.0	10
Agricultural mechanization	25.0	10
Incentive for potato cultivation	20.0	11
Potato can be used for industrial purpose and export	18.8	12
Well drainage system	15.0	13

Table 4. Continued.

Suggestions	Respondents (%)	Rank
Agricultural credit facilities at reduced rate of interest and government financial grants are required	13.8	14
Potato can be included in rationing system	11.3	15
Timely agricultural advices	8.8	16
Labour price can be reduced	7.5	17
Disaster management	3.8	18
Improvement of road and transportation facilities	3.8	18
Increasing cold storages	1.3	19
Crop zoning	1.3	19

Table 5. Multiple regression coefficients of contributing factors

Dependent variable	Independent variables	Unstandardized β coefficients	P value
Problems faced in cultivation of BARI alu25	Age	0.040	0.854
	Level of education	0.948	0.024*
	Family size	0.131	0.875
	Farm size	0.616	0.491
	Annual income	-0.004	0.152
	Training experience	-0.048	0.045*
	Extension contact	-0.421	0.047*
	Farming experience	0.093	0.646
	Organizational membership	-0.065	0.116
	Cosmopoliteness	1.456	0.041*
	Innovativeness	0.092	0.874
	Knowledge on potato cultivation technique	0.123	0.841
	Constant	34.111	
	R^2	0.279	
	Adjusted R^2	0.150	
	F value	2.161	
	P value	0.024*	

* Significant at 0.05 level

who had more education and cosmopoliteness had more agricultural knowledge which influenced them to be aware of their problems and hence they confronted higher problems. Different findings was observed by Pandit and Basak (2013). Respondents, training experience and extension contact had negative significant contribution to their problem confrontation. Perhaps the growers who received more training acquired the knowledge of solving their problems. The finding is in line with the studies of Rana and Rahaman (2021) and Afrad *et al*. (2020b). Perhaps the farmers who had more extension contact could communicate frequently with the extension workers, therefore faced lower level of problems. Barau *et al*. (2020) and Pandit and Basak (2013) observed similar findings. It was observed that 27.9 percent ($R^2 = 0.3$) of the variation in the respondents' problem confrontation was attributed to their age, level of education, family size, farm size, annual income, training experience, extension contact, farming experience, organizational membership, cosmopoliteness, innovativeness and knowledge on potato cultivation technique. The F value 2.161 indicates that the model is significant (*p=0.024*). Adjusted R-square value penalizes the addition of extraneous predictors in the model, and the value of 0.150 still indicates that the

Table 6. Stepwise multiple regression analysis

Independent variables	β	Value of t (p value)	R^2	Adj. R^2	Variation explained in percent	F value
Training experience	-0.061	-3.029 (0.003**)	0.105	0.094	9.4	9.178**
Training experience	-0.071	-3.502 (0.001**)	0.152	0.130	13.0	6.891**
Level of education	0.683	2.055 (0.043*)				

* Significant at 0.05 level ** Significant at 0.01 level

variance in the respondents' problem confrontation can be attributed to the predictor variables rather than by chance, and the model is suitable model.

Stepwise multiple regression analysis to identify best contributing factors related to problems confrontation by the respondents in cultivation of BARI alu25: Training experience was the best predictor of the respondents problem confrontation in BARI alu25 cultivation (Adjusted $R^2 = 0.094$) and was entered first (Table 6). The next best predictor was level of education (Adjusted $R^2 = 0.130$). It was found from the final model that these two variables effectively contributed to the respondents problem confrontation. It is also revealed that 13.0 percent of the variation in the respondents problem confrontation was attributed to their training experience and level of education jointly. The F-value 6.891 indicates that the model is highly significant (*p=0.002*). Therefore, it can be concluded that these two independent variables jointly predicted the respondents' problem confrontation in BARI alu25 cultivation. Respondents training experience alone contributed 9.4 percent of the variation in the problem confrontation. The t-statistics were significant at both the 1 and 5 percent levels, respectively. The t-statistics indicate that the training experience was the most important contributing factor (significant at the 1% level) for predicting the respondents' problem confrontation, while the coefficient of level of education was significant at the 5 percent level. The respondents training experience had negative significant contribution to their problem confrontation. The finding is in line with the studies of Rana and Rahaman (2021) and Afrad *et al*. (2020b). Respondents level of education had positive significant contribution to their problem confrontation. Different finding was observed by Pandit and Basak (2013) where farmers level of education had significant negative relationship with their constraints in commercial vegetables cultivation.

Conclusion

The highest percentage (68.8%) of farmers confronted medium problems in BARI alu25 cultivation. Lack of proper management in cold storage and no compensation were the top ranked problems followed by minimal price of potato during production boom, high cold storage charge and unavailability and high price of input, respectively. Farmers level of education, training experience, extension contact and cosmopoliteness had significant contribution to their problem confrontation. Respondents training experience was the most significant contributing factor to their problem confrontation. The concerned authority may arrange more functional training, provide more agricultural advices and assistance and arrange adult education facilities for the farmers so that their problems can be minimized as suggested by the respondents.

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