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Impact of COVID-19 pandemic on cultivation of potato in Bangladesh

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Abstract

COVID-19 pandemic was a serious catastrophe which affected the people worldwide. The study was carried out to assess the impact of COVID-19 pandemic on cultivation of potato variety BARI Alu-25 in Bangladesh. The study sites were Sirajdikhan and Tongibari upazilas under Munshiganj district and Pirgacha and Mithapukur upazilas under Rangpur district. Data were collected from 80 BARI Alu-25 growers. Descriptive statistics were used for data analyses. About one-fifths (13.8%) of the respondents were very highly affected in marketing BARI Alu-25 and 10.0 percent of them were very highly affected in getting market price due to COVID-19 pandemic. The highest portion of the respondents suggested to give incentives, subsidies, inputs, marketing support, labourer financial grants, credit at a reduced rate of interest and transport facilities for carrying potato farming during lock down with government initiative.

Keywords: *Solanum tuberosum*, COVID-19, labourer, market price

Introduction

COVID-19 pandemic was an adversity originated from Wuhan, China which gradually devoured the whole world. It was a pandemic having adverse effects on both human lives causing deaths and serious health hazards as well as on economic and agricultural activities. About seven million people died due to COVID-19 pandemic throughout the world which is a serious loss (Worldometer 2025). The COVID-19 was the fifth documented pandemic since the 1918 flu pandemic. The first report of COVID-19 was observed in Wuhan, China at the end of 2019 and from there it was spread all over the world. Extensive precautions like extensive hygiene protocol (e.g., regular hand washing, avoidance of face-to-face interaction etc.), social distancing, wearing of masks etc. and banning gatherings of people, locking the population, enforcement of strict quarantine were adopted by many countries to control the spread of COVID-19. The daily life of people, businesses, the world trade and movements were seriously affected by COVID-19 (Haleem *et al.* 2020).

The access to inputs such as seeds, fertilizers and agrochemicals by the farmers were greatly affected by the lock downs and border closure (Roubík *et al*. 2022). The first COVID-19 patient was reported on March 11, 2020 in Bangladesh. The COVID-19 pandemic put the agriculture sector at risk and 66% farmers obtained lower price than normal situation in Bangladesh. The price of vegetables, fruits and nearly all agricultural products were lowered due to reduced market demand. Thirty four percent of respondents reported damages of their products (Gautam *et al*. 2022).

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. The productivity of potato was decreased during COVID-19 pandemic. The accessibility of farmers to the market was difficult. Sometimes they were not able to go to the market due to the large-scale social restrictions. The frequency of the presence of collectors was also decreased (Pujiharto and Wahyuni 2023). An unprecedented rise in price of potato was reported during the months of lock down in India. It might be due to the decrease in arrivals because of transportation and labour unavailability. The prices decreased at the end of lock down due to the relaxations in lock down and reduced demand (Rajpoot *et al*. 2022).

Many researches were conducted on the impact of COVID-19 pandemic on agriculture worldwide. Several researches on this issue were also carried out in Bangladesh, though limited carried out on the impact of COVID-19 pandemic on potato production especially in the context of Bangladesh. Therefore, this research was conducted on impact of COVID-19 pandemic on cultivation of a Bangladesh Agricultural Research Institute released

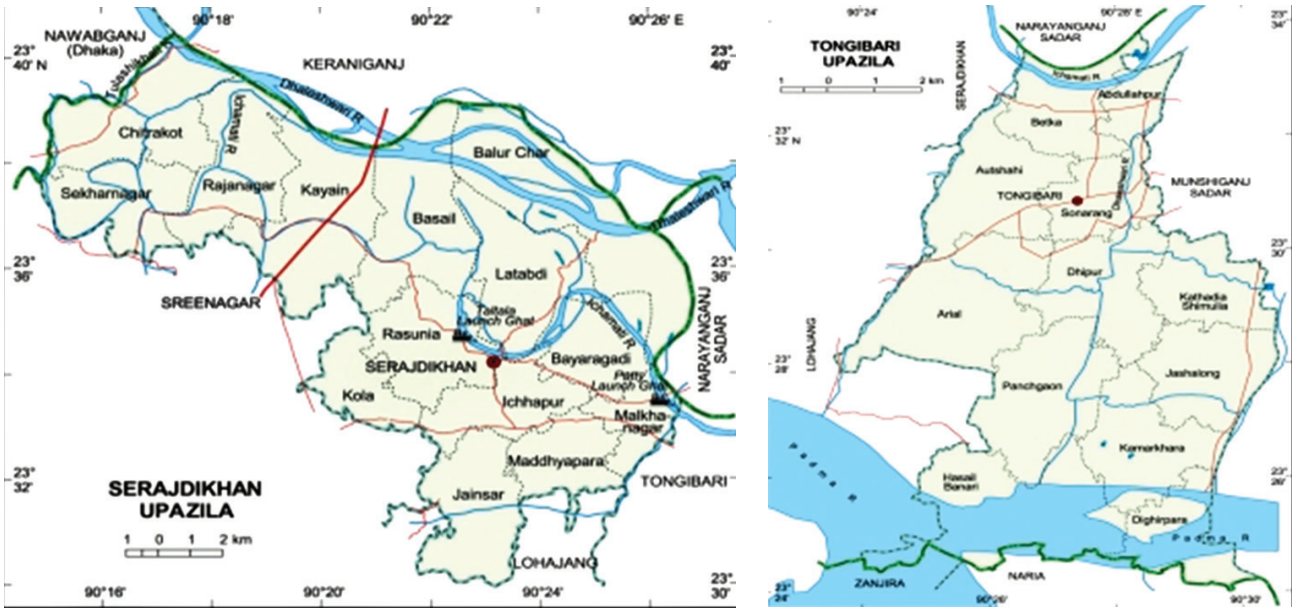


Figure 1. Map showing Sirajdikhan and Tongibari upazilas under Munshiganj district

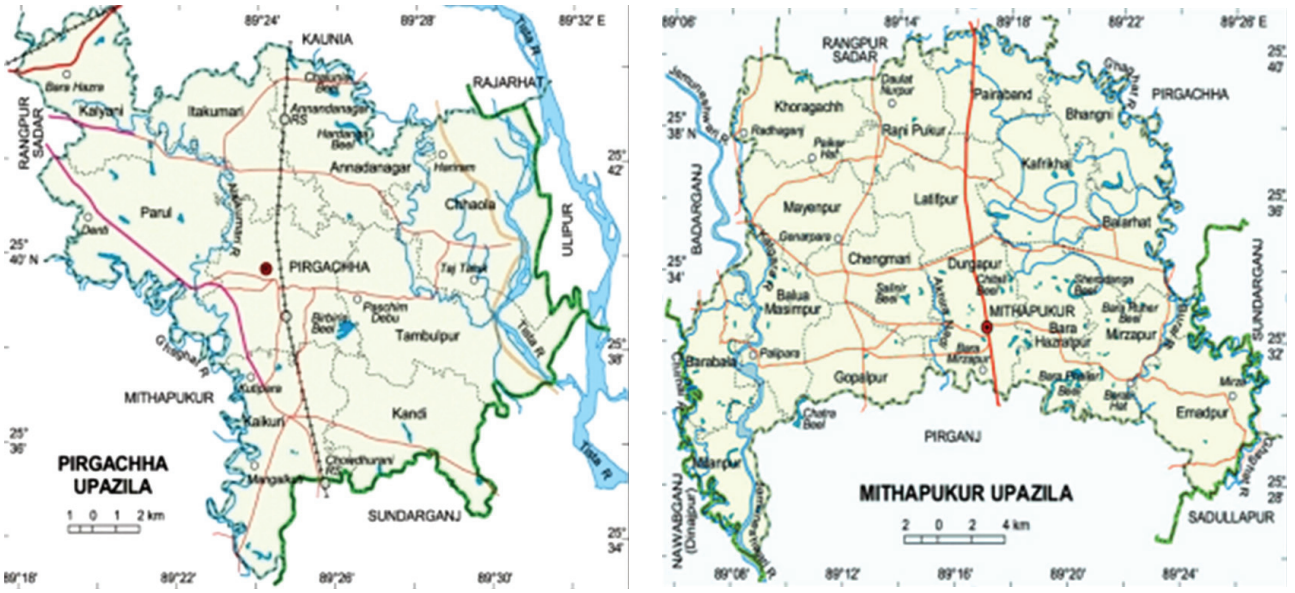


Figure 2. Map showing Pirgacha and Mithapukur upazilas under Rangpur district.

potato variety, BARI Alu-25 considering all the aspects of cultivation and marketing.

Methodology

The study was carried out in Sirajdikhan and Tongibari upazilas under Munshiganj district and Pirgacha and Mithapukur upazilas under Rangpur district (DAE 2019a, DAE 2020a, DAE 2020b, DAE 2020c).

The population of the study was the growers who cultivated BARI Alu-25 for at least three years. The sampling population was 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. Sampling was done following Hossain and Rahman (2001) where the respondents were 80. The data were collected during December, 2020 to

November, 2021. Fifteen selected characteristics of the respondent were the independent variables of the study. Age of the respondent was measured in terms of years. Level of education was measured in terms of years of schooling. Family size was measured by counting the total number of family members of the respondent comprising the head of the household, his wife, children, parents and other dependents who jointly lived and ate together. Farm size was measured in terms of hectares. Annual income was measured in terms of thousand BDT. Training experience was measured in terms of number of days. Extension contact was measured in terms of scores. Farming experience was measured in terms of years. Access to credit, off-farm activities and availability of irrigation water were measured in ordinal scale where if the respondent 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). Similarly, if the respondent had off farm activities, it was coded as one (1) and if he/she had no off-farm activities, it was coded as zero (0). In case of availability of irrigation water, if the respondent had available irrigation water, it was coded as one (1) and if he/she did not have available irrigation water, it was coded as zero (0). Organizational membership, cosmopoliteness, innovativeness and knowledge on cultivation of potato were measured in terms of scores. The impact of COVID-19 pandemic on cultivation of potato variety BARI Alu-25 was the focus variable of the study. Impact of COVID-19 pandemic on cultivation of BARI Alu-25 was measured by using five-point rating scale. The extents of impact were 'very highly affected', 'highly affected', 'moderately affected', 'poorly affected', and 'not affected at all', with the corresponding scores assigned '4', '3', '2', '1' and '0', respectively. The issues considered for measuring impact of COVID-19 were: production, harvest, market price, marketing, transport, labourer, availability of seed, high cold storage charge, and input price. The suggestions to cope with the challenges of COVID-19 pandemic in cultivation of potato variety BARI Alu-25 were collected from the respondents' responses. Then the suggestions were listed based on the percentage. Data were coded, compiled, tabulated and analyzed according to the objectives of the study using SPSS v20. Descriptive statistical measures like number and percentage distribution, range, rank order, mean etc. were used.

Results and discussion

Results presented in Table 1 show that about half (46.3%) of the respondents were old aged. Majority (82.5%) of them were literate and the highest percentage (42.5%) of them belonged to secondary education level. The majority of them (45.0%) had small family. More than half (51.3%) of the respondents had medium farm and there were no landless farmers. Their average annual income was BDT 649.4 thousand which was much higher than the national average (BDT 137.8 thousand) (BBS 2021) and most of the growers (81.2%) belonged to medium to low annual income category. About half (40.0%) of the respondents had high training experience. The large majority of them (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 them had no off-farm activities. All the respondents (100.0%) had available irrigation water. Majority of them (48.8%) had medium organizational membership. Majority of them (71.3%) had medium cosmopoliteness. About half of the respondents (43.7%) had low innovativeness. Most of them (71.2%) had low to medium innovativeness. Majority of them (75.0%) had moderate knowledge on potato cultivation.

About one-fifths (13.8%) of the BARI Alu-25 respondents were very highly affected in marketing BARI Alu-25 and 10.0 percent of them were very highly affected in getting market price (Table 2) due to COVID-19 pandemic. It was also found that 8.8 percent of them were very highly affected in getting transport, 5.0 percent of them were very highly affected in getting labourer, 5.0 percent of them were very highly affected in availability of seed and 2.5 percent of them were moderately affected in input price due to COVID-19 pandemic. It might be due to the reason that because of lock down caused by COVID-19 pandemic growers were very highly affected in marketing BARI Alu-25 and getting the market price, transport availability, labourer availability and seed availability. Their input price was also moderately affected. During lock down they could not sell potatoes due to market closure. They also did not get reasonable market price due to reduced demand, panic and market closure since potato is perishable crop. Therefore, they sold the potatoes at

Table 1. Characteristics of the respondents

Characteristics (Measurement unit)	Possible and observed range	Respondents (n=80)		Mean
		Categories	%	
Age (Year)	Unknown (24-78)	Young (up to 35)	26.2	47.5
		Middle aged (36-50)	27.5	
		Old (above 50)	46.3	
Level of education (Years of schooling)	Unknown (0.5-18)	Illiterate (0)	0.0	7.8
		Can sign only (0.5)	17.5	
		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
		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
		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 (10-3900)	Low (up to 291)	38.7	649.4
		Medium (292-1008)	42.5	
		High (above 1008)	18.8	
Training experience (Number of days)	Unknown (0-330)	No training (0)	26.2	39.8
		Low (1-5)	26.3	
		Medium (6-10)	7.5	
		High (above 10)	40.0	
Extension contact (Score)	0 to 80 (11-56)	Low (up to 21)	20.0	31.7
		Medium (22-42)	63.8	
		High (above 42)	16.2	
Farming experience (Years)	Unknown (4-65)	Low (up to 13)	17.5	26.6
		Medium (14-40)	66.3	
		High (above 40)	16.2	
Access to credit	-	No	13.8	-
		Yes	86.3	
Off farm activities	-	No	55.0	-
		Yes	45.0	
Availability of irrigation water	-	No	0.0	-
		Yes	100.0	
Organizational membership (Score)	Unknown (0-216)	Low (up to 11)	36.2	37.7
		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
		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
		Medium (4-7)	27.5	
		High (above 7)	28.8	
Knowledge on potato cultivation (Score)	0 to 30 (14-28)	Low (up to 19)	18.7	22.4
		Medium (20-26)	75.0	
		High (above 26)	6.3	

reduced price.

The potato farmers did not get transport for carrying products and did not get labourer during lock down. They also faced difficulties in input availability. Inputs especially seeds were not available due to lock down and input price was also high in some cases. Gatto and Islam (2021) revealed that agricultural production was reduced after COVID-19 hit in Bangladesh. But significant reductions were not observed in case of potato. Slight reduction was observed in the share sold at markets in case of potato in 2020. It was also observed in their study that to compensate for the reduction in male family labourer, households hired slightly more male and female labourer. The consumption of potato was reduced in 2020. COVID-19 had no significant effect on potato sales but the coefficients had the expected negative sign which might be due to the fact that the potato is an important cash crop. Talukder *et al*. (2021) reported that the agri-food systems were disrupted at the farm, value chain and market levels in Bangladesh due to COVID-19 pandemic.

The Lock down led to loss of income among people across the country, with lowered purchasing power and demand for fresh produce which affected both producers and suppliers. Farmers could not sell their products after harvest in many cases. Some farmers had let their crops rot in the fields, leading to great loss. Some farmers could sell perishable produces locally at significantly discounted rates. Rahman *et al*. (2021) also reported that the lock down due to COVID-19 pandemic caused restrictions on the access to agricultural products, materials, markets and advisory services in Bangladesh and farming activities were greatly affected by those. Gautam *et al*. (2022) reported that 53% crop and vegetables farmers obtained lower price during COVID-19 than normal situation in Bangladesh. The price of vegetables, fruits and nearly all agricultural products were lowered due to reduced market demand. Thirty four percent of respondents reported damages of their products. Haque *et al*. (2022) also reported that the availability of labourer for the time bounding farming such as vegetable, crops and fruit picking was seriously affected by quarantine measures in Bangladesh. Perishable products like fruits, vegetables and milks were spoiled due to transportation restriction. The movement of workers were impeded due to transport restriction which seriously affected horticultural, livestock, and food processing industries. Plantation and harvesting operations were hindered because of unavailability of expert workers. In their study it was also reported that the marketing and shipping of fruits, vegetables, eggs, chicken meat, and milk were seriously affected. Khan *et al*. (2021) reported that the shortage of adequate storage facilities, along with transport disruptions and reduced demand due to lock down to prevent the spread of COVID-19 caused wastage of perishable goods. It was also found in their study that labourers could not move

Table 2. Impact of COVID-19 pandemic on potato variety BARI Alu-25 cultivation in Bangladesh

Item	Extent of impact				
	*VHA (%)	HA (%)	MA (%)	PA (%)	NAAA (%)
Production	0.0	1.3	0.0	0.0	98.8
Harvest	1.3	2.5	0.0	1.3	95.0
Market price	10.0	3.8	1.3	0.0	85.0
Marketing	13.8	1.3	1.3	0.0	83.8
Transport	8.8	0.0	3.8	2.5	85.0
Labourer	5.0	1.3	3.8	5.0	85.0
Availability of seed	5.0	0.0	1.3	0.0	93.8
High cold storage charge	1.3	0.0	0.0	0.0	98.8
Input price	1.3	0.0	2.5	1.3	95.0

*VHA=Very highly affected, HA= Highly affected, MA=Moderately affected, PA=Poorly affected, NAAA= Not affected at all

Table 3. Rank order of the suggestions to cope with the challenges of COVID-19 pandemic in potato variety BARI Alu-25 cultivation

	Suggestions	Respondents (%)	Rank
1.	The government may rehabilitate the affected growers through incentives, subsidies, quality inputs, labourer and marketing support, financial grants, and credit at a reduced rate of interest	37.5	1st
2.	Transport facilities for carrying agricultural products in lock down with government initiative	37.5	1st
3.	The government may provide labourer support in lock down situation and arrange easy transport and movement facilities for labourer at low cost in lock down	31.3	2nd
4.	Reasonable market price of potato can be ensured through regular monitoring	31.3	2nd
5.	Market of perishable agricultural products may be kept open in compliance with health regulations and maintaining social distance in lock down situation with government initiative	25.0	3rd
6.	Export of potato can be increased with government initiative	18.8	4th
7.	Government may purchase potato and arrange marketing and export	12.5	5th
8.	Vaccination of growers for COVID-19 and creating awareness	12.5	5th
9.	Timely input supply in lock down situation	6.3	6th
10.	Import of potato can be reduced during harvesting of potato	6.3	6th
11.	Proper training may be arranged for growers	6.3	6th
12.	Government cold storage facilities are essential	6.3	6th

due to social distancing and decreased transportation. It was also reported that agricultural inputs are imported by most of the countries from other parts of the world. The shipment of agricultural inputs became expensive because of the closing of the international border and restriction on commercial flights in lock down situation. Farmers experienced the scarcity of agricultural inputs such as seeds, fertilizer, and pesticides.

To cope with the challenges of COVID-19, the highest portion (37.5%) of the respondents suggested that the government may rehabilitate the affected growers through incentives, subsidies, quality inputs, labourer and marketing support, financial grants, and credit at a reduced rate of interest and about 'transport facilities for carrying agricultural products in lock down with government initiative' (Table 3). It might be due to the fact that the affected growers needed rehabilitation through incentive, subsidy, financial grants and agricultural credit support. The incentives, subsidies, free distribution of quality inputs, labourer and marketing support, financial grants, and credit at a reduced rate of interest provided by the government help the affected farmers, especially small and marginal farmers, for rehabilitation in any calamities. Haque *et al*. (2022) also reported that the loans should be given on easy terms among the marginal farmers so that their poor financial condition due to lock down can be overcome since the small and marginal farmers were affected most due to the lock down. In their study, it was also reported that there can be provision for free distribution of agricultural inputs. Getting agricultural loans by the farmers can be made easy. They also suggested about the consideration of the decision to reduce interest on previous loans. They also reported that it is essential to create an accurate database to reach the facilities and subsidies provided by the government at the marginal farmer level. They also suggested that the supply of irrigation facilities, crop-protecting equipment, seed, and fertilizer needs to be ensured in a lock down situation. The capacity of BADC needs to be expanded to increase irrigation. Amjath-Babu *et al*. (2020) also suggested about adequate credit facilities and innovative labourer management tools.

The respondents also suggested about transport facilities. It might be due to that they could not sell their agricultural products timely because of transport unavailability in lock down. If there are provision of transport for carrying

agricultural products in lock down situation farmers can easily sell their agricultural products to markets and the products can be carried throughout the country. Jhajhria *et al*. (2020) also suggested that transportation logistics are essential for the movement of farm produce which can be arranged by farmers' groups or traders during lock down due to COVID-19. Mottaleb *et al*. (2020) also reported that the government can issue movement passes to persons and carriers of agricultural input and output in very strict lock down situation to support smallholder agriculture, wage workers and agricultural value chains in Bangladesh.

About one-third (31.3%) of the respondents' major suggestions were 'the government may provide labourer support in lock down situation and arrange easy transport and movement facilities for labourer at low cost in lock down' and 'reasonable market price of potato can be ensured through regular monitoring' (Table 3). It might be due to the fact that they could not get labourer due to lock down, restrictions on movement and transport unavailability. It is very essential to ensure labourer availability in lock down situation and easy transport and movement facilities for labourers to execute agricultural activities. Mottaleb *et al*. (2020) also reported that the government can issue movement passes to persons and carriers of agricultural input and output in very strict lock down situation to support smallholder agriculture, wage workers and agricultural value chains in Bangladesh. They also might not get reasonable market price of potato due to lock down situation and closing of market. If regular monitoring can be ensured by the government, then reasonable market price of potato can be obtained by farmers. Haque *et al*. (2022) also reported that market monitoring is very essential to maintain a sound marketing chain after COVID-19 pandemic. Syndicate is a serious problem for distribution of profit among all stakeholders associated with supply chain. Syndicate and illegal stocking affect profit distribution. Proper monitoring can reduce these problems and proper distribution of profit can be ensured among all stakeholders.

One-fourths (25.0%) of the respondents suggested that the market of perishable agricultural products may be kept open in compliance with health regulations and maintaining social distance in lock down situation with government initiative (Table 3). It might be due to the fact they could not sell their agricultural products timely because of closing of market in lock down. As a result, their potatoes were wasted. Therefore, markets of perishable agricultural products are essential to be kept open in lock down situation maintaining health regulations properly. Rahman *et al*. (2021) reported that any distortions in the supply chain during harvest needs to be avoided in the COVID-19 pandemic. Mottaleb *et al*. (2020) also reported that the government can issue movement passes to persons and carriers of agricultural input and output in very strict lock down situation to support smallholder agriculture, wage workers and agricultural value chains in Bangladesh.

Conclusion

COVID-19 pandemic negatively impacted human lives as well as global economy all over the world. About one-fifths (13.8%) of the respondents were very highly affected in marketing BARI Alu-25 and 10.0 percent of them were very highly affected in getting market price due to COVID-19 pandemic. Their transport, labourer and seed availability were also affected. The highest portion of the respondents suggested the government about rehabilitation of the affected growers through incentives, subsidies, inputs, labourer and marketing support, financial grants, and credit at a reduced rate of interest and transport facilities for carrying agricultural products in lock down with government initiative.

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