Socio-Demographic Status of Onion Cultivators and Major Correlates of Onion Production: A Study from Pabna, Bangladesh

Md. Shaim Hossain[1*]; Md. Mahmudul Hasan[2]; Md. Yeamin Hossain[3]; Muhammad Usama Islam[4]

[1]Department of Economics, University of Rajshahi, Bangladesh
[2]Department of Economics, Varendra University, Rajshahi, Bangladesh
[3]Department of Fisheries, University of Rajshahi, Bangladesh
[*4]Department of MIS, Metropolitan State University, USA
*Corresponding Author

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Abstract— *Onion cultivation plays a vital role in the agricultural landscape of North-West Bangladesh, though Bangladesh experiences a great gap between national production and consumption. The main aim of the study is to show the socio-demographic status of onion producers in North-West Bangladesh (Pabna) along with key correlates of onion production. In order to gather primary data from a sample of 100 onion farmers who were randomly selected from four unions in the study area, a face-to-face interview method was used. Descriptive statistics was used to show the socio-demographic status and Spearman's rank-order correlation (Spearman's rho) was used to measure the strength and direction of the relationships between pairs of variables: (i) total seed cost and output in kg, (ii) Age of farmers and involvement years in Onion production, and (iii) output in kg and after harvesting cost. Most of the farmers were found experienced which also indicates a statistically significant strongly positive relationship between age and involved years of farmers ($\rho = .685$, $p<0.01$), though maximum farmers were found as having lower formal education with lower annual income. A statistically significant relationship was also fund between total seed cost and output though the relationship is weak ($\rho = .208$, $p<0.05$), underscoring that there are other factors also which can affect production. A significant moderate positive relationship was found between output and after harvesting cost ($\rho = .508$, $p<0.01$) which indicates that the more production, the more economic burden on the farmers. Despite facing various problems, 90% farmers wanted to continue production in future.*

Keywords— Onion production; Agriculture in Bangladesh; Statistical Analysis; Smallholder farmers; Supply chain in Agriculture.

I. INTRODUCTION

Bangladesh is an agro-based country. The country is endowed with many natural resources, including a variety of temperate zones and vast amount of productive land, making onion production a very promising industry for cultivation, marketing, processing, and export. This country is rich in natural resources and its weather is excellent for onion cultivation. Throughout the world, onion (*Allium cepa*) is a significant herbaceous bulb and spice crop, including Bangladesh. Onion is a major cash crop of Bangladesh and it is largely cultivated in Bangladesh [4]. It is a spice crop that is used as a spice in our food and salad. It also acts as medicine for many diseases since it contains calcium, carbohydrates, protein, vitamin C and E. In Bangladesh, we use onion every day and cannot think a day without onion.

Livelihoods of many people in the village are mainly based on onion, some are involved in onion cultivation and others are involved in onion trading which is profitable in most cases. Onion is produced in all area of Bangladesh and largely cultivated in profitable scale in the greater districts of Rajshahi, Dhaka, Faridpur, Dinajpur, Jessore, Pabna, Rangpur and Kushtia. Bapari *et al.* [5] conducted a study on onion production in Sujanagar and Santhia upazila of Pabna. They found that onion production

is profitable and they found a profit of Tk. 26883.48 per bigha, though they found some problems in onion production like lack of storage facilities, limited access to quality seeds etc. Anjum and Barmon [2] explored a study on profitability and comparative advantage of onion in two districts named Jhenaidah and Kushtia. They also found that onion production is profitable in both districts with a BCR of 2.02 in Kushtia and 1.83 in Jhenaidah. Haque *et al* [8] directed a study in Magura Faridpur and Rajshahi and observed that onion is a highly profitable crop with a BCR of 1.85 and the profitability from onion is higher than the profit from other crops like cabbage, mustard, and groundnuts. Islan *et al.*[12] observed a study by categorizing farmers as small, medium, and large based on farm size and found that onion production was profitable for all farmers with an overall undiscounted BCR of 1.74. Islam et al.[11] conducted a study to analyze the value chain of onion and found onion production as profitable where a BCR of 1.55 was found. They also found that farmers add the highest value of 29.14% in the supply chain and receive the highest net marketing margin of 42.51%. Mila et al. [13] explored a study to show the onion supply chain and find out barriers faced by stakeholders before and during the COVID-19 pandemic. They found that onion production is viable with a BCR of 1.19.

According to BBS (2024) 2917 (000 M. tons) onion was produced in 514 (000 acres) area in Bangladesh in 2023-24 fiscal year which was 2547 (000 M. tons) in 503 (000 acres) just in immediate past fiscal year. Hossain, Abdullah and Parvez [10] did a time series analysis of onion production in Bangladesh using ARIMA (0,2,1) model and the model forecasted a steady increase in onion production from 2014 to 2023, from 1.24 million metric tons to 1.88 million metric tons. While onion output is growing daily, in a land-starved nation like Bangladesh, high population growth may make it impossible to offer local demand. There is a huge lack of onion compared to the total demand. As there is land constraint, it is not possible to increase the area under cultivation in order to enhance onion production; however, there is a chance to do so by improving current production methods and adopting advanced technology. Baree [6] conducted a study on technical efficiency of onion in Santhia upazila of Pabna district and showed that the yield of onions per hectare will increase by 0.0718 percent, 0.3026 percent, and 0.0442 percent, respectively, if the labor force, land areas, and capital costs are all increased by 1%. They found mean technical efficiency 83% which indicates that, with the present level of material and technology, onion farmers are producing 17% less output than the maximum possible. But, at the same time, he found that as the education of farmers rises the effect of technological inefficiency grows because most of the educated farmers not only depend on agriculture for their livelihood but also have other income sources. Hossain *et al.* [9] observed that Bangladesh annually produces 1.7 million tonnes of onions, yet the demand stands at 2.2 million tonnes, highlighting a considerable shortfall between production and consumption. Bangladesh depends on onion imports from neighboring countries (i.e., India, Myanmar) to meet its domestic demand as proposed by Ahmed and team [3]. This trade dependency significantly rinsings the country's foreign currency reserves, emphasizing the urgent need to enhance domestic onion production and reduce import reliance [1]. Pabna is well-known for onion production. Among the 64 districts of Bangladesh, highest amount of onion is produced in Pabna. Bapari *et al.* [5] did a study on onion production in Sujanagar and Santhia upazila of Pabna and Baree [6] conducted a study only in Santhia upazila. Again, Islan *et al.* [12] conducted a study in Durgapur, Sadarpur, Sujanagar of Bangladesh and Haque *et al.*[8] directed a study in Magura Faridpur and Rajshahi about onion production. But there is no study solely in Sujanagar of Pabna. It has been passed so many years since there is no study in Sujanagar. So, our concern is about Sujanagar upazila. This study will help people to know about the socio-demographic status of onion cultivators and interrelation among various variables of onion production in Sujanagar upazila of Pabna district. The main objectives of the study are:

1) To show the socio-demographic status of onion farmers in Sujanagar upazila of Pabna;
2) To determine the interplay between seed cost and output, age and involved year of farmers in onion farming and output and after harvesting cost.

II. METHODOLOGY

2.1 Selection of the Study Area:

On the basis of high concentration of onion cultivation and production, Pabna district is considered as one of the leading onion producing zone in Bangladesh. So, among the 64 districts of Bangladesh we have selected Pabna district as our study area. There are 9 sub-districts in pabna district. We have collected our data from Sujanagar of Pabna district. Sujanagar upazila has ten unions and Manikhat, Satbaria, Hatkhali and Raninagar have been chosen randomly from the union. Among the union of Manikhat union data have been collected from Manikhat, Dashpara, Toilkundu, Bonkola, Khetupara, Bil khetupara, Chor Gojaria and Ulat village. In case of Satbaria union data have been collected from Ramchandrapur village. From Hatkhali union data have been collected from Hatkhali and Soidpur villages. And in case of Raninagar union data have been collected from Raninagar village.

2.2 Study Period:

With the aid of pre-designed and pre-tested interviews, data have been obtained using the survey method during November 2022 to April 2023. To achieve the goals of the study, the obtained data will be edited, summed up, tabulated, and analyzed. The author personally visited the area on multiple occasions to gather additional data.

2.3 Sampling Size:

Total number of onion cultivator in the sampling villages is around 5000. To meet our objectives, we have collected data from 100 onion cultivators. Not only 100 cultivators but also middlemen, dealers, stockiest, wholesalers, retailers, and final users or customers in Pabna district are also population of the survey. Various information have been collected from middlemen, dealers, stockist, wholesalers, retailers, and final users or customers in Pabna district.

2.4 Preparation of Survey Schedule:

Before collecting data from survey method it is mandatory to set a questionnaire for interview or communication. According to the objectives of the study one set of formal questionnaire or interview schedules was prepared for farmers and an informal schedule was set for middlemen, dealers, stockist, wholesalers, retailers, and final users or customers. Through the interview schedule, information on the volume of sales, places where sales and purchases are made, production costs, marketing costs, sales prices, and purchase prices, who to buy from and who to sell to, the amount of post-harvest loss suffered by farmers and middlemen, problems faced by supply chain stakeholders, and their potential recommendations will be gathered. After the necessary corrections, modifications, and adjustments, all of the schedules were pre-tested and then completed.

2.5 Data Analysis:

To show socio-demographic status, Microsoft Excel was used to analyze collected data and statistical software SPSS was used to determine the relationships between key correlates of onion production. As the data were not normally distributed and the relationships between each pair of variables were not strictly linear, Spearman's rho was used to examine the direction of the monotonic relationships between three pairs of variables: (i) Total Seed Cost and Output, (ii) Farmer Age and Involved years in Onion Production, and (iii) Output and After Harvesting Cost. The rho (ρ) can range from -1 to +1, and the closer the values to +1, the stronger the relationship.

III. RESULTS AND DISCUSSION

3.1 Age of the Farmers:

Age distribution contributes a pivotal role for the improvement of farming activities as found by Blijham et al., [7]. Aged farmers normally possess higher production experience which helps to higher production. On the other hand, too much aged farmers become physically less strong and can have negative impact on production. Baree [6] found that as age increases by one percent, onion production decreases by 0.0090 percent. In this case, middle aged farmers are considered as best suitable for better yielding. In our study area, 42% of the respondents are middle aged which indicates that almost half of the farmers are experienced farmers (Figure 1). Only 20% respondents are young (age 20-35).

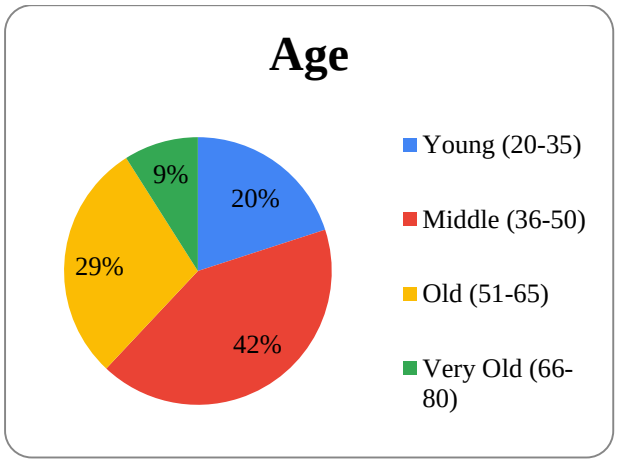

FIGURE 1: Age of the Respondents

3.2 Number of Year Involved in Onion Production of Farmers

The horizontal bar chart (Figure 2) illustrates the involvement of the farmers in onion production. 43% of the respondents are highly experienced (21-30), whereas 13% of the respondents have experience of 31-40 years. So, it can be said that more than half of the respondents are highly experience in onion production which is good sign for production.

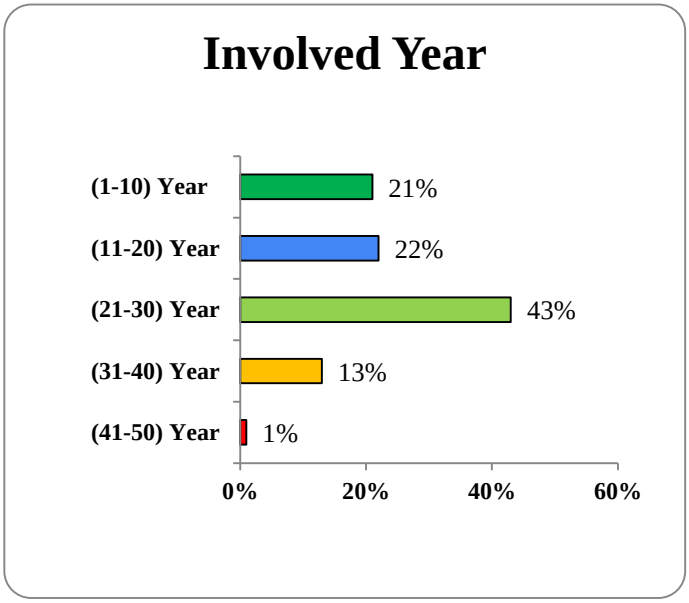

FIGURE 2: Involved in Onion Production (in years)

3.3 Education Level of the Farmers:

Though the application of education can increase production, in reality, the more educated a person is, the higher inclination of aversion from agricultural production. In the study area, 56% of the respondents have primary education (0-5 in numbers) indicating that most of the farmers are lower educated. A total of 14% farmers have higher education.

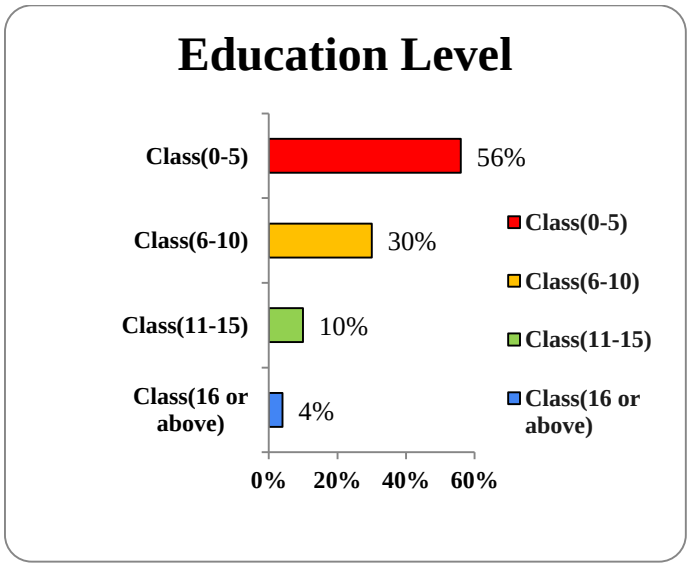

FIGURE 3: Education of the Respondents (in years)

3.4 Status of Owning Land of the Farmers:

In the study area, two types of farmers were found, one who have their own land and another who do not have. The farmers who do not have their own land cultivate land by rent which increases their production cost. Almost 56% of the total farmers have their own and whereas 44% do not have (Figure 4).

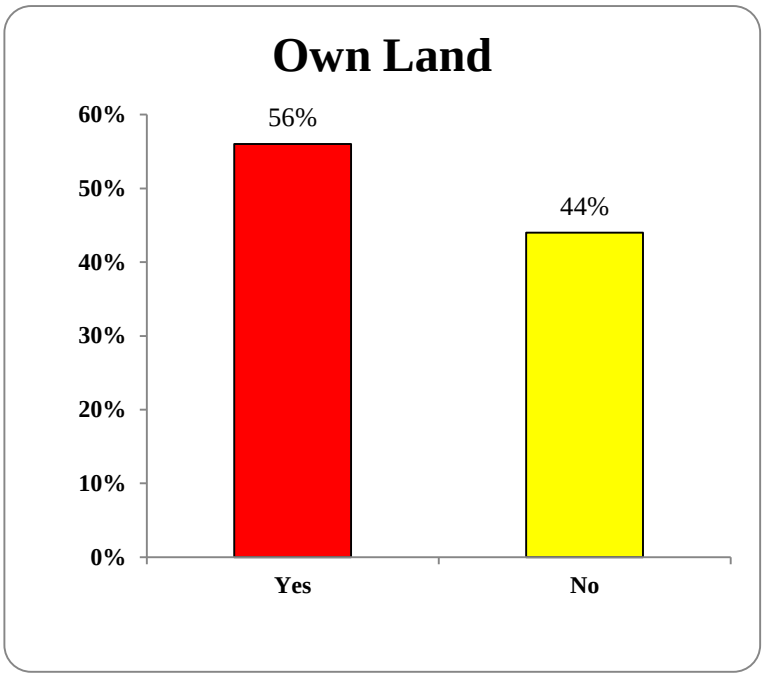

FIGURE 4: Status of Owning Land

3.5 Annual Household Income of the Farmers

Annual income may have positive impact on production because farmers having higher seeds can afford high quality of seeds, skilled labor, modern technology etc. In the study area, 48% farmers have annual income of Tk. one lac to two lacs (Figure 5). It is the lowest annual income in the study area. Only 8% farmers have annual income of above Tk. 5 lacs.

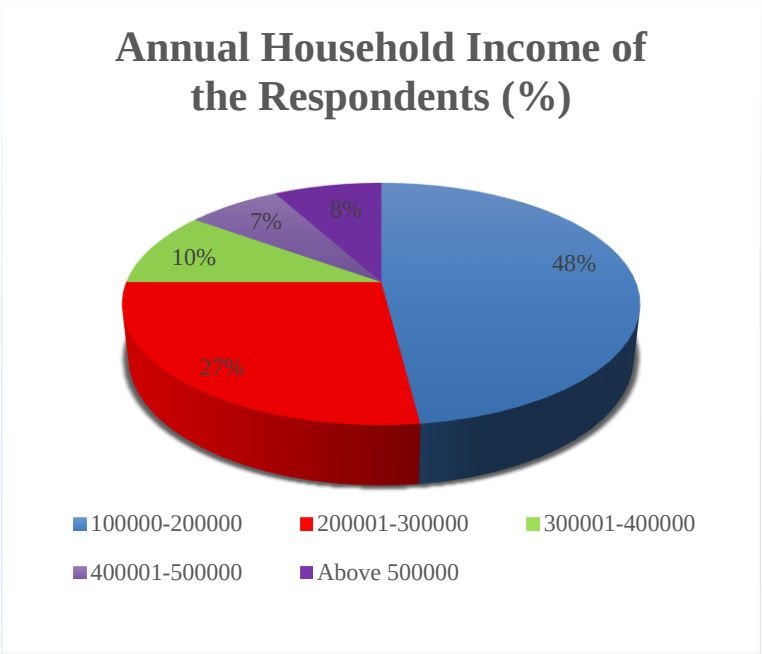

FIGURE 5: Annual Household Income of the Respondents (in tk.)

3.6 Types of Onion Seed Used:

There are various types of onion available named King, Hybrid, Deshi, Cross King, Queen, Sultan King, Khan Hybrid and so on. A diversification was seen in the use of onion seed in the study area. The most used onion seeds are King, Deshi and Cross King. They are used by 36%, 37% and 29% farmers respectively.

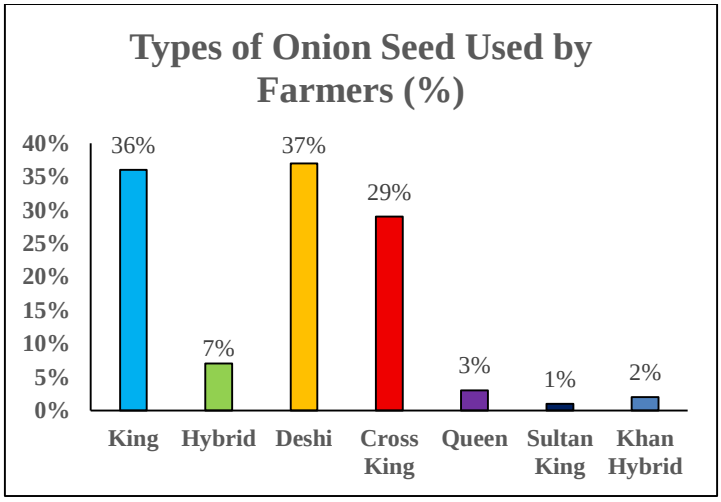

FIGURE 6: Types of Onion Seed Used by Farmer

3.7 Correlations between Total Seed Cost and Output

Spearman's rank order correlation was used to find out the relationship between total seed cost and output. Before calculation, visual representation was used to examine the linearity between these two variables and found non-linear relationship. At the same time, both of the variables were found not to be normally distributed. The table 1 shows that there exists a weak positive relationship between total seed cost and output and the relationship is statistically significant, $\rho = .208$, $p<.05$, two-tailed. The relationship indicates that as total seed cost increases, output also tends to increase but there are other factors also which can affect production.

TABLE 1
SPEARMAN'S RHO RESULTS

Variable		Total Seed Cost	Output
Total Seed Cost	Correlation Coefficient	1	.208*
	Sig. (2-tailed)	.	0.038
	N	100	100
Output	Correlation Coefficient	.208*	1
	Sig. (2-tailed)	0.038	.
	N	100	100

. Correlation is significant at the 0.05 level (2-tailed)

3.8 Correlations between Age and Involved Year in Onion

To determine the relationship between age and involved year, Spearman's rank order correlation was also used as the variables are not normally distributed and there exists non-linear relationship between them. Table 2 shows the rank order correlation was found strongly positive and statistically significant, $\rho = .685$, $p<.01$, two-tailed. This indicates that as age of the respondents, the involved year or experience also increases.

TABLE 2
SPEARMAN'S RHO RESULTS

Variable		Age	Involved Year in Onion
Age	Correlation Coefficient	1	.685**
	Sig. (2-tailed)		0
	N	100	100
Involved Year in Onion	Correlation Coefficient	.685**	1
	Sig. (2-tailed)	0	
	N	100	100

****. Correlation is significant at the 0.01 level (2-tailed)***

3.9 Correlations between output and Cost After Harvesting

Along with various types of costs, production requires cost after harvesting. A Spearman's rank order correlation was also used to determine the relationship between output and cost after harvesting as these variables were also fit for the test. A statistically significant moderate positive relationship (ρ=.508) was found between these two variables, indicating that as output increases, cost after harvesting also increases. This result underscores the pecuniary burden of supervising larger harvests.

TABLE 3
SPEARMAN'S RHO RESULTS

Variable		Output	Cost After Harvesting
Output	Correlation Coefficient	1	.508**
	Sig. (2-tailed)		0
	N	100	100
Cost After Harvesting	Correlation Coefficient	.508**	1
	Sig. (2-tailed)	0	
	N	100	100

. Correlation is significant at the 0.01 level (2-tailed)

3.10 Problems Faced by Onion Farmers

During and after production, farmers face various problems like labor shortage, high wage of labor, high cost of various types of materials etc. As figure 7 shows the most facing problem is high price of fertilizers and pesticides (60%). As without these, production is not possible, higher price of them lead to increase the production cost. Additional wage is another major problem faced by farmers as there is labor shortage this problem arises. Most of the problems are money related problems which is a major constraint to production. Low quality of seeds is another problem which is faced by 13% of the farmers. Sometimes, low quality of seeds is mixed with good quality seeds which affect production badly.

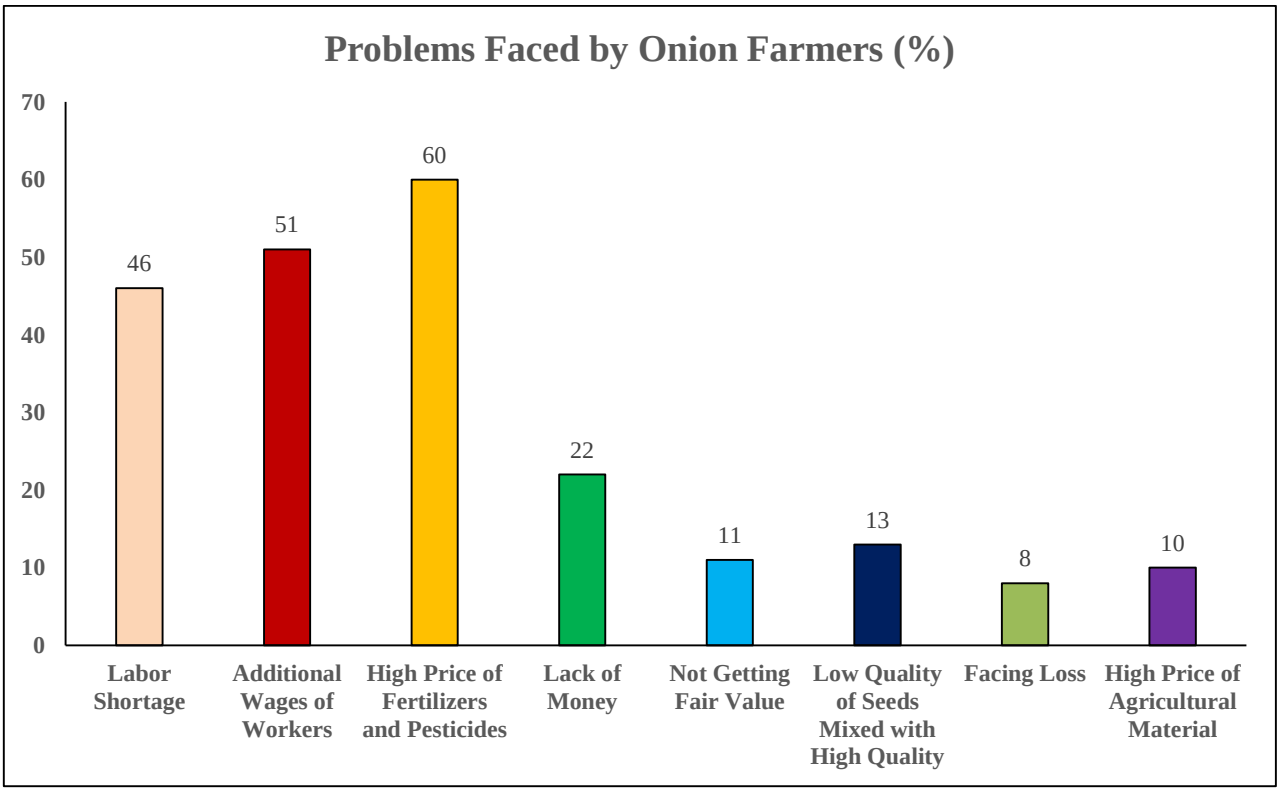

FIGURE 7: Problems Faced by Onion Farmers

3.11 After Harvesting Problems Faced by Farmers:

Harvesting or collecting the products is not the last stage of production. After harvesting, there are so many stages like sorting, storing, transporting etc. before reaching to customers. The common problem faced by farmers is decomposition of onion. As during harvesting period, the price of onion drastically falls the farmers tend to not to sell and face decomposition of onion. 74% of farmers said that they face the problem of decomposition. Additionally, there is storage problem too which may lead to decomposition. Another big problem faced by farmers is uses of fan as more fan is needed to store onion. Lack of vehicles and shortage of women labor are also problem though they are faced by a few.

TABLE 4
AFTER HARVESTING PROBLEMS FACED BY FARMERS

Problems	Percentage of Farmers
Fan has to be used	34
Decomposition of onion	74
Storage problem	40
Lack of Vehicles	7
Shortage of women labor to cut leaf	3

Source: Field Survey, 2023

3.12 Want to Continue Onion Production or Not:

As the farmers face various types of problems in onion production from the beginning of production process to the reaching of the product to the hand of customers or retailer seller, a question was asked whether they want to continue to produce onion in future or not. The result is shown in below figure (Figure 8). 90% of the farmers said that they want to continue onion production in future and the rest 10% said they do not want. The result indicates that onion production might be profitable in spite of having various types problems.

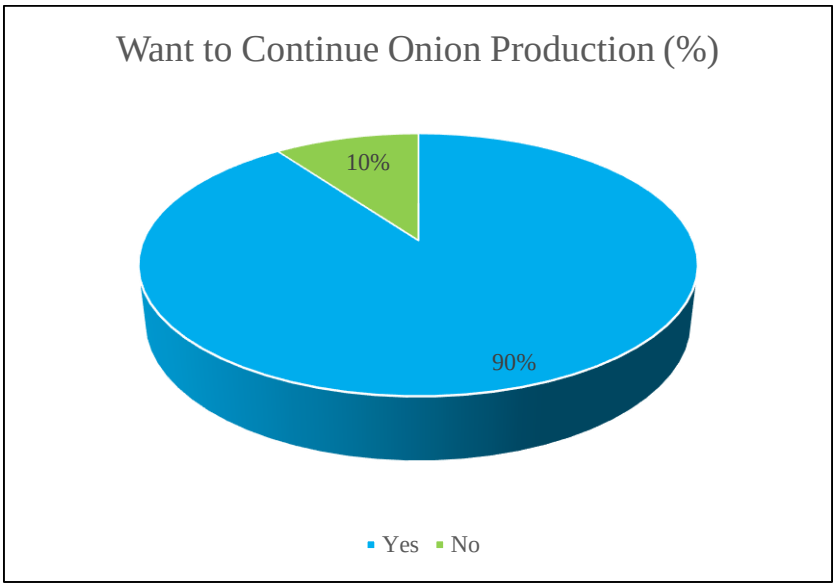

FIGURE 8: Whether Want to Continue Onion Production or Not

3.13 Suggestions by Farmers to Improve Onion Cultivation

Farmers were asked to share suggestions according to their production experience which can increase onion production or encourage farmers to be engaged in onion production. From various types of suggestions five suggestions are given below (Table 5). 66% of the farmers shared that import of onion should be stopped because import of onion leads to decrease the price of price which contribute to lower profit. 55% of the farmers said that price of pesticide has to be reduced. A fixed price of onion, establishing training institutions and loan on low interest rate were also suggested.

TABLE 5
SUGGESTIONS BY FARMERS TO IMPROVE ONION CULTIVATION

Suggestions	Percentage of Farmers
No import	66
Price of pesticide has to be reduced	55
A fixed price has to be set	35
Training institutions have to be established	28
Loan has to be given on low interest rates	20

Source: Field Survey, 2023

IV. CONCLUSION

The study was divided in two parts- socio-demographic status of onion producers and key correlates of onion production. Socio-demographic status like age, education, family member, annual income, involvement of years can affect any kind of agricultural production. Though education is not directly applied or educated people in Bangladesh rarely come in farming profession, age, family member, involvement years directly can affect farming. The socio-demographic results reveal that the farmers are well experienced but not that much educated and most of the farmers are not financially stable. Mainly three pairs of key correlates were tested using spearman's correlation test and all of them found statistically significant. There was a weak but positive relationship found between total seed cost and output ($\rho = .208$), a strong positive relationship was found between age and involved years ($\rho = .685$) and a moderate positive relationship was found between output and cost after harvesting ($\rho = .508$). The farmers face various types of problem from the beginning of the production to the selling of the product. Yet 90% of the farmers expressed their opinion that they want to produce onion in future, indicating the profitability of onion. Farmers were concerned about high import of onion. Government and the concerned authority should come forward and take proper initiative regarding this matter.

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