

# An Empirical Analysis of the Factors Associated with Mushroom Cultivation: A Case of Dhaka

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<https://doi.org/10.18034/abr.v12i2.628>

## ABSTRACT

The analysis aimed to identify mushroom production and marketing problems by different stakeholders in Bangladesh, specifically in the Dhaka district. It also aims to improve the mushroom marketing system for domestic markets. The research was carried out in the Savar Upazila, located in the Dhaka district. One hundred twenty-one farmers were randomly picked and asked questions using an interview schedule to collect data. Pearson's chi-squared test was utilized to investigate the degree to which socio-demographic factors and the response variable are related. In the end, a multivariate method known as logistic regression analysis is utilized to study the relationships between each predictor variable and the result variable that pertains to the respondents. The result revealed significant effects of gender, farmer's education, and information sources for intermediate and experienced mushroom cultivators. However, land size, scientific cultivation, sources of capital, packaging, and sale were stronger among expert mushroom farmers than the new and mediocre mushroom farmers. This research provides valuable insights to improve the mushroom marketing system for domestic markets.

**Key words:** Mushroom Farming, Mushroom Marketing, Agribusiness, Marketing Systems, Savar Upazila, Bangladesh

## INTRODUCTION

Mushroom farming has been suggested as one of the possible possibilities because of the goal for more sustainability, improved food security through increased diversity, and the development of more sustainable sources of revenue, particularly for farmers operating on a smaller scale. It offers biotechnology that is both effective and economically viable (Bradley, 2013), resulting in steady growth with a high level of biological efficiency (Jonathan et al., 2012). Mushroom (*Agaricus bisporus*) production is a lucrative and successful cottage industry for low-income rural households (Lelley, 1988). This industry gives full- or part-time employment to rural and urban poor and marginal people in many developing nations (Moulick & Neogy, 2020). More than one hundred countries worldwide are now engaged in the cultivation of mushrooms. Mushrooms have been considered one essential food item since ancient times, and due to their important function in human health, nutrition, and

illnesses, their intake has increased over time. The edible mushrooms are also a good source of protein, vitamins, and minerals (Barmonet et al., 2012).

World production of mushrooms is growing and now exceeds ten million tons, of which 8.19 million tons are yielded in Asia. The output of southern Asia was 0.19 million tons, of which 0.029 million tons were produced in India. However, the data on mushroom production in Bangladesh is not available. Bangladesh is an agrarian country and one of the most densely populated countries in the world. Therefore, the fruits and vegetables produced by the government can fulfill 65-70% of the national demand. In addition, a significant portion of fruits and vegetables is lost after harvest. As a result, the available fruits and vegetables fulfill only 50% of our requirements (Shakil et al., 2014). In this situation, mushroom cultivation can be new hope for Bangladesh (Rahman et al., 2017).



## MATERIALS AND METHODS

### Study Population

The mushroom cultivation center of the Department of Agricultural Extension (DAE) is located at Savar in the Dhaka district. Farmers collect span from this center and cultivate mushrooms, and mushroom cultivators are closely populated in Savar Upazila. For this reason, Upazila was selected as the population of the study.

### Sampling Technique

As the type of the study is purposive, 121 respondents were selected by following a random sampling method directly involved in the mushroom industry as cultivators.

### Data Source and Collection

A cultivator survey was also administered at Savar Upazila under Dhaka district on an opportunistic basis. The survey collected 121 respondents from May 1 to July 31, 2018. The authors designed a structured questionnaire to capture the most pertinent data on the determinants of mushroom cultivation among farmers in the Dhaka district. Face-to-face interviews are used to collect information.

### Dependent Variable

The dependent variable for this study was the mushroom cultivation experience (in years), which was categorized as "1-3 years as a new cultivator," "4-6 years" mediocre cultivator, and "> 6 years" as an expert cultivator.

### Independent Variables

In the established multivariate model, socioeconomic and demographic factors related to mushroom cultivation were considered covariates. As for our study, gender, respondent age, education, occupation, land size, source of information, scientific cultivation, medicinal value, diabetes control, nutritious food, cultivation intensity, location, source of capital, sale, marketing system, unsold mushroom, packaging.

### Analysis Model

In the bivariate setup, the chi-square test of independence has been applied to assess the association between mushroom cultivation (in years) with selected covariates. Mathematically, the chi-square test statistic can be defined as,

$$\chi^2 = \sum_{i=1}^n \frac{(\text{Observed frequency}_i - \text{Expected frequency}_i)^2}{\text{Expected frequency}_i}$$

This statistic follows a chi-square distribution with  $(\text{Number of row} - 1) \times (\text{Number of column} - 1)$  degrees of freedom.

The binary logistic regression model in a multivariable setup was applied to identify factors associated with mushroom cultivation. The result was presented as OR and 95% confidence interval (CI).

The SPSS statistics 25 (IBM, Corporation, Armonk, NY, USA) was applied for data processing. The R Project for Statistical Computing version 4.0.0 (R Core Team-2019) was used to perform the statistical analyses.

## ANALYSIS AND RESULTS

### Association between socio-demographic factors on mushroom cultivation

A bivariate analysis with two-way contingency tables using Pearson's chi-square test showed that when tested independently, all of the explanatory variables have a significant association with the outcome variable except age group and cultivation intensity, as shown in Table 1.

All the predictors, including education level, occupation, land size, source of information, scientific cultivation, selling the place, medicinal value, nutritional value, location, source of capital, marketing system, and unsold mushrooms, had significant impacts on mushroom cultivation.

Results showed that gender also had a significant impact on mushroom cultivation. From the perspective of experience, it offers a difference in the percentage between males and females. There is a significant ( $p < 0.05$ ) association between gender and cultivation in years. The result also shows that education level, occupation, land size, source of information, scientific cultivation, selling the place, diabetes control, and packaging have significant ( $p < 0.001$ ) associations between them and the cultivation of mushrooms (in all three types of years). It indicates that these independent variables have the highest impact on the dependent variable. Besides, medicinal value, nutritional value, location, source of capital, marketing system, and unsold mushrooms have significant ( $p < 0.05$ ) effects on the cultivation of mushrooms. On the other hand, age and cultivation intensity do not have an impact on mushroom cultivation.

Table 1: Cross-tabulation analysis of mushroom cultivation in years by different socio-demographic characteristics

Characteristics	Types of Mushroom Cultivation			$\chi^2$ value	P-value
	New (%)	Mediocre (%)	Expert (%)		
<b>Gender</b>					
Male	3.8	20.0	76.2	7.30	<0.05
Female	24.0	20.0	56.0		
<b>Age (years)</b>					
≤40	19.3	18.2	62.5	3.18	>0.05
>40	15.2	33.3	51.5		

Characteristics	Types of Mushroom Cultivation			$\chi^2$ value	P-value
	New (%)	Mediocre (%)	Expert (%)		
<b>Education</b>					
No education	0	39.3	60.7	30.65	<0.001
Primary	13.2	44.7	42.1		
Secondary and above	9.1	20.0	70.9		
<b>Occupation</b>					
Mushroom cultivation	0	32.5	67.5	63.23	<0.001
Others	57.9	0	42.1		
<b>Land size</b>					
Landless	0	18.0	82.0	161.34	<0.001
Marginal	0	18.5	81.5		
Smallholder	20.0	30.0	50.0		
Medium size holder	0	14.0	86.0		
Large	0	0.12	88.0		
<b>Source of information</b>					
Mushroom development center	8.3	26.7	65.0	48.13	<0.001
Neighboring farmer	0	33.3	66.7		
Newspaper	0	60.7	39.3		
<b>Scientific cultivation</b>					
Yes	6.6	35.5	57.9	31.21	<0.001
No	0	37.8	62.2		
<b>Medicinal value</b>					
Yes	25.0	18.2	56.8	11.11	<0.01
No	0	33.3	66.7		
<b>Diabetes control</b>					
Yes	6.5	6.5	87.0	66.59	<0.001
No	38.6	50	11.4		
<b>Nutritious food</b>					
Yes	25.0	25.0	50	14.19	<0.01
No	0	15.2	84.8		
<b>Cultivation intensity</b>					
Once	0	0	100	9.20	>0.05
Few times	20.5	26.5	53		
Occasionally	18.5	18.5	63		
<b>Location</b>					
Home garden	25.0	18.2	56.8	11.11	<0.01
Room	0	33.3	66.7		
<b>Source of capital</b>					
Own	28.6	14.3	57.1	19.29	<0.01
Bank	0	31.3	68.8		
Lending from others	0	39.3	60.7		
<b>Sale</b>					
Local market	0	15.2	84.8	69.09	<0.001
City Market	50.0	0	50.0		
Hotels	50.0	0	50.0		
Middleman	0	50.0	50.0		
<b>Marketing System</b>					
Yes	0	40.7	59.3	11.61	<0.01
No	23.4	17	59.6		
<b>Unsold mushroom</b>					
Make it dry	28.3	26.7	45.0	15.97	<0.01
Consume it	0	0	100		
Keep in cold storage	10.0	22.0	68.0		
<b>Packaging</b>					
Yes	31.0	7.0	62.0	33.63	<0.001
No	0	44.0	56.0		

### Identify factors contributing to mushroom cultivation

In binary logistic analysis, all the factors identified significantly associated with mushroom cultivation were included in the multiple logistic regression model.

Results based on multinomial logistic regression analysis for mushroom cultivation are shown in Table 2. To avoid the problem of multi-collinearity, a decision was made to drop some of the viable from the analysis. All

independent variables included in the studies showed a significant relationship with outcome variables. Findings revealed that education level, land size, source of information, and source of capital are significant associations with the mediocre and expert mushroom cultivators. When the cultivators get minimum education, it helps them to understand and adopt new technology and scientific techniques and implement them in case of harvesting. The level of significance between them is ( $P < 0.01$ ). Capital plays a crucial role in

business, who get more worth can purchase more land and adopt the latest technology. The relationship between the source of capital and cultivation in years is significant at ( $P < 0.05$ ). The result also shows that the source of information has a highly effective relationship with the dependent variable at ( $P < 0.01$ ) significance level. Naturally, the cultivators who got enough training and education on mushroom cultivation will do better performance from those who do not have that.

Table 2: Effect of selected variables on mushroom cultivation

Variables	Mushroom Cultivation			
	Mediocre vs. New		Expert vs. New	
	OR	95% CI	OR	95% CI
<b>Gender</b>				
Male	1.16	1.10-1.20	3.35*	2.34-5.79
Female (ref.)	1		1	
<b>Education</b>				
No education	0.12*	0.10-0.24	0.39*	0.20-0.48
Primary	0.22**	0.13-0.25	0.57**	0.16-0.59
Secondary+ (ref.)	1		1	
<b>Occupation</b>				
Mushroom cultivation	5.43	4.90-5.69	5.0	4.0-7.0
Others(ref.)	1		1	
<b>Land size</b>				
Landless	0.08	0.05-0.20	0.58	0.52-1.87
Marginal	0.14	0.04-1.02	0.61	0.53-1.92
Smallholder	0.19	0.09-1.07	0.62	0.54-1.92
Medium size holder	0.58	0.51-1.90	0.65*	0.39-0.49
Large (ref.)	1		1	
<b>Scientific cultivation</b>				
Yes	2.48	2.23-4.87	3.59*	2.64-4.87
No (ref.)	1		1	
<b>Source of capital</b>				
Own	8.1	6.9-9.54	1.49*	0.9-1.7
Bank	0.0		0	
Lending from others(ref.)	1		1	
<b>Source of information</b>				
Mushroom development center	1.22*	1.20-1.24	1.59*	1.20-1.81
Neighboring farmer	1.02**	1.01-1.04	1.37**	1.26-1.54
Newspaper(ref.)	1		1	
<b>Packaging</b>				
Yes	1.20	1.12-1.25	1.24*	1.20-2.45
No (ref.)	1		1	
<b>Sale</b>				
Local market	2.88	1.70-3.1	3.59	2.64-4.87
City Market	5.44	4.34-6.29	6.01*	4.02-8.35
Hotels	6.59	6.0-7.7	9.62	8.79-9.92
Middleman(ref.)	1		1	

## STUDY FINDINGS AND DISCUSSION

As mentioned earlier, the study aims to explore the current profile of mushroom cultivation and give direction to policymakers on the prospects of quality mushroom supply for the domestic market. Being widely known that mushroom cultivation is a highly profitable agri-business compared to vegetables due to its high price in the market.

Bangladesh is an agricultural country and one of the most densely populated countries in the world, with high poverty and suffering from protein malnutrition. In this situation, mushroom cultivation can be new hope for Bangladesh as its climate is reasonably conducive to high-volume mushroom production (Rahman et al., 2017). Analysis to this study, Oyster mushroom is popular in Bangladesh and is used both

as food and medicine to ensure body fitness. Oyster mushrooms naturally contain statins like lovastatin, which is why ingestion of these mushrooms has been linked to lowered cholesterol levels in numerous in vivo studies (Hossain et al., 2003; Khatun et al., 2007).

As per this research, the level of education was a key factor influencing mushroom cultivation, and the particular result was in line with another review in Bangladesh (Ferdousi et al., 2020). Educated young people are mainly involved in mushroom production in Bangladesh. Multivariate analysis shows that uneducated farmers were less likely to cultivate mushrooms for 1 to 3 years and the long term than the secondary and above-educated farmers.

Most farmers operate their function from limited sources and cultivate more likely long-term mushrooms. Multivariate analysis shows that farmers who got information from the mushroom development center were less likely to grow short- and long-term mushrooms with the reference group.

This study attempts to discover the factors associated with growing mushrooms, and as far as we know, there is not much research in this area in Bangladesh. Despite these strengths, this study had some limitations. First, the sample size of this study was not administratively representative due to a lack of funding. Second, due to data limitations, this study cannot take advantage of several important factors that contribute significantly to mushroom cultivation. Third, the data's cross-sectional properties preclude any causal relationships.

## CONCLUSION

This study has been initiated to achieve three research objectives. The first research objective was to find out the problems of mushroom marketing among different stakeholders in Bangladesh. Lack of capital, poor quality seed, insect attack, high temperature in summer, choosing the suitable variety, low temperature in winter, inappropriate trimming of production, and heavy rainfall are the major problems during production. High transportation costs, lack of promotion, a large number of intermediaries, limited wholesale market, proper marketplace, and absence of storage facilities are the major problems during marketing. According to various literature, it is noted that mushrooms are an essential vegetable that is nutritive, and the climate of Bangladesh is suitable for mushroom cultivation.

On the one hand, mushrooms fulfill the lack of nutrition in the body. Besides, many marginal farmers are becoming sustainable by cultivating mushrooms in Bangladesh. So the policymakers of the country's agribusiness sector should pay attention to this aspect. On the other hand, according to the results of this study, it can be pointed out that poverty can be alleviated in

Bangladesh by increasing the amount of mushroom cultivation.

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### How to cite this article

Rahman, M., Islam, M. N., Saha, S., Haq, I., & Hossain, M. I. (2022). An Empirical Analysis of the Factors Associated with Mushroom Cultivation: A Case of Dhaka. *Asian Business Review*, 12(2), 31-36. <https://doi.org/10.18034/abr.v12i2.628>