

## **Assessment of Mushroom (*Pleurotus Ostreatus*) Production in Bohol, Philippines**

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### **Abstract**

The average farm size among Filipino farmers is less than two hectares. Therefore, an alternative crop that does not need a large land area must be considered. For the past years, mushroom production has been gaining recognition globally. Although its production does not require much space, Philippine production is behind compared to other Asian countries such as India, Korea, China, and Thailand. This study was conducted to assess the mushroom production in Bohol province, including its demographic profile, gender role analysis of the growers, the status of mushroom adopters, and its cost-benefit analysis to depict its current condition. A complete enumeration of oyster mushroom producers in Bohol listed by the Agricultural Training Institute (ATI)-Central Visayas served as respondents for the study. Results revealed that mushroom production in Bohol is considered one of the profitable businesses with a benefit-cost ratio per peso investment of 1.10. The results suggest that mushroom production can be a profitable business venture that can be expanded throughout the province. Furthermore, additional knowledge on value-adding is also encouraged to increase the profit among producers.

**Keywords:** Cost-benefit, benefit-cost ratio, gender role analysis

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### **INTRODUCTION**

Most of the poor are employed on family farms (Lowder et al., 2019; Celik and Peker, 2009). While family farms all over the world account for more than 90 percent (Lowder et al., 2019). Rural development objectives in developing countries often focus on increasing job opportunities through diversification of rural income and attaining a competitive structure for agriculture. Small family farmers are disadvantaged as they do not have the large tracts of land needed to produce large crops and raise significant quantities of animals (Celik & Peker 2009).

Likewise, existing agricultural lands are being converted into industrial areas or are owned by elite people, reducing the opportunities for impoverished farmers. Recent literature reviews conducted pointed out that there was a reduction in the average farm size in low and middle-income countries from 1960–2010 (Lowder et al., 2019; Lowder et al., 2016).

In the Philippines, a reduction in the average farm size has been reported from 1960-2000 (Lowder et al., 2019; FAO, 2015). Likewise, farmers in the country have been consistently registered as one of the primary sectors with the highest poverty incidence in the general population since 2006 (FAO, 2018). To ensure sustainable income among small landholder family farmers, mushroom production could be a potential opportunity for them.

Edible mushrooms have been harvested since ancient times. They were used for medicinal properties and have expanded with their current market for nutritional value such as protein, vitamins, and minerals (Khan et al., 2011; Manikandan, 2011). Globally the mushroom market size value was 12.74 million tons (MT) last 2018 and is projected to reach 20.84 million tons (MT) by 2026 with a compound annual growth rate (CAGR) of 6.41% (Fortune Business Insights, 2021.). In many developing and developed countries such as the USA, Great Britain, China, Japan, and Europe, production has become a profitable commercial agribusiness (Kortei et al., 2018). However, mushroom production in the country is relatively low compared to other neighboring countries such as India, Korea, China, and Thailand (Pathania et al., 2017).

Realizing the potential of mushroom production, the Philippine Department of Agriculture (DA) provides oyster mushrooms in the country through community-based programs; Bohol province is one of its recipients (Felisilda, 2014). Likewise, the Agricultural Training Institute (ATI) holds seminars and training on mushroom production for farmers. Despite the government initiative, there are few growers in Bohol, resulting in a limited supply of mushrooms and mushroom products for consumers.

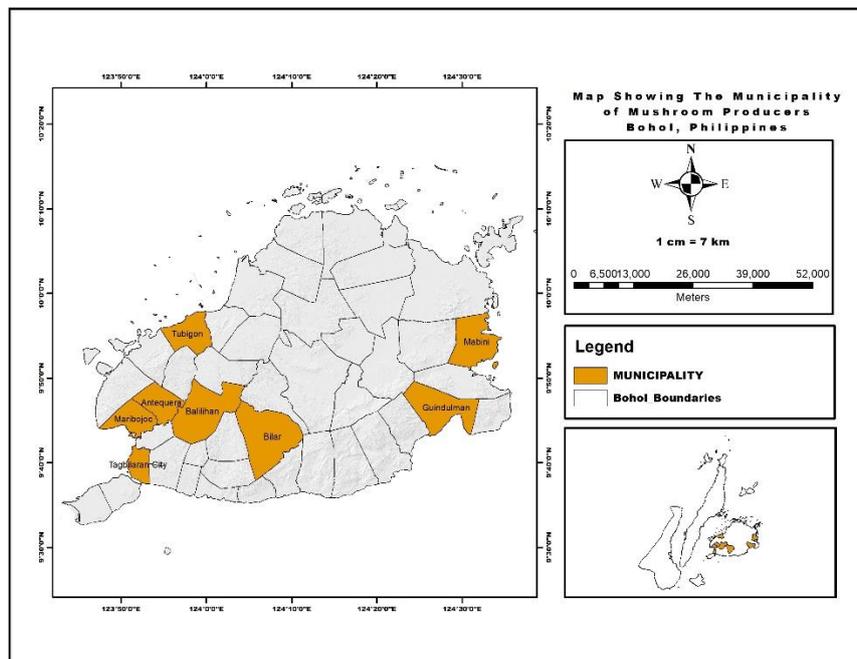
Although mushroom consumption is increasing in the province, and lack of farmland and drought problem arises, the sector is not growing well. As the information on mushroom production in the Philippines is limited, nevertheless, information relating mushroom production to the gender role analysis is not documented.

Gender role analysis determines the concentration of women, men, and children's (boys and girls) activity profiles and the differences in access to and control over resources (FAO, 2014). In many developing countries, women comprise the largest percentage of the workforce in the agriculture sector. They play a predominant role and have an essential economic contribution to agricultural production (de Roo et al., 2016). However, these roles are often unrecognized and/or undervalued. For instance, in some countries, women are still considered subordinates to their husbands or male family members. Their roles in farming are seen as household chores and, therefore, remain unpaid. This, however, does not reflect the contribution of women to agriculture and the rural sector, where they play a significant role in food production and participate in the harvesting, processing, and marketing of agricultural produce (FAO 2018). Thus, closing the gender gap in agriculture is vital to ensure productivity and food security.

The objective of the present study was to determine the demographic profile, gender role analysis of the growers, the status of mushroom producers, and the cost-benefit analysis of mushroom producers in Bohol. With this, the researchers are hopeful that the results would be utilized as a basis for encouraging more Boholano farmers to venture into mushroom production and would serve as a guide in implementing programs by the policymakers, donors, researchers, and extension agents for its success.

## **MATERIALS and METHODS**

A complete enumeration of the 12 mushroom producers in Bohol listed by the ATI-Central Visayas served as the study's respondents. A total of eight (8) municipalities in Bohol served as study sites. This includes the municipalities of Bilar, Guindulman, Tubigon, Tagbilaran, Mabini, Antequera, Balilihan, and Maribojoc (Figure 1). Surveys were conducted from July through October 2019.



**Figure 1.** Map showing the mushroom producers in Bohol, Philippines

A pilot test of the questionnaire on two mushroom growers for small-scale and commercial-type production was first employed to test its validity. The semi-structured questionnaire was modified from the methods of Celik and Peker (2009) and Singh et al. (2010) for the cost-benefit analysis and Abadingo and Macalolot (2015) for gender role analysis. The questionnaire assessed demographic profile, gender role analysis, the current status of mushroom adopters, and cost-benefit analysis of mushroom producers in Bohol. Following the pilot test, the assessment tool was finalized, and one-on-one interviews with the respondents were conducted.

The data gathered on the demographic profile and status of mushroom producers were tallied, collated, tabulated, and analyzed using simple percentages. In identifying the gender role analysis, the frequency of response among the mushroom producers-respondents were used as a basis. On the other hand, the cost-return analysis comprising the total variable cost, total production cost, average selling price (Php/kg), gross returns, net returns, returns over variable cost, benefit-cost ratio, cost of production (Php/kg) and net returns (Php/kg) were calculated following the formulas of Singh et al. (2010).

## RESULTS and DISCUSSION

### Demographic Profile of Mushroom Growers/ Respondents

A total of 12 mushroom growers were interviewed, seven men and five women. Of those interviewed, one was from Antequera, Maribojoc, Tagbilaran, Tubigon, and Bilar; two from Balilihan and Guindulman; and three from Mabini. Most (91.87%) of the mushroom producers in Bohol were married. Twenty-five (25) percent of respondents were housewives with 0-3 years of experience in mushroom production. Housewives participating in mushroom production is a good contributing factor to increase the socio-economic status per household. Government employees, businessmen/women, and farmers are also involved in the production (16.67% equally). This denotes that mushroom production in Bohol has been gaining recognition not only from the local farmers but from the professionals as well.

**Table 1.** Demographic Profile of the Mushroom Grower-Respondents

Item	Frequency	Percentage (%)
<b>Civil status</b>		
Single	1	8.33
Married	11	91.67
<b>Occupation</b>		
Government Employee	2	16.67
OFW	1	8.33
Housewife	3	25.00
Businessman/Woman	2	16.67
Farmer	2	16.67
Seaman	1	8.33
Instrumental Engineer	1	8.33
<b>Educational Attainment</b>		
Elem. Level	0	0.00
Elem. Graduate	0	0.00
Secondary Level	0	0.00
Secondary Graduate	2	16.67
College Level	1	8.33
College Graduate	9	75.00
<b>Training/seminars</b>		
Mushroom Growing and Harvesting	11	91.66
Business Aspect, Mushroom Marketing	1	8.33
Mushroom Substrate	12	100.00
Food Processing	7	58.33
<b>Experience in Mushroom Production</b>		
0-1 years	4	33.33
2-3 years	4	33.33
4-5 years	3	25.00
6-7 years	1	8.33

All respondents participated in substrate preparation, and almost all (91.66%) attended the topics on mushroom growing and harvesting. Additionally, a majority (58.33%) had attended food processing.

This suggests that while initial trainings are successful, there is a need to conduct subsequent trainings, such as marketing strategy for the producers. Considering their length of experience in mushroom production, there are also indications of a need to conduct more seminars and training, which would broaden the producers' expertise.

## Gender Role Analysis

The gender role analysis of mushroom producers in Bohol reveals that, except for harvesting, all operation decisions are made by males. Similar results were observed in actual operations in that only harvesting and marketing were the domains of the women. Male dominance in the growth stages of mushroom production should be considered when conducting seminars and training. However, this also emphasizes the need to expand these skills to women in production. Conversely, harvesting and marketing are currently dominated by women. Gender roles are important considerations so that the seminars to be given will fit their actual roles in the operation but also be used as a platform to expand roles. Children are rarely involved in the decision-making and actual operation of mushroom production. There is a need for them to be trained or developed to ensure the sustainability of mushroom producers within the household.

**Table 2.** Gender Role Analysis in Mushroom Production in Bohol

Farm Operation	Decision Making				Actual Operation			
	Men	Women	Boys	Girls	Men	Women	Boys	Girls
Spawn/Seed Selection	√		√		√		√	
Substrate Preparation	√		√		√		√	
Fruiting bag Preparation	√		√		√		√	
Incubation	√		√		√		√	
Fruiting	√		√	√	√		√	
Harvesting		√	√			√	√	
Marketing	√		√			√	√	

## Status of Mushroom Producers

A majority (58.33%) of mushroom producers have conducted a market survey for price demand, indicating that producers in Bohol had prior knowledge of the market survey. It also indicates that they have further plans to develop a business venture. Furthermore, almost all (91.67%) producers have less than 500 pieces of fruiting bags during production. As such, most (41.67%) of them had an abundant quantity with very good quality on the first production. An equal number of growers consumed mushrooms on a daily/weekly basis depending on their food menu and the availability of their harvest. This correlates with the mode of product utilization in which all respondents reported consuming their produce at home as part of their food menu.

Despite the high reported consumption levels within the home, producers are all motivated by pricing and marketability to sell their products outside the home. Two of the areas indicated for sale were the local market and restaurants, implying profitability in expanding the production within the province.

**Table 3.** The status of mushroom producers

Item	Frequency	Percentage (%)
<b>Market Survey</b>		
Yes	7	58.33
No	5	41.67
<b>No. of Fruiting Bags</b>		
0-500 pcs	11	91.67
501- 1,000 pcs	0	0.00
1,001-1,500 pcs	0	0.00
1,501- 2,000 pcs	0	0.00
2,001- 2,500 pcs	0	0.00
2,501- 3,000 pcs	1	8.33
<b>Quality of produced</b>		
Excellent	3	25.00
Very good	5	41.67
Good	4	33.33
Fair	0	0.00
<b>Quantity of first produced</b>		
Few	5	41.67
Abundant	7	58.33
<b>Frequency of mushroom consumption</b>		
Daily	5	41.67
Weekly	2	16.66
Bi-weekly	5	41.67
Monthly	0	0.00
<b>Motivation for continuing mushroom production</b>		
Better marketability	11	91.66
Better price	12	100.00
<b>The possible market for mushroom</b>		
Hotel	2	16.66
Market	7	58.33
Restaurant	7	58.33
Co-growers	5	41.67

### **Cost and Returns from Mushroom Production**

Fixed costs were the incubation room and growing area, while the variable costs were labor, electricity, compost, and spawn. These costs resulted in an average of PhP 11,676.70 per 100 fruiting bags. The average mushroom production in the province per 100 fruiting bags is PhP 54.65 per kilogram, with an average selling price of PhP 235.45 per kilogram, creating a net return of mushroom per kilogram of PhP 21.78. Therefore, the benefit-cost ratio of mushroom production per peso investment is 1.10. Similar profitability findings have been observed in Turkey, Tanzania, and Thailand (Celik and Peker, 2009; Marshal and Nair, 2009), further supporting the stability and potential of the industry. The results imply that mushroom production can be an alternative and or supplementary source of income among small landholders in the province whose average annual income is PhP 110, 000.00 (or 9,166.67 per month).

**Table 4.a.** Break-up of Cost of Mushroom Production in Bohol Per 100 fruiting bags  
(size: 6 x 12 x 0.002)

Particulars	
<b>A. Fixed Cost</b>	
i. Depreciation on Incubation room	5740.56
ii. Depreciation on Growing area	33.33
Total	PhP 5773.89
<b>B. Variable Cost</b>	
i. Labor Charges	5290.38
ii. Electricity Charges	147.59
iii. Compost	101.50
iv. Spawn	363.33
Total	PhP 5902.80
Total (A+B)	PhP 11,676.70

**Table 4.b.** Cost (Php) and Returns of Mushroom Production in Bohol per 100 fruiting bags  
(size: 6 x 12 x 0.002)

Particulars	
Total variable cost	5902.80
Total production cost	11676.70
Mushroom production (kg)	54.65
Average selling price (Php/kg)	235.45
Gross returns	12867.19
Net returns	1190.49
Returns over variable cost	6964.38
Benefit-cost ratio	1.10
Cost of production (Php/kg)	213.67
Net returns (Php/kg)	21.78

## CONCLUSION

The results of the study show that most of the mushroom growers are married and housewives, which is an excellent contributing factor to increase their socio-economic status per household. Furthermore, mushroom producers are not only local farmers, but some are professional as well, creating a diverse population with differing networking opportunities. Basic seminars and training appear to be well attended by growers, but additional opportunities must be present to expand the sector. When considering the mushroom production gender roles in the present study, gender should be considered when hosting such educational opportunities.

Mushroom production in Bohol was a profitable business venture in the province with a net return of Php 21.78 per kilogram and a benefit cost-ratio per peso investment of 1.10. It has been shown to be successful, even as a secondary business venture. Additionally, the government scheme appears to be working as citizens are engaged in the production of mushrooms. However, there are indicators that additional educational opportunities and consideration of gender roles would help expand production within Bohol.

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