

Training and Feasibility Study of Oyster Mushroom Cultivation at Ganda Mandiri Farmer Group in Sukamanah Village, Ciamis Regency

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Abstract Oyster mushroom cultivation is one solution for improving a community's economy. In mushroom cultivation, is necessary to pay attention to various things that support the success of its production. The success of the production of seeds and bag logs of oyster mushrooms is an indicator of feasibility in this business. Success in production can be judged from a large amount of production enabled by hyalinizing the risk of failure. The parameters of the feasibility or success of the business require a cost analysis that is appropriate to the conditions and needs. One of the farmer groups that carry out mushroom cultivation business is Ganda Mandiri Farmer Group in Sukamanah Village, Ciamis Regency. The purpose of this community service was to increase the target farmers' understanding and improve their skills in mushroom cultivation and determine the feasibility of oyster mushroom cultivation for the farmer group. The methods used during this activity were interviews and direct observation of the farmer group's business activities. After the counseling and training, it was found that the farmer group's members showed a significant increase in their skills, especially in making seeds. This farmer group could produce as many as 7,200 bag logs within 4 weeks. The result of the analysis of the R/C ratio was 2.51. The results of the cost analysis could be used as an indicator of the feasibility for a business, and the oyster mushroom cultivation business run by Ganda Mandiri Farmer Group was said to be feasible and profitable.

1. INTRODUCTION

The development of agriculture in the food sector, especially horticulture currently is aimed at further strengthening food self-sufficiency, increasing people's incomes, and improving nutritional conditions through diversification of foodstuffs. In general, Indonesia as a country with a tropical climate has great potential to develop agricultural products, especially horticultural products like fruits, vegetables, and edible mushrooms (Pramudya & Indra, 2012).

The main function of horticultural plants is not only as food but also relates to health and the environment. Horticultural plants have several functions; they function as food provider, especially in terms of providing vitamins, minerals, fiber, energy, and other compounds for nutritional

fulfillment; they also has an economic function, namely the source of farmers' income in that in general horticultural commodities have high economic values through trade and industry; these plants also has a health function as fruits and vegetables and especially biopharmaceuticals can used to prevent and treat diseases; finally, they have a socio-cultural function as an element of environmental beauty/comfort, ceremonies, tourism, and others (Khusnul, 2019)

Mushrooms are one of the horticultural commodities that can be used as food and a nutraceutical (any food and beverage for disease prevention and treatment). Mushroom cultivation has quite bright prospects in Indonesia because its natural conditions are very supportive. In addition, the ingredients and

and raw materials for making substrate or mushroom planting logs are quite abundant. Indonesia has the potential to become one of the leading edible-mushroom-producing countries because it has various types of mushrooms that are highly nutritious and can be used as health products. This can be one of potential for the state's revenue.

Edible mushroom or food mushroom is a term for a type of mushroom that can be consumed and used as a food ingredient and does not contain toxins or poisons that are detrimental to health; such mushrooms can be either cultivated products or those harvested from nature. Edible mushrooms are the most common mushrooms consumed by people. The preparations of mushroom for food can vary depending on needs or purposes. As an example, oyster mushrooms whether they are white, brown, red, or ear mushrooms can be made chips for snacks and their taste is delicious. This mushroom contains complete nutritional components that include essential amino acids, fiber, minerals, and vitamins as well as a high content of unsaturated fatty acids. These superior contents of edible mushrooms made them ideal for alternative food ingredients to substitute meat. Some edible mushrooms even contain several active compounds that are used for disease treatments (Khusnul, 2019).

There are 600 types of edible mushrooms in the world that are usually consumed by humans. However, 200 types of mushrooms can be consumed, and 35 types of them have been cultivated commercially. These edible mushrooms include edible mushrooms, ear mushrooms, and oyster mushrooms. These three mushrooms are superior in terms of taste, nutrition, texture, color, and they have many benefits compared with other edible mushrooms. Oyster mushrooms can be cultivated in most parts of Indonesia which have warm temperatures. The mushroom cultivation process is also not too complicated, and the market segmentation is also wide because the price is very affordable (Pratiwi, 2010).

White oyster mushroom is known to reduce cholesterol content, as an antibacterial, antioxidant, antitumor, anticancer, and antiviral agent due to D-glucans contained in this mushroom. An active component of oyster mushrooms, namely statins, can lower cholesterol. The presence of fiber which is high has made this mushroom a diet food consumed to overcome digestive problems (Ummiyatie, et al. 2013).

The opportunities and good uses of this mushroom can motivate a mushroom farmer community to cultivate mushroom more seriously. In general, the cultivation technology applied by mushroom farmer groups is the use of sawdust. This powder is used as a substrate (bag log) which is packaged in a heat-resistant plastic bag, and the use of cereals or ground corn is widely used as a substrate for fungal growth as seeds. The characteristic of oyster mushroom's growth in sawdust substrate bag log media is that within 40 to 60 days the entire surface of bag log would have been overgrown by white fungal mycelium. On the other hand, mushroom's growth in the seedling medium can grow within about 15 to 20 days. In bag log medium, within one to two weeks after bag log is opened,

shoots will usually grow within two to three days, and they will become perfect fruit bodies to be harvested. The growth of fruit bodies at harvest time would show the width of the hood that is between 5cm and 10cm. Mushroom production is carried out by harvesting fruit bodies 4 to 5 times with an average of 100 grams of mushrooms per harvest. The interval between each harvest is 1 to 2 weeks. The mushroom growth process depends on the cultivation technique used (Parlindungan, 2003). Generally, oyster mushrooms are cultivated in high plains because their temperature and humidity are more suitable for the mushrooms' growth. Oyster mushroom generally requires an optimal temperature of around 22-28°C with room humidity from 60% - 70%.

During mushroom cultivation, it is important to pay attention to marketing activities. In general, marketing channels can be distinguished into two channels, namely: direct marketing and marketing through intermediaries. If marketing is carried out directly, the price set by the producer is the same as the price paid by consumers. Therefore, the producer are able to set reasonable prices, and the consumers can have high purchasing power; in addition, the consumers can purchase fresh products directly from the producer while marketing through intermediaries will involve another trader (Zikri, et al. 2015)

One of the farmer groups that cultivate oyster mushrooms in Tasikmalaya is "Ganda Mandiri". This farmer group had been established for more than five years. Since it had been established, this group has improved quite well in doing its business, but in the past few months, it had experienced several problems, namely that the quality of the seeds produced has decreased and there had been a risk of contamination in the planting media (Bag log). The existence of the group is very much needed by many mushroom farmers in the Priangan area of West Java, such as Banjar. Currently, they still depended on the availability of bag log produced by Ganda Mandiri. Its success and increase in productivity would greatly affect the financial states of the mushroom farmers. This year, the farmers experienced a decrease in their productivity. Some even discontinued their business because they suffered a lot of losses. To overcome these problems, efforts needed to be made to pay close attention to each process in mushroom cultivation. In response to this, an increase and a development of mushroom cultivation would be carried out. The solution was to provide an extension on mushroom cultivation by focusing on the failure factors in mushroom cultivation, production of quality seeds, and rapid growth of bag log with thick mycelium.

The purpose of this community service was to increase the target farmers' understanding and skills in mushroom cultivation and determine the feasibility of oyster mushroom cultivation by Ganda Mandri farmer groups

2. METHOD

The methods that were used during this community service program to help overcome the problem in mushroom cultivation experienced by Ganda Mandiri Farmer Group were as follows.

2.1 Improving farmers' knowledge and skills

The first step was providing extension and assistance in mushroom cultivation, and this was done by the community service team. The materials presented were related to failure factors in mushroom cultivation, the process of selecting pure isolator, producing superior seeds (F0) (Khusnul, 2019), producing quality seeds (F1), the rapid growth of bag log with large yields, renovation seed production room, and seed incubation room and provision of autoclave for seed sterilization. This activity also covered the process of growing and maintaining mushrooms and analyzing the cost and benefits of oyster mushroom cultivation.

2.2 Feasibility Study of Oyster Mushroom Cultivation

The data collection techniques used to collect the data that were then used to analyze the cost of profit referred to the research done by Hendra Habibi & Siska Fitrianti (2018). These techniques are as follows.

a. Interview

This was the process of obtaining profit/information using direct questions and answers between the questioner or interviewer and the respondent. The respondent interviewed was the chairman or owner of Ganda Mandiri. Some of the questions that formed the basis for calculating the feasibility analysis of oyster mushroom cultivation were as follow.

1. Mushroom Cultivation Investment Cost
 2. Depreciation Cost of Oyster Mushroom Cultivation Equipment
 3. Fixed Costs (Raw material for seedling and bag log production)
 4. Labor Cost
 5. Other costs
- b. Observation

This was a data collection technique that was done through direct- observations of the object under study.

3. RESULT AND DISCUSSION

3.1 Oyster Mushroom Cultivation and Training

The extension and training activities were attended by approximately 120 participants including members of the Ganda Mandiri Farmer Group. This event was held on Tuesday, July 2nd, 2019, at the Graha Husada Hall STIKes Bakti Tunas Husada (BTH) Tasikmalaya. This location was chosen considering that it was very strategic and could be reached by training participants and also attended by several members of the STIKes BTH academic community, who were both students and employees. To find out the response to understanding the knowledge of the extension and training, the participants were asked to fill out several questions before the extension (pre-test) and after the training (post-test).

The materials were delivered through a lecture complemented with PowerPoint slides that were presented via an LCD projector. The extension material was delivered by the community service team. The presentation of this material was directed at the introduction of fungi in general and other information that comprised the characteristics of fungi, its reproduction, tips in mushroom cultivation, its

harvesting process, and how to market mushrooms.

The steps in the process of making oyster mushroom seeds, presented to the participants, according to Khusnul (2019) were as follow.

1. Tools and materials that need to be prepared comprised a 220 ml clear glass bottle, sieve, basin, autoclave, LAF, spatula, sprayer, gloves, incubation rack, wood sawdust, ground corn, cotton, Samson paper, rubber bands, water, alcohol, and F1 oyster mushroom seeds.
2. Ground corn is soaked in clean water for one day so that it would become soft.
3. The ground corn is washed under running water until it is clean. Wood sawdust is sifted.
4. Milled corn and sawdust are mixed in a ratio of 25:1.
5. A mixture of wood sawdust and ground corn is put into a glass bottle for F2 seed medium, covered with cotton and Samson paper, and tied with a rubber band.
6. The mixture of materials is put into a bottle, and the bottle is then put into an autoclave for sterilization
7. The sterilization process is done at a temperature of 121°C with a pressure of 2 atm for 30 minutes.
8. The next process is that oyster mushroom F1 seeds are inserted or inoculated on a sterile seed medium. F2 seeds are then incubated for 15 to 20 days at room temperature.

The processing of planting media materials or bag log was carried out according to Khusnul (2021) through the following steps.

- a. 100 kg of sawdust (sengon wood or any kind of softwood) mixed with 15 kg of rice bran, 0.6 kg of gypsum, 3 kg of corn bran, and 1.4 kg of lime. Mix or stir these materials until evenly distributed using a shovel. The mixing is firstly done to the material with the smallest weight.
- b. After the ingredients are mixed evenly, give enough water or until the material is already gripped.
- c. Put the mixture of materials into PP plastic or polypropylene 0.5 - 0.6 which will later be used for cultivation. The bottom of the plastic is slightly folded, so that the planting medium can later be erected. Pour the sawdust while compacting it by beating it down.
- d. The growing medium is then pasteurized or steamed using an autoclave. The bag log is pasteurized for ± 4 hours (until 1 cylinder of 3 kg gas is used up).

The enthusiasm of the participants could be observed during the extension session, in which they responded actively and positively by asking various questions about points presented in the PowerPoint slides. There were many interesting information that the participants did not know before they attended the session, especially those related to the biological theory of oyster mushrooms. After the extension session was completed, the event continued with training in making seeds and bag log of oyster mushrooms (Figure 1). Before the training activity began, all participants filled out a questionnaire that related to their ability to cultivate mushrooms. The results of the survey are shown in Figure 2.

This training session was comprised of making agar media for F0 seeds and seed inoculation techniques, as well as tips and tricks in making high-quality seeds.

These activities are shown in the image below. It was hoped that after the extension and training sessions, the participants would be able to implement the learn methods, so that they could increase the productivity of oyster mushrooms in Tasikmalaya. After these sessions were completed, this community service program continued with carrying out a business feasibility analysis for the Ganda Mandiri Farmer Group.



Figure 1. Mushroom Cultivation Training Activities

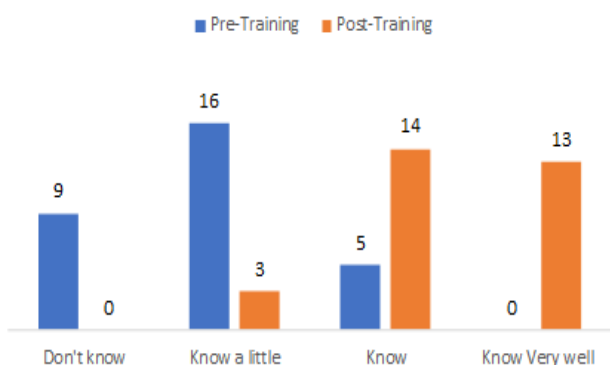


Figure 2. The results of the pre and post training survey

3.2 Cost Analysis of Oyster Mushroom Bag log Business at Ganda Mandiri Farmer Group

The analysis of bag log production costs in the oyster mushroom business was aimed to calculate the pending in the production of white oyster mushroom seeds that comprised equipment costs, material costs, investment costs, depreciation costs, labor costs, and other costs (electricity and water, and transportation). The mushroom cultivation room in Ganda Mandiri was divided into two rooms, each of which consisted of one inoculation room, one incubation room, and one room for mushroom cultivation.

The raw materials needed in producing white oyster mushrooms were sawdust, bran, lime, gypsum, PP plastic, firewood, rubber bands, rings and collars, seeds, spirit, alcohol, water, newsprint, and matches. The labor cost incurred in the production of the white oyster mushroom business was the labor costs of making oyster mushroom bag logs. The equipment used in the cultivation of oyster mushrooms in producing 4000 bag log had decreased in value which is usually included in the depreciation cost. The amount of depreciation expense for

one period that is equal to three months was IDR 1,141,011. Electricity cost for the oyster mushroom business unit at Ganda Mandiri Farmer Group in producing seeds and bag log was the expense for electricity bill and the average monthly use of electricity for water pumping machines. The sterilization process required LPG for seed production and firewood for bag log sterilization, so transportation cost was required for the delivery of the firewood. The concept of this cost analyst referred to the research carried out by Hendra Habibi & Siska Fitrianti (2018).

Table 1. Analysis of Profit and Loss of Oyster Mushroom Production and Bag log

No	Cost Description	Cost (IDR)	Total (IDR)
1.	Main Income	78,000,000	
	Total main income		78,000,000
2.	Cost depreciation	1,414,011	
	Raw material cost	15,651,600	
	Labor cost	13,760,000	
	Miscellaneous expense	210,000	
	Total Cost		31,035,611
3.	Profit		46,964,389

1. Financial analysis

b. Estimated income for one production period was IDR 78,000,000

c. Estimated cost of one production period was IDR 31,035,611

d. Estimated profit for one production period was IDR 46,964,389

2. R/C ratio Analysis

$$\begin{aligned} \text{R/C ratio} &= \text{Income} / \text{total cost} \\ &= 78.000.000 / 31.035.611 \\ &= 2.51 \end{aligned}$$

The above calculations illustrate that the oyster mushroom cultivation business was feasible because the R/C ratio value was greater than one. The oyster mushroom business at Ganda Mandiri farmer Group could be said to be efficient because it had a revenue-to-cost ratio value that was more than one (R/C Ratio > 1). Therefore, the white oyster mushroom business activity was feasible because it could provide greater revenue than the expenditure (Habibi & Fitrianti, 2018).

3. Break Event Point (BEP) Analysis (Habibi & Fitrianti, 2018)

Bag log Production Operational Costs

$$\begin{aligned} &= \text{Bag log Material Costs} + \text{Labor Costs} + \text{Other Costs} + \\ &\text{Depreciation Costs} \\ &= 4,473.600 + 12,560.000 + 210,000 + 1,414,011 \\ &= 18,657,611 \end{aligned}$$

$$\begin{aligned} \text{BEP bag log price} &= \text{operating cost} / \text{total bag log production} \\ &= 18.657.611 / 7200 \\ &= 2,591 \end{aligned}$$

The BEP calculation of bag log price above shows that by producing and maintaining 7,200 oyster mushroom bag logs, the turning point is reached if the bag log price is IDR2,591/bag log.

$$\text{BEP bag log production} = \text{operating cost} / \text{bag log price}$$

$$= 18.657.611/2500$$

$$= 7,463$$

The BEP of bag log production above shows that with a selling price of IDR2,500/bag log, the turning point is reached if 7,463 bag logs are sold.

4. CONCLUSION

This activity was attended by more than 100 participants who were mostly mushroom farmers who were the members of Ganda Mandiri Farmer Group. The participants were very enthusiastic in participating in both extension and training sessions. Through these activities, they could increase their knowledge and skills in mushroom cultivation. Through the optimization of bag log production carried out at the farmer group starting, they could produce 7,200 bag logs within 4 weeks. The result of the analysis of the R/C ratio was a value of 2.51. The results of the cost analysis could be used as an indicator of the feasibility of a business. In addition, the oyster mushroom cultivation business run by Ganda Mandiri Farmer Group was said to be feasible and profitable based on the results of the calculation of cost analysis or business feasibility.

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CONFLICT OF INTERESTS

We declare that there are no known conflicts of interest in this publication. Also, there is no financial support for this work that could have influenced its outcome. The authors also have read, proof-read, and approved this manuscript entitled "Training and Feasibility Study of Oyster Mushroom Cultivation at Ganda Mandiri Farmer Group in Sukamanah Village, Ciamis Regency". The contact person in charge during the editorial process is the corresponding author.

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