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Production Efficiency of Oyster Mushroom MSMEs in East Java Province

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ABSTRACT

The phenomenon and problems found in the field are that many experienced oyster mushroom farmers who have been in business for more than four years have experienced a decline in turnover or profits and have even stopped their businesses. This is due to several factors, and a solution or answer must be found so that people who cultivate oyster mushrooms in East Java Province can run their businesses and improve them. One solution is to improve production efficiency by utilizing information from the internet, such as research journals and e-books related to oyster mushroom production. The objectives of this study are 1) to determine the production efficiency of oyster mushroom MSMEs using the methods that have been implemented, 2) to implement production efficiency by replacing nutrients with better ones and production energy, and 3) to apply production efficiency by replacing production energy. The research method used was qualitative research with a PAR (Participatory Action Research) approach. The results of the study showed that the percentage increase in the economic value of the second production compared to the first production after several changes was 195.325%, while the percentage increase in the economic value of the third production was 308.848%. Therefore, it can be concluded that the third production has a very high economic value for the community engaged in oyster mushroom production in East Java Province.

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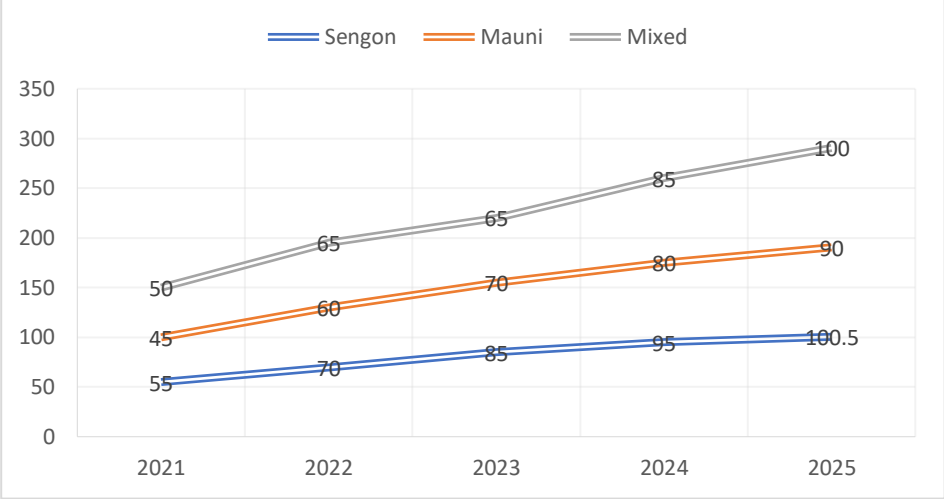
1. INTRODUCTION

This study is a continuation of a previous study entitled Marketing Analysis of Factors Influencing the Amount of Oyster Mushroom Farmers' Harvest Production in Tulungagung Regency. This follow-up study was conducted because several phenomena and problems were found in the field, namely that many experienced oyster mushroom farmers who had been in business for more than four years experienced a decline in turnover or profits and even stopped their businesses. This is caused by several factors, and a solution or answer must be found so that the community, especially those who utilize unproductive narrow land and generally the community who cultivate oyster mushrooms in East Java

Province, can run their businesses and improve their businesses, which will also have an impact on improving the community's economy because it will certainly sequentially improve the economy of the community in the East Java region.

In addition, another reason why solutions and answers to these problems need to be found immediately is because the results of the study on the Utilization of Narrow and Non-Productive Land for Oyster Mushroom Cultivation in Boyolangu District, Tulungagung Regency, stated that oyster mushroom cultivation was able to survive and thrive during the COVID-19 pandemic that occurred in 2019. This is in stark contrast to other business sectors that experienced a decline and even bankruptcy during the COVID-19 pandemic. Therefore, for these reasons, the oyster mushroom cultivation sector should be given attention and maintained. This can be proven based on observations and interviews conducted on July 6, 2025, with Mbak Nur and Mas Bram, oyster mushroom collectors in the East Java region who are active in Tulungagung Regency. They stated that the demand for oyster mushroom agricultural products continues to increase, in contrast to the supply offered by all oyster mushroom farmers in Tulungagung Regency.

Based on previous research, the decline in turnover or profits of mushroom farmers is caused by several factors, including the selection of inappropriate raw materials, rising raw material prices, the high cost of energy used in the production process, and the community's lack of knowledge about the efficiency or effectiveness of the right composition in the production process to obtain a good harvest. Interviews with several mushroom farmers in Tulungagung Regency (Kec Karangrejo, Boyolangu, Karangwaru, Kedungwaru, Bandung, Pakel, Ngunut, and Rejotangan), Blitar, kediri and trenggalek revealed that the scarcity of raw materials (sawdust) is caused by several factors, including factories from other cities that use sawdust (wood sawdust) to generate energy in the production process and buying it at a higher price than that paid by oyster mushroom farmers, resulting in raw material (wood sawdust) suppliers prioritizing these factories over mushroom farmers due to the price difference. In addition, this phenomenon or problem has given rise to a new series of problems. Observations in January 2024 revealed important information that the price of sawdust.



Figur 1. Price Sawdust

The price of one pickup truck load of sengon powder in 2021 is IDR 550,000 and continues to increase year on year until in 2025 the price will be IDR 1,050,000. The price of sengon powder has never decreased, even with this continuous increase in price. The quality and amount of mushroom logs that can be produced from 1 pickup truckload of powder is unknown because the contents of each supplier's truckload are not the same, depending on their Islamic ethics and the compaction process they use. Next is the price of powder made from mauni wood or a mixture (sengon and mauni). This is due to

adjustments to the prices paid by factories and the tactics of drivers who prioritize delivering sawdust to farmers willing to pay more than other mushroom farmers, as no substitute material has been found for oyster mushroom cultivation.

Then, energy for the production process became the second factor that could reduce the turnover of people who have oyster mushroom cultivation businesses. Based on observations in March 2024, it was found that some farmers in the Rejotangan District used oil fuel, which cost Rp 4,000 per liter, while for one sterilization (steaming) process, 10 liters of oil were needed for 110 logs. Then, in June, there was a phenomenon where the community had difficulty obtaining LPG gas, which was then experienced by people who have oyster mushroom cultivation businesses. This has an effect on the production process because some mushroom farmers use gas energy for sterilization or steam. As stated by farmers in Simo and Waung villages, to obtain gas, they have to travel to several areas outside their region, which increases transportation costs.

The third factor is reading literacy or public knowledge about nutritional composition in the production process. Some people are unaware and afraid that adding rice bran without steaming it first could increase the risk of failure in the production process. In fact, agricultural yields will increase significantly if the production process is successful because the harvest will be heavier with more and better quality nutrients.

These factors led researchers to conduct a study entitled "The Production Efficiency of Oyster Mushroom MSMEs in East Java Province in the Era of Digitalization." The study was conducted in East Java due to the decline in agricultural yields and the fulfillment of agricultural needs in various cities in the East Java region, which are passed through Surabaya. Production in Tulungagung City, especially oyster mushrooms, has now declined by almost 90%.

COMMUNITY ECONOMICS

Empowerment is a term that refers to the granting of power or capabilities to parties that have been weak or to communities that are economically disadvantaged or politically and structurally marginalized. There are three keys to empowerment: participation, transparency, and democracy. Empowerment requires the active and equal participation of three groups, namely the government, the private sector, and the community, in economic projects. With full and active participation in a democratic atmosphere, the expected results are the allocation of economic resources, distribution of benefits, and accumulation, thereby achieving economic improvement or increased income and welfare for the underprivileged, who have been marginalized.

Economic empowerment of communities should be one of the most important themes in community development, and it should be aligned and oriented in line with the new paradigm of development approaches because empowerment is a long-term project. The long-standing top-down development paradigm needs to be reoriented towards a bottom-up approach that places communities or farmers in rural areas at the center of development, or as Chambers in Anholt (2001) often refers to as "put the farmers first." (Nasution, 2023)

Community empowerment and economic improvement are key priorities in national development, so appropriate and concrete measures and strategies must be pursued to ensure rapid, effective, and sustainable economic growth for communities. In addition, community empowerment and economic improvement are expected to advance community life toward a better, more developed, and more independent future. Community economic improvement includes several things, among others, the regulation of ownership of production factors, productivity efficiency, digital marketing, strengthening distribution supervision and searching for marketing distribution channels so that the community can receive sufficient profits or results to strengthen their mindset to seek information, knowledge, and perform skills that will be implemented in many aspects of life.

In reality, developing the economic potential of the community is carried out in various ways but still aims to improve and streamline productivity in various fields carried out by the community, improve human resource capabilities and utilize natural resources to increase economic value and seek

opportunities from things that do not yet have economic value in the community. This improvement in the community's economy can be an indication of an improvement in the social class within the community in avoiding poverty and backwardness, and to achieve this, participation and creativity are needed.

The most important goal of community empowerment is to achieve equitable social justice among disadvantaged communities. Social justice is equality of rights in politics and society to provide peace and comfort to the community in an effort to help and learn through development with small steps in order to achieve greater goals (Imran & Indriani, 2022).

PRODUCTIVITY EFFICIENCY

Productivity is the main goal in every industrial activity. Productivity is a comprehensive and thorough measurement of the quantity and quality of raw materials or services produced by workers, machines, or resources as inputs in the form of output. Productivity connects the results or output with the quantity of inputs to obtain the desired product (Rieska, 2021).

Productivity involves two approaches, namely:

1. Optimizing resource utilization

   Optimizing the use of resources is one of the steps in resource efficiency, both in terms of raw materials and human resources, which are inherent in economic productivity. For example: scheduling the ordering of raw materials according to demand, adding suppliers to improve time efficiency, storing raw materials away from the effects of weather or pests, adding nutrients to improve productivity and fermentation, eliminating waiting time in the production process, changing the work system for human resources, minimizing defects, and so on.

2. Increasing output value

   Increasing output value is largely supported by the technology used in productivity. The technology used in oyster mushroom cultivation is a mixer that is useful for accelerating and facilitating the mixing of nutrients with other ingredients (such as water, lime, etc.), thereby saving time, money, and energy in this process. Then, electric or diesel-powered presses are used, adopting the latest technology to accelerate the input of oyster mushroom growing media, resulting in more precise timing and better compaction than using manual labor.

PRODUCTION & TECHNICAL EFFICIENCY

Production efficiency is a company's ability to produce output at a certain level of quality at a lower or minimal cost. In production, efficiency is the ratio of inputs to outputs, meaning the achievement of maximum output with a minimum amount of inputs. To determine the maximum profit from oyster mushroom cultivation, research is needed on how much profit can be made by increasing the production efficiency and technical skills of oyster mushroom farmers in East Java Province, which is one of the regions where oyster mushrooms are cultivated**.**

Technical efficiency is a condition in which a company combines inputs to produce a certain output as cheaply as possible (Nugroho, 2021). It states that businesses that utilize natural resources, such as agriculture, are technically efficient if they can be compared to other farmers, if the same type of production and amount of inputs result in a higher physical output or more yield and economic value.

In oyster mushroom cultivation, technical efficiency is influenced by the quality and quantity of production factors used. The combination of raw materials, amount of nutrients, choice of energy sources, selection of seeds, and labor can affect the level of technical efficiency. The proportion of each production factor used varies among oyster mushroom farmers, so each farmer has a different level of efficiency. A farmer can be said to be more efficient than other farmers if he or she is able to use fewer or the same amount of production factors as other farmers, but can produce the same or even higher yields than other farmers.

PRICE EFFICIENCY

Price efficiency is the relationship between output produced and costs incurred. Price efficiency can be achieved if profits can be maximized, i.e., by equating the marginal product of each factor of production with the selling price in the market. Price efficiency occurs when the value of the marginal product is equal to the price of the relevant factor of production. If oyster mushroom farmers earn large profits from their farming business, for example due to the effect of prices on weighted crop yields, then these farmers can be said to have allocated their farming inputs efficiently.

ECONOMIC EFFICIENCY

Farmers who have good production and can sell their produce at high prices relative to their input costs are able to achieve technical efficiency and price efficiency, which can be said to have achieved agricultural production economics (Primatami & Ayuningtyas (2022). The concept used in economic efficiency is to minimize costs, meaning that a production process will be economically efficient at a certain level of output if there is no other process that can produce similar output at a lower cost. In oyster mushrooms, economic efficiency is influenced by several factors, including the selling price of the harvest (kg), the amount of harvest per bag log (kg), and the total production cost (TC) used. The selling price of oyster mushrooms will affect total revenue (TR). Oyster mushrooms can be said to be more economically efficient if they are more profitable.

2. METHODS

This study uses a qualitative approach to search for, observe, find solutions or answers, and then apply the solutions Suaib, 2023). In this study, the solutions will be applied to improve the production efficiency of oyster mushroom MSMEs in East Java Province in the era of digitalization.

The initial idea of participatory action research (PAR) is to educate communities to think critically about the social issues and problems they face. PAR is a scientific action research methodology commonly used in education and social work. PAR builds and develops social networks and interactions with communities through feedback, reflection, equal distribution of power, and learning to trust the process. PAR discusses community conditions through the local wisdom inherent in the community; the community is the subject of the research, not merely the object of research. The purpose of this research is to identify and explore problems directly and then find solutions to apply them in the community (Syaifuddin, 2024).

In the PAR research design, researchers begin by observing, asking questions, seeing, listening, and discovering problems or expectations in the community in the economic field, analyzing problems, establishing a focus on improving efficiency in the production process to boost the community's economy, identifying obstacles and difficulties in the oyster mushroom cultivation production process, and facilitating the community through visits, training, and focus group discussions (FGD).

Researchers are present in research for several crucial reasons, including that researchers are people who know exactly what they want to achieve from research activities and actions, thus requiring direct interaction between informants and respondents in order to collect data through observation and interviews. The research location is where the research is conducted so that researchers can discover, practice, and evaluate the results of the research. The initial observations and interviews conducted by the researchers were to identify the factors causing the decline in farmers' turnover and the reasons why mushroom farmers reduced their production. The initial observations were also to observe the production process and the energy used in the production process.

Structured interviews were chosen because we wanted to prepare questions and obtain answers that would lead to the interview's objective, namely the problems and expectations that exist in the community regarding oyster mushroom cultivation. The interviews were conducted in a structured format in order to observe and ask questions about the entire production process and some of the failures experienced by farmers.

The documents collected from the field will be analyzed by researchers. The documents in this study include both direct and indirect documents. Direct documents include photos of production tools, photos of raw materials and seeds, photos of nutrients, energy used, and harvest results to date, while indirect documents include a list of names of people who participated in the discussion, data, addresses of community members, and supporting documents for evaluation.

3. FINDINGS AND DISCUSSION

The first research result was that the same production results were found in the production process, meaning that with the selection and addition of higher quality nutrients, the same fermentation time, energy conversion in the production process, and changes to the packaging system, sterile oyster mushroom logs were obtained that could be used to grow oyster mushroom seeds.

a. Old Production Process

In the previous (old) production process, to produce 100 oyster mushroom logs, 50 kg of sengon powder was needed at a price of IDR 1,050,000 per pickup truck, 10 kg of rice bran at a price of IDR 1,500-1,700 per kg, 1.5 kg of lime at a price of IDR 2,000 per kg, plastic at a price of IDR 35,000 per kg containing 215 sheets, 2 bottles of seeds at a price of IDR 7,000 per bottle, and energy for the production process of 10 liters of oil at a cost of IDR 4,000 per liter, a pair of rings and ring caps priced at IDR 300, rubber for 100 logs priced at 1000, and daily labor for 100 logs usually takes 3 hours with an hourly wage of IDR 7,000.

Table 1. Mushroom Production Cost Table Using Rice Bran Type 4 Nutrition And Oil Energy

No	Name of Material and Energy	Price (Rp)	Unit	Contens	Price per unit	Production cost of 100 logs
1	Sawdust.	1050.000	Per pick up	2000	525	52500
2	Rice bran (type 4 Coarse)	2000	Kg	10	200	20000
3	Lime	2000	Kg	66	30	3000
4	Plastic	35.000	Kg	215	163	16300
5	Rubber	12.000	0.5 kg	500	24	2400
6	Seeds	8.000	bottle	50	160	16000
7	Metal rings and caps	300	per pair	1	300	30.000
8	Energy (used oil)	4000	Tube	1	400	40000
9	Labor	7.000	Per hour	1	210	21000
10	Capital input			1	300	30000
Total					2.312	231.200

From the table above, it can be concluded that the cost of producing one unit of oyster mushroom logs is IDR 2,312, so if you want to produce 1,000 logs, the cost will be IDR 2,312,000. The production yield of 1,000 oyster mushroom logs with the above composition is around 3 kg over a period of 3 months (although during peak harvest or ngebrol it can be more than 4 kg, but this only lasts for a short time and will return to normal), so with the price of oyster mushrooms per kg at IDR 13,000, the community will get an economic value of:

90 days x 3 kg x Rp 13,000 = IDR 3,510,000 (3 months) : 1000 = IDR 3,510 (output value per bag of logs). Therefore, the gross profit obtained is IDR 3,510,000 - IDR 2,312,000, which is IDR 1,198,000.

b. Second Production Process

In the second production process, with efficiency and energy conversion, to produce 100 logs of oyster mushrooms, 50 kg of sengon powder is needed at a price of Rp 1,050,000 per pickup truck, 10 kg of rice bran at a price of IDR 4,000 per kg, 1.5 kg of lime at a price of IDR 2,000 per kg, plastic at a price of IDR 35,000 per kg containing 215 sheets, 2 bottles of seeds at a price of IDR 7,000 per bottle, and energy in the production process using LPG gas at a price of IDR 20,000, a pair of rings and ring caps at a price of IDR 300, rubber for 100 logs at a price of IDR 1,000, and daily labor for 100 logs, which usually takes 3 hours at an hourly wage of IDR 7,000.

Table 2. Mushroom Production Cost Table Using Rice Bran Type 1 Nutrition And Gas Energy

No	Name of material and Energy	Price (Rp)	Unit	Contens	Price per unit	Production cost of 100 logs
1	Sawdust.	1050.000	Per pick up	2000	525	52500
2	Rice bran (type 1 Coarse)	4000	Kg	10	400	40000
3	Lime	2000	Kg	66	30.3	3000
4	Plastic	35.000	Kg	215	163	16300
5	Rubber	12.000	0.5 kg	500	24	2400
6	Seeds	8.000	bottle	50	160	16000
7	Metal rings and caps	300	per pair	1	300	30.000
8	Energy (used gas)	20.000	Tube	1	200	20.000
9	Labor	7.000	Per hour	1	210	21000
10	Capital input			1	300	30000
Total					2.312	231.200

From the table above, it can be concluded that the cost of producing one unit of oyster mushroom logs is IDR 2,312, so if you want to produce 1,000 logs, the cost will be IDR 2,312,000. The production yield of 1,000 oyster mushroom logs with the above composition is around 5 kg over a period of 3 months (although during the harvest season or ngebrol it can be more than 5 kg, but this only lasts for a short time and will return to normal), so with the price of oyster mushrooms per kg at IDR 13,000, the community will get an economic value of:

90 days x 5 kg x IDR 13,000 = IDR 5,850,000 (3 months) : 1000 = IDR 5,850 (output value per bag log). So the gross profit obtained is IDR 5,850,000 - IDR 2,312,000, which is IDR 3,538,000.

c. Third Production Process

In the third production process, with efficiency and energy conversion, to produce 100 logs of oyster mushrooms, 50 kg of sengon powder is needed at a price of IDR 1,050,000 per pickup truck, 10 kg of rice bran at a price of IDR 4,000 per kg, 1.5 kg of lime at a price of IDR 2,000 per kg, plastic at a price of IDR 35,000 per kg containing 215 sheets, 2 bottles of seeds at a price of IDR 7,000 per bottle, and energy in the production process using wood scraps from broom craftsmen (stumps) at a price of IDR 10,000, a pair of rings and ring caps priced at IDR 300, rubber for 100 logs priced at 1000, and daily labor for 100 logs usually takes 3 hours with an hourly wage of IDR 7,000.

Table 3. Mushroom Production Cost Table Using Rice Bran Type 1 Nutrition And wood scraps from broom craftsmen (stumps) Energy

No	Name of material and Energy	Price (Rp)	Unit	Contens	Price per unit	Production cost of 100 logs
1	Sawdust.	1050.000	Per pick up	2000	525	52500
2	Rice bran (type 1 Coarse)	4000	Kg	10	400	40000
3	Lime	2000	Kg	66	30.3	3000
4	Plastic	35.000	Kg	215	163	16300
5	Rubber	12.000	0.5 kg	500	24	2400
6	Seeds	8.000	botol	50	160	16000
7	Metal rings and caps	300	per pasang	1	300	30.000
8	Energy (used wood)	10.000	bijian	1	100	10.000
9	Labor	7.000	Perjam	1	210	21000
10	Capital input			1	300	30000
Total					2.212	221.200

From the table above, it can be concluded that the cost of producing one unit of oyster mushroom logs is IDR 2,212, so if you want to produce 1,000 logs, the cost will be IDR 2,212,000. The production yield of 1,000 oyster mushroom logs with the above composition is around 6 kg over a period of 3 months (although during peak harvest or ngebrol it can be more than 6 kg, but this only lasts for a short time and will return to normal), so with the price of oyster mushrooms per kg at IDR 13,000, the community will get an economic value of:

90 days x 6 kg x IDR 13,000 = IDR 7,020,000 (3 months) : 1000 = IDR 7,020 (output value per bag of logs). Therefore, the gross profit obtained is IDR 7,020,000 - IDR 2,212,000, which is IDR 4,898,000.

4. CONCLUSION

Based on a comparison between the old production process and the new production process, an increase in economic value was found and obtained. The old production process generated an economic value of IDR 1,198,000 per 1,000 logs over a period of 3 months. Then, in the second production process, by making changes to the nutrients (from coarse rice bran to high-quality rice bran) and changing the production energy (from used oil to LPG), an economic result of IDR 3,538,000 was obtained. and finally, by changing or replacing the production energy (LPG gas replaced with wood ash from broom/bonggolan production), an economic value of IDR 4,898,000 was obtained. The increase in the economic value percentage of the second production from the first production after several changes was 195.325%, while the increase in the economic value percentage of the third production from the first production was 308.848%. Therefore, it can be concluded that the third production has a very high economic value for communities that have oyster mushroom production businesses (not oyster mushroom cultivation) in East Java province.

These results can still be maximized because there are still several things that can be done and added to increase the economic value of oyster mushroom MSME output, including fermentation for 2-3 days and adding fermentation agents to wood powder that has been mixed with other ingredients. In addition, there are production innovations by changing the form of raw output, which can then be followed up with further research to improve the community's economy because each MSME is linked to several other MSMEs that support the production, distribution, and consumption processes.

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