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FINANCIAL FEASIBILITY ANALYSIS OF OYSTER MUSHROOM CULTIVATION BASED ON SAWDUST

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ABSTRACT

The wood sawing industry produces sawdust waste that has not been optimally utilized. Most sawdust waste processing is still carried out in an environmentally unfriendly manner, such as being dumped into rivers or burned. However, sawdust has significant economic potential, one of which is as a growing medium for oyster mushrooms. This study aims to determine the percentage of sawdust waste that can be utilized and to analyze the financial viability of developing an oyster mushroom cultivation business. The data collection methods used were observation, interviews, and documentation, while data analysis was conducted through percentage analysis and financial feasibility analysis using the NPV, IRR, BCR, Payback Period, and sensitivity analysis approaches. The results of the study indicate that 89.60% (3,000 kg) of the total sawdust waste was successfully utilized, with 44.80% (1,500 kg) used as a growing medium for oyster mushrooms, 29.90% (1,000 kg) for cattle bedding, and 14.90% (500 kg) for fertilizer. The financial feasibility analysis focused on the utilization of 44.80% (1,500 kg) of sawdust for oyster mushroom cultivation, while the utilization of the remaining sawdust was not analyzed financially but rather from the perspective of waste reduction. The use of sawdust as the main substrate for oyster mushroom cultivation contributes Rp 7,200,000/year, or approximately 8.9% of the total annual production cost. The use of sawdust as a mushroom cultivation medium yields an NPV of Rp 43,336,430, an IRR of 49.67%, a BCR of 2.64, and a payback period of 2 years and 20 days. Sensitivity analysis with scenarios of a 10% decrease in production, increase in costs, and decrease in prices shows that this business remains financially viable. Thus, the results of this study indicate that the use of sawdust for oyster mushroom cultivation is financially viable and can be applied as a sustainable waste management solution.

Keywords: *financial feasibility;oyster mushroom;sawdust waste*

INTRODUCTION

The wood processing industry in Indonesia consists of several important subsectors, such as the particleboard, pulp and paper industry, and sawmilling. Sawmilling is a simple form of the wood processing industry that develops in various regions in Indonesia. The industry plays a role in job creation, with one million m^3 of timber absorbing 14 - 15 workers (Indartik & Yosefi, 2008). In its production process, the sawmill industry produces considerable waste, such as sawdust, wood chips, and wood chips. Research (Purwanto, 2009) It shows that the sawmill industry generates waste by 40.48%, which consists of sawdust (22.32%), wood chips (9.39%), and wood chips (8.77%). Sawdust waste is often considered worthless and managed in an environmentally unfriendly manner, such as being dumped into rivers, incinerated, or simply piled up in open areas. This practice pollutes the environment and can reduce water quality and have an impact on public health.

Sawdust has great potential to be used as a value-added product, one of which is as a medium for growing oyster mushrooms. The composition of sawdust containing cellulose (49.40%), hemicellulose (24.59%), and lignin (26.8%) makes it an ideal material for the growth of mycelium and the fruit body of oyster mushrooms (Astuti & Kuswytasari, 2013). Sengon wood is known to be lightweight, porous, and easily decomposed, and has lignocellulose content that is suitable for the growth of oyster mushrooms (Nisa & Sumarni, 2019). The use of sawdust for oyster mushroom cultivation can be an environmentally friendly waste management solution, while also increasing the economic value of the waste.

Sengon Wood (*Paraserianthes falcataria*) was chosen as the main raw material in this study because it is a leading commodity from community forests that is widely used by the local wood processing industry. In West Java, sengon makes a significant economic contribution to farmers, although the largest added value is still controlled by actors downstream of the supply chain (Parlinah et al., 2015). Apart from being an industrial raw material, sengon wood is also a primary commodity in agroforestry systems and community forest management in West Java. Currently, its use is increasingly widespread, including as a raw material for making baglogs in oyster mushroom cultivation by the local community (Monica et al., 2021). In addition, the availability of abundant and sustainable raw materials greatly supports mushroom cultivation businesses in the long term.

Research Purwanto (2009) explained that the sawmill industry produces waste of 40.48% of the volume of logs processed. The waste consisted of slash (22.32%), wood chips (9.39%), and sawdust (8.77%; further conveyed by Ericson et al., 2025 The efficiency of wood processing is influenced by the skills of the carpenter and the tools used. It is estimated that the amount of sawn wood powder waste in Indonesia is 0.78 million m^3 per year. However, data on the percentage of waste that is used in economic activities is still limited. This is an obstacle in planning the development of waste-based businesses due to the uncertainty of raw material supply. Therefore, the calculation of the percentage of waste utilization is very important as a basis for production capacity planning. In addition, a financial feasibility analysis is also needed to ensure that these waste-based businesses are economically viable and sustainable.

For this reason, this study aims to analyze the percentage of sengon wood sawdust waste utilization and assess the financial feasibility of the development of oyster mushroom cultivation as a form of optimizing the management of sawmill waste. The research was conducted in two main locations that are functionally interconnected, namely CV Putra Mandiri as an object of the sawmill industry and Saung Jamur Rumpin as a representation of small-scale mushroom cultivation businesses that have succeeded in utilizing sawdust sustainably. This research makes an important contribution to the development of waste-based businesses in the wood industry, by opening up opportunities for more effective waste utilization, increasing added value, and supporting economic sustainability and better environmental management.

METHOD

Research Time and Place

This research was carried out from November 2024 to February 2025 in two locations, namely the CV Putra Mandiri Timber Sawing Industry in Cipinang Village, Rumpin District, Bogor Regency, West Java Province, and Saung Jamur Rumpin located in Rumpin Village, Rumpin District, Bogor Regency, West Java Province. The selection of the location of this research is based on the availability of industrial waste sources in the form of sawdust and the existence of a business to utilize sawdust waste. The location of the research can be seen in Figure 1.

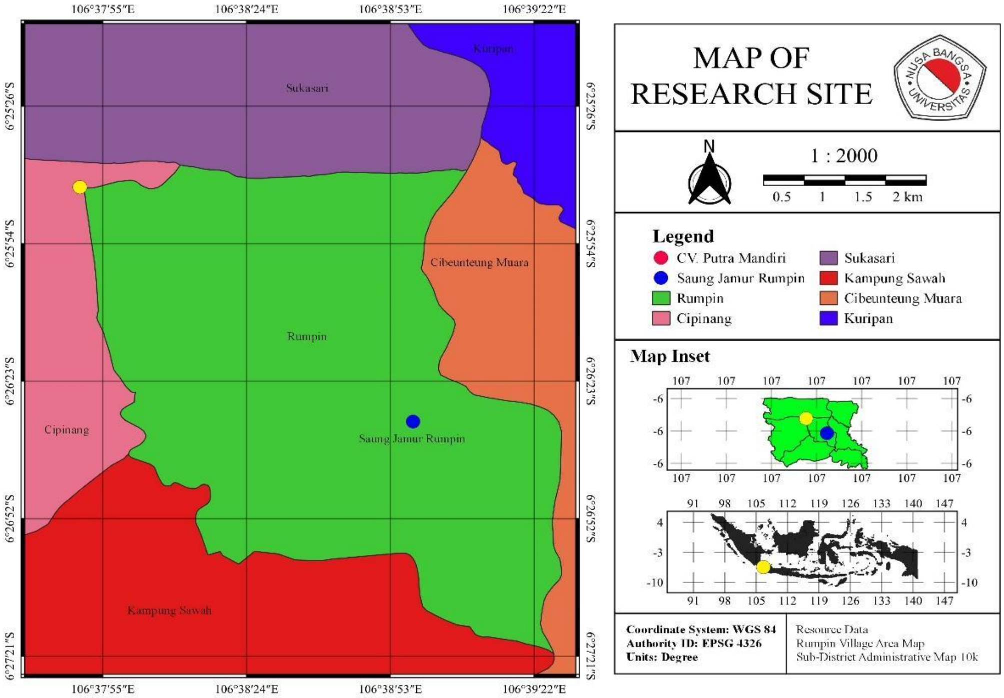

Figure 1. Map of the Research Location

Research Tools and Materials

The equipment used in this study included literature, stationery, laptops, cameras, scales, tally sheets, calculators, and sacks. The primary research materials comprise wood sawmill production data and operational data on oyster mushroom cultivation, both obtained from the two research sites.

Data Collection Methods

1. Sampling Method

The determination of the research location employs the purposive sampling method, using criteria such as the availability of industrial waste sources in the form of sawdust and the presence of a business that can utilize sawdust waste. The selection of respondents was based on the understanding of the research object, including business owners, workers related to business activities in both research locations.

2. Primary Data Collection

Primary data were obtained through open interviews using interview guidelines and participant observations. The information gathered from the interviews includes;

a. Waste Utilization Percentage Analysis
   - Daily and monthly production data of sawn timber.
   - Volume and type of sawdust waste produced
   - Sawdust waste utilization pattern

b. Financial Feasibility Analysis
   - Oyster mushroom production cost structure data that includes fixed costs and variable costs.
   - Oyster mushroom and baglog sales data.
   - Information about the investment capital and equipment used.

3. Secondary Data Collection

Secondary studies were obtained through literature studies from related agencies relevant to the research.

4. Research assumptions

The study uses several basic assumptions to ensure the consistency of the analysis:

a. Oyster mushroom cultivation in Saung Mushroom Rumpin with a production capacity of 5,000 baglogs per cycle.
b. The main raw material in the form of sawdust waste is obtained from CV Putra Mandiri with a guarantee of stable supply throughout the year.
c. The oyster mushroom production process involves 1 permanent employee and 5 wholesale employees with a production cycle that lasts all year round.
d. The productive period of each baglog lasts for 3 - 4 months assuming the entire production can be absorbed by the market.
e. For financial analysis, the interest rate used is 10% per annum, assuming fixed income every year.

Data Analysis Methods

1. Waste Utilization Percentage Analysis

a. Waste volume measurement: Measures the volume of waste generated through 3 repeated measurements to ensure data accuracy.
b. Production logging: Records the number of wood blocks processed and the weight of sawdust produced each day.
c. Calculation of averages: Calculates the average waste production per block and per day.
d. Monthly total calculation: Calculates the total monthly waste production.
e. Utilization analysis: Calculates the amount of waste used or sold per month and determines the percentage of its utilization against the total waste generated.

Table 1. The data collected

Yes	Data collected	Collection Method	Data Source
1	Daily production data of sawn timber	Open interviews + observations	CV Putra Mandiri
2	Sawn timber monthly production data	Open interviews + observations	CV Putra Mandiri
3	Volume of sawdust waste generated	Repeated measurement (3x)	CV Putra Mandiri
4	Types of sawdust waste	Observation	CV Putra Mandiri
5	Number of timber blocks processed per day	Daily Record	CV Putra Mandiri
6	Sawdust weight per day	Weighing + logging	CV Putra Mandiri
7	Sawdust waste utilization pattern	Open interviews	CV Putra Mandiri
8	The amount of waste used per month	Recording + calculation	CV Putra Mandiri
9	Percentage of waste utilization	Mathematical calculations	CV Putra Mandiri

2. Financial Feasibility Analysis

The financial feasibility analysis is carried out by calculating cash flows which include:

Table 2. Data analyzed for Financial Feasibility

Yes	Kind	Data analyzed	Collection Method	Data Source
1	Input	Initial investment capital	Open interviews	Grass Mushroom Swing
		Land rental costs	Open interviews	Grass Mushroom Swing
		Salary of permanent employees	Open interviews	Grass Mushroom Swing
		Equipment depreciation costs	Calculations and interviews	Grass Mushroom Swing
		Cost of sawdust raw materials	Open interviews	Grass Mushroom Swing
		Mushroom seedling cost	Open interviews	Grass Mushroom Swing
		Additional material costs	Open interviews	Grass Mushroom Swing
		Gary wholesale employees	Open interviews	Grass Mushroom Swing
2	Output	Oyster mushroom sales revenue	Sales recording	Grass Mushroom Swing
		Baglog sales revenue	Sales recording	Grass Mushroom Swing
		Annual net cash flow	Mathematical calculations	Grass Mushroom Swing

3. Investment Eligibility Criteria

From the calculation of cash flow, annual net cash flow is obtained which is the basis for the financial feasibility analysis. The investment criteria used to assess financial feasibility include:

a. *Net Present Value* (NPV): Calculates the present net value of an investment
b. *Internal Rate of Return* (IRR): Calculates the internal rate of return on investment
c. *Benefit Cost Ratio* (BCR): Calculates the ratio of benefits to costs
d. *Payback Period* (PP): Calculates the period of return on investment

4. Sensitivity Analysis

To anticipate risks and uncertainties in the business, a sensitivity analysis was conducted with three different scenarios:

Table 3. Sensitivity Analysis Scenario

Scenario	Variable Changes	Percentage Change	Purpose of Analysis
1	Production	-10%	Measuring the impact of production declines
2	Operating Costs	+10%	Measuring the impact of rising costs
3	Selling Price	-10%	Measuring the impact of price drops

RESULTS AND DISCUSSION

Percentage of Sawdust Waste Utilization

1. Sawdust Waste Generated

Based on the results of measurements with three repetitions, the total sawdust waste was 117 kg produced from the cutting of 104 Sengon wood blocks (*Paraserianthes falcataria*). From the total measurement, an average of 1.1250 kg of sawdust per beam was obtained. The complete data is presented in Table 4.

Table 4. Average sawdust per beam

It	Observation of the Day	Number of Beams (Rods)	Amount of Powder (kg)	Information
1.	1	34	38,2	Wood Type : Sengon (*Paraserianthes falcataria*) Beam Size : 300 x 13.5 x 17.5
2.	2	34	38,4	Wood Type : Sengon (*Paraserianthes falcataria*) Beam Size : 300 x 13.5 x 17.5
3.	3	36	40,4	Wood Type : Sengon (*Paraserianthes falcataria*) Beam Size : 300 x 13.5 x 17.5
Total		= 104 bars	= 117 kg	
Average sawdust per beam		= 1.1250 kg		

Resources: research 2025

Figure 2. Produced Sawdust

Based on CV. Putra Mandiri, the average number of sawn blocks per month reaches 2,975 bars or 119 blocks per day. Monthly production data is presented in Table 5.

Table 5. Amount of Raw Materials Sawn Per Month and Per Day

No	Moon	Quantity (Beams/Month)	Quantity (Beams/Day)
1.	August	2.970	118,8
2.	September	2.980	119,2
3.	October	2.975	119,0
Total	**8.925**	**357**	
Average	**2.975**	**119**	

Resources: research 2025

From the data of the average number of blocks and the average sawdust per beam, the total sawdust waste production can be calculated. The recapitulation of production data is presented in Table 6.

Table 6. Recapitulation of Sawdust Production and Waste Data Per Month and Per Day

Utilization	Quantity (Sack)	Quantity (Kg)	Percentage (%)
The media is on the shores of Jamur	150	1.500	44,80
Cow Shed Floor Mat	100	1.000	29,90
Fertilizer	50	500	14,90
Total	**300**	**3.000**	**89,60**

Resources: research 2025

2. Percentage of Sawdust Waste Utilization

The results showed that 89.60% (3,000 kg) of sawdust had been utilized in three main categories: 44.80% (1,500 kg) for oyster mushroom planting media, 29.90% (1,000 kg) for cowshed floor mats, and 14.90% (500 kg) for fertilizer. The complete data is presented in Table 7.

Table 7. Average Sawdust Sales Per Month

It	Description	Calculation Formula	Sum
1.	Average number of sawn beams per day	Average number of sawn blocks in 1 month (2,975) ÷ working days (25 working days)	119 Rods
2.	Average sawdust per beam	Total sawdust over 3 days of observation (117 kg) ÷ total sawn beams over 3 days of observation (104 beams)	1.1250 kg
4.	Amount of sawdust per day	Average sawdust per block (1.1250 kg) x average number of sawn blocks per day (119 blocks)	133.87 kg
5.	Average sawn blocks in 1 month	Total sawn beams in 1 month	2,975 blocks
6.	Amount of sawdust per month	Amount of sawdust per block (1.1250 kg) x average sawn blocks in 1 month (2,975 blocks)	3,346.87 kg

Resources: research 2025

Figure 3. Utilization of Sawdust as a Mushroom Growing Medium

The results showed that the average production of sawdust waste per block of sengon wood reached 1.1250 kg, with a total monthly production of 3,346.87 kg. This high volume is influenced by the physical characteristics of the wood, the specifications of the sawing tools, and the skill of the operator in the sawing process. These results are in line with research (Nurhayati & Adalina, 2009) which states that sawdust waste from the sawmill industry can reach 10.6% of the volume of wood processed Of the total sawdust waste produced, 89.60% (3,000 kg) was successfully utilized, consisting of 44.80% (1,500 kg) for oyster mushroom growing media, 29.90% (1,000 kg) for cattle bedding, and 14.90% (500 kg) for fertilizer. The largest utilization is for oyster mushroom cultivation, in line with the findings (Astuti & Kuswytasari, 2013) that the content of cellulose, hemicellulose, and lignin in sengon sawdust supports optimal mushroom mycelium growth. In this study, sengon sawdust was chosen because it is the dominant type of wood used in the research location and proved suitable as a growing medium for oyster mushrooms.

The distribution of sawdust from CV Putra Mandiri to Saung Jamur Rumpin is done through a buying and selling mechanism at a price of Rp 6,000 per sack (10 kg). The composition of growing media at Saung Jamur Rumpin consists of 80% sawdust, 15% bran and 5% dolomite lime. The use of 1,500 kg of sawdust per month is based on a production capacity of 5,000 baglogs per cycle, which requires approximately 4,000 kg of growing media every four months. This amount includes material reserves as well as anticipated shrinkage during the production process.

From 1,500 kg of sawdust, 5,000 oyster mushroom baglogs can be produced, each of which produces an average of 0.8 - 1kg of mushrooms during the harvest period. After going through the production stage, baglogs can be harvested every day during the productive period. Each baglog can be harvested 3 - 4 times during the productive period. The total mushrooms produced can reach 4,000 kg with a selling price of IDR 13,000 per kg. The contribution of sawdust in oyster mushroom production costs is relatively small. The price of sawdust is IDR 6,000 per sack of 10 kg or equivalent to IDR 600 per kg. With the need for 1,500 kg per month, the total cost for sawdust reaches Rp 900,000. When compared to the total production cost that includes additional materials, labor, and operations, the cost of sawdust only accounts for a small portion of the overall cost, which is estimated to be below 10%. This shows that utilizing sawdust waste as a growing medium is financially efficient.

The supply of sawdust from CV Putra Mandiri proved to be consistent with an average production of 2,975 blocks per month during the observation period (August-October 2024). The current maximum capacity of Saung Jamur Rumpin can accommodate 1,500 kg of sawdust per month, which is equivalent to 44.80% of the total waste production.

The absorption capacity of sawdust by Saung Jamur Rumpin of 44.80% of the total available waste is in accordance with the current production capability. Meanwhile, the remaining 45% of the waste is utilized by other parties, namely local farmers for cage bedding and organic fertilizer entrepreneurs. Saung Jamur Rumpin does not collect all 89.60% of the waste, but only the portion that is needed. The remaining 10.40% (approximately 346.87 kg) of unutilized sawdust is mostly still piled up in the CV Putra Mandiri factory area. This includes sawdust that has fallen or scattered during the transportation and bagging process, and some of it is set aside as raw material reserves to anticipate sudden requests from buyers. Although not yet fully utilized, the implementation of sawdust utilization has generally had a positive impact on waste management at CV Putra Mandiri. Previously, almost all waste was burned or disposed of in open areas, but now only 10.40% remains that has not been optimally utilized.

Financial Feasibility Analysis

The results of the financial feasibility analysis show that the Saung Jamur Rumpin business is feasible to develop, as presented in Table 8.

Table 8. Results of the Financial Feasibility Analysis of the Saung Jamur Rumpin business

No	Investment Criteria	Value
1.	*Net Present Value* (NPV)	Rp 43.336.430
2.	*Internal Rate of Return* (IRR)	49,6654%
3.	*Benefit Cost Ratio* (BCR)	2,64
4.	*Payback Period* (PP)	2 years 20 days

Resources: research 2025

Sensitivity analysis with three scenarios (10% production decrease, 10% cost increase, and 10% price decrease) shows that the business remains viable with all indicators above the feasibility limit, as presented in Table 9.

Table 9. Sensitivity Analysis Results

Change Scenario	Criterion			Eligibility Limit
	NPV (Rp)	IRR (%)	BCR	
Normal (*Base Case*)	Rp 43.336.430	49, 6654%	2,64	-
Production Down 10%	Rp 33.077.892	52,58%	2,48	>0
Fees Increase by 10%	Rp 42.994.392	60,65%	2,89	>10%
Price Drop 10%	IDR 33,077,892	52,58%	2,48	>1

Resources: research 2025

The financial feasibility analysis shows that the Saung Jamur Rumpin business is very feasible to develop, with an NPV value of Rp 43,336,430, IRR of 49.67%, BCR of 2.64, and Payback Period of 2 years and 20 days. This payback period is relatively fast and shows investment efficiency, because it is under the economic life of the business. This is in line with the opinion of (Permatasari & Nugroho, 2021) which states that an investment is said to be feasible if the payback period is faster than the economic life of the business.

In addition, the results of the sensitivity analysis of three change scenarios, namely a decrease in production, an increase in operating costs, and a 10% decrease in selling prices, show that this business is still within the limits of feasibility, because all indicators (NPV> 0, IRR> 10%, and BCR> 1) are still met. Thus, this oyster mushroom cultivation business is not only financially prospective, but also has resilience to risks and market dynamics.

The financial feasibility analysis indicates that the Rumpin Mushroom Farm business is highly feasible to develop, with an NPV of IDR 43,336,430, an IRR of 49.67%, a BCR of 2.64, and a Payback Period of 2 years and 20 days. This payback period is relatively fast and demonstrates investment efficiency, as it falls below the business's economic lifespan. This aligns with the opinion of Permatasari & Nugroho (2021), who stated that an investment is considered feasible if the payback period is faster than the business's economic lifespan.

Furthermore, the results of a sensitivity analysis for three scenarios: a decrease in production, an increase in operational costs, and a 10% decrease in selling price, indicate that this business remains within the feasibility limits, as all indicators (NPV > 0, IRR > 10%, and BCR > 1) are still met. Thus, this oyster mushroom cultivation business is not only financially promising but also resilient to risks and market dynamics.

CONCLUSIONS AND SUGGESTIONS

Conclusion

1. The utilization of sawdust waste from CV Putra Mandiri reached 89.60% (3,000 kg) of total production, with details of 44.80% (1,500 kg) used as oyster mushroom growing media, 29.90% (1,000 kg) for cattle bedding, and 14.90% (500 kg) for fertilizer.
   The use of sawdust as the main component of oyster mushroom growing media provides a financial contribution of Rp 7,200,000 per year or about 8.9% of the total annual production cost, which shows efficiency in the business cost structure.
   In addition, this utilization also reduces the amount of waste that must be managed by the sawmill industry, previously all waste was disposed of or burned, now only 10.40% of unutilized waste remains, thus supporting more environmentally friendly and sustainable waste management.
2. The financial feasibility analysis shows that the Saung Jamur Rumpin business is feasible to develop, with an NPV of Rp 43,336,430, IRR of 49.6654%, BCR of 2.64, and Payback Period of 2 years and 20 days.

Suggestion

1. CV Sawmill Industry Putra Mandiri needs to collaborate with other oyster mushroom cultivation businesses around Rumpin Village to utilize the remaining 10.40% (346.87 kg) of waste as a mushroom planting medium.
2. Saung Mushroom Rumpin needs to increase the production volume of backlogs to optimize the utilization of available sawdust waste while increasing the production capacity of Saung Mushroom Rumpin, considering that the results of the financial feasibility analysis show that this business is feasible to be developed.

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