

Feasibility Analysis of Straw Mushroom Farming using Cotton Fiber Waste Growth Media in Small Straw Mushroom Businesses (Case in Karangmangu Village, Kramatmulya District, Kuningan Regency, West Java)

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ABSTRACT

Merang mushroom (*Volvariella volvaceae*) grows in rice tangaki (merang) after harvesting (crab). This research aims to find alternative growing media using cotton fiber (industrial waste), in an effort to solve the sustainability of the mushroom business due to the increasingly limited availability of merang. The research was carried out with community groups who are used to trying to grow mushrooms, trying to spread seeds on cotton fibers that have been fermented with yeast bacteria using livestock manure, lime and bran. Through bio-engineering, cotton fiber waste, which was originally a waste material in the furniture industry and yarn spinning, can be used as a medium for growing merang mushrooms. Merang mushroom business actors are able to apply bio-technology engineering appropriately so as to produce merang mushrooms with excellent quality. The results of the economic analysis show that: The average production obtained was 227.21 kg with a revenue of Rp.4,771,500, after deducting production costs of Rp.2,858,928, so the income of merang mushroom farming was obtained of Rp.1,912,571, with an R/C of 1.65. This means that for each victim one unit of cost (Rp.1.00) in the process of merang mushroom farming will be obtained 1.65 units (Rp.1.65).

INTRODUCTION

Merang mushroom (*Volvariella volvaceae*), so called because the original growing medium is merang or used rice waste (merang). This commodity has very good prospects to be developed, either to meet the increasing domestic market demand or to be used as a non-oil and gas export. In line with public awareness in meeting the nutritional needs of families, mushrooms are a vegetable of choice for a variety of foods with high nutritional value, do not contain saturated fat, and do not contain cholesterol.

Merang mushroom has a complete nutritional content, such as vitamins B1, B2, D and niacin. Mushrooms also contain various mineral elements needed by the body, such as potassium, calcium, sodium and magnesium. The fiber content is also high, ranging from 7.4 to 27.6%.

According to research, fresh mushrooms contain more plant-based protein compared to other vegetables. Mushrooms are also believed to have efficacy as a drug that lowers blood sugar and cholesterol, prevents tumors and cancer, neutralizes toxins in processed foods, prevents intestinal inflammation, lowers blood pressure and anti-carcinogens (Bambang Sunandar, 2010). The nutritional value of mushrooms is mentioned

Table 1. Chemical Content and Nutritional Value of Mushrooms

No	Chemical composition/Nutritional value	Fungal Species					
		Oyster	Ear	Merang	Shitake	Ling Zhi	Champignon
1	Fat %	1,2-2,4	7,2-8,3	2,0-2,6	4,9-9,0	72,0	1,7-8,0
2	Total protein %	10,5-44	4,2-19,4	25,9-28,5	13,4-17,6	19,0-35,0	1,3-4,8
3	Carbohydrates %	50,7-81,8	82,8-82,9	2,7-5,8	67,5-70,7	9,5-78,0	51,3-62,5

Source : West Java Agricultural Technology Assessment Center, 2010.

In line with the characteristics of agricultural products, during the harvest, straw waste is abundant so that it can be used as a cultivation medium. But after that, the artisans had difficulty finding a medium for growing merang mushrooms, because merang rice was increasingly difficult to get.

The results of Iin Suartini's (2015) research, the production of merang mushrooms is 246.67 Kg so the revenue of merang mushroom farming is Rp.5,180,000, after deducting production costs of Rp.3,002,167, so that the income of merang mushroom farming is obtained of Rp.2,177,833, with an R/C of 1.73. This means that each victim of one unit cost (Rp.1.00) in the process of merang

mushroom farming in the Mitra Jaya Sejahtera farmer group will get 1.73 units (Rp.1.73).

Cotton waste that used to be categorized as garbage and thrown away for nothing, turned out to be very good to be used as a medium for cultivating merang mushrooms, in addition to being clean because it does not contain soil, it is also easy to regulate in the arrangement of beetles, so that the results of merang mushrooms produced are cleaner and whiter.

The production technology is not complicated, it only requires precision and patience in treatment and maintenance. Because in the process there are very critical activities that must be good, such as during composting and the pasteurization process, a perfect fermentation process must occur. Then at the time of planting mushroom seeds into mashed media, all tools used must be believed to be sterile. Kubung that has been planted with merang mushrooms, must be closed and must not be exposed to direct sunlight. Observation and care must be carried out, especially from pests or diseases that often damage and degrade the quality of the stool.

LITERATURE REVIEW

Merang Mushroom

Fungi are plants that produce spores, their cells have a true nucleus in which there is no chlorophyll. Its body is composed of a combination of hyphae threads. The white hyphae thread collection is called mycelium and the clumping mycelium group will form primordium which is the beginning of the formation of the fungal fruit body.

(Bambang Sunandar, 2015). Saying that among the many species of mushrooms, *Volvariella volvaceae* or known as merang mushroom is the most well-known mushroom species, especially for the people of Southeast Asia. This mushroom has long been cultivated as a food ingredient because it is one of the most delicious mushrooms and has a good texture so that it is liked by people.

Volvariella volvaceae has a volva or cup. Usually mushrooms that are cupped are poisonous mushrooms, except for merang mushrooms, merang mushrooms are very popular consumption mushrooms because of their deliciousness. Its figure is cup-covered, stemmed and has spores of red or pink color. The developmental stage starts from the knot, small buttons, egg buttons, stem extension and finally the adult stage. In the adult stage, the originally cup-shaped veil turns into an umbrella and fully opens.

Merang mushrooms generally grow on media that contain a lot of carbohydrates, for example piles of former rice straw (merang), which is why it is called merang mushroom. Not only on rice straw, this fungus can also grow on rice mills, paper mill waste, palm waste, palm waste, sago tree waste or cotton waste. In principle, merang mushrooms are happy to grow in agricultural waste. Straw waste for growing merang mushrooms is also useful as compost. (West Java Agricultural Technology Assessment Center, 2015).

Merang Mushroom Cultivation

Composting is carried out with the aim of activating thermophilic microbes, namely bacteria and fungi that will remodel cellulose, hemicellulose and lignin so that they are easier to digest by fungi. During the composting process, heat will arise which can kill competing organisms which is detrimental to fungal growth (Bambang Sunandar, 2015).

As a raw material (medium) for the growth of merang mushrooms, namely straw. This raw material can be combined with agricultural waste available around the cultivation site, for example used cotton, water hyacinth that has been dried. Other additives needed are bran as a source of carbohydrates, lime to neutralize the media, and chicken manure can be added to increase nitrogen levels in the media. The complete composition of the media for merang mushroom cultivation with a total production of 450kg.

Harvest

Production according to (Debertin L. David. 2016) is a part of the product that can be used to meet needs. The activity of picking merang mushrooms that are old enough to get merang mushroom results in accordance with the provisions. Before picking, wash your hands using 70% alcohol. Picking is carried out by cutting off the base of the mushroom fruit body using the tip of the thumb, index finger and middle finger. Try not to damage the planting medium around the fungus. The base of the mushroom is cleaned to remove the remaining planting medium that is carried using a pisai. The harvest of merang mushrooms is placed in a clean basket.

Business Feasibility Analysis

The merang mushroom cultivation business is a type of business that utilizes waste from rice cultivation in the form of straw or other media such as cotton waste. From an economic point of view, this business aims to get profits or income for its managers.

Revenue (Fatma, Alifia Ulfatul 2017) is the financial value received by producers (farmers) as a result of product sales (output) in a certain period of time and has been determined. The size or small value of revenue is influenced by the amount of production obtained from farming and the unit price of products that apply in the market. Meanwhile, factors that can affect the productivity of a farming business include: the fertility of the planting medium, the application of technology and the experience of farmers in running their businesses. Revenue is obtained from the result of subtracting the value of receipts from expenses.

Revenue is obtained from total receipts minus all production costs incurred. Production costs are the sum of total fixed costs and total variable costs. In the mushroom cultivation business, income is the goal that farmers want to achieve in their business.

According to Mubyarto (1998) in (Fahmi, Irham 2017). Income, namely the revenue obtained from managed farming minus all production costs during the production process. Furthermore, it was also stated that the high and low income received by farmers is influenced by the amount of production produced, the

higher the production produced, the greater the farmer's income assuming constant prices.

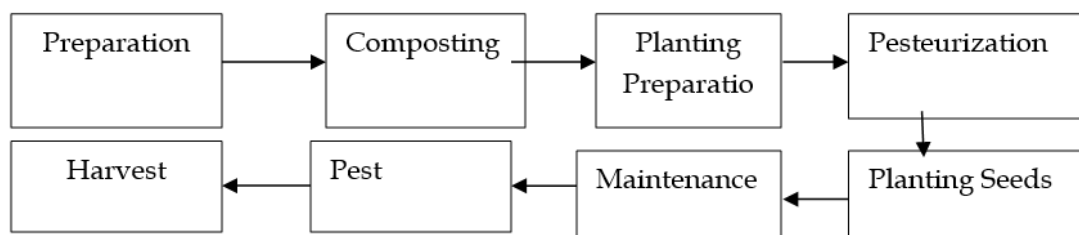
According to (Asmarataka, Ratna Winandi 2018). A type of business will be assessed whether it is appropriate or feasible to be carried out based on certain criteria that exist. Decent for a business means profitable from various aspects. Agribusiness business feasibility analysis is an effort to find out the level of feasibility or appropriateness to be done from a type of business, by looking at several parameters or certain feasibility criteria. Thus, a business is said to be feasible if the profits obtained can cover all costs incurred, both direct and indirect costs.

METHODOLOGY

The research was carried out in June 2024, using a survey method of 32 respondents using a questionnaire to merang mushroom farmers in the planting period from June to September 2023. The location is in Katangmangu Village, Kramatmulya District, Kuningan Regency.

The research was carried out in a community of merang mushroom artisans who use cotton waste as a growing medium, the selection of this location was carried out with the consideration that in the village there are many communities of small entrepreneurs of merang mushrooms and oyster mushrooms. This technology is worked on jointly by the home industry community as many as 32 people. Each perpetrator holds the instructions of the Production Operating Standards (SOP) prepared by the author, with this guide, research participants can easily and uniformly apply research practices.

This research, according to Sunaryo, Yoyo. 2015. will be seen from the technical aspect, which analyzes the elements of technology and the way or procedure of its application. Economic aspect, which analyzes financial and economic elements as well as trade. The socio-cultural aspect, which discusses elements of customs, togetherness and the ability to accept this new innovation. The order of implementation is as follows:



The process of applying this biotechnology, in the implementation at every stage, must be carried out perfectly. If there is one stage that is not done well and the results are not perfect, it will have an impact on the next stage and will reduce the quality of the results.

RESEARCH RESULT AND DISCUSSION

Merang mushroom (*Volvarella volvaceae*) has long been cultivated as a food ingredient because it belongs to the group of mushrooms that are delicious and have a good texture so that people like it. Having a volva or cup, usually

cupped mushrooms are poisonous mushrooms except for merang mushrooms. It is a very popular consumption mushroom due to its delicious taste. Cup-hooded, stemmed and has spores red or pink in color. The developmental stage starts from the knot, small buttons, egg buttons, stem extension and finally the adult stage. In the adult stage, the originally cup-shaped veil turns into an umbrella and fully opens.

Merang mushroom requires a temperature of 30-35°C according to its nature and characteristics, it can be cultivated in lowlands to slightly higher areas. The specialty of this business does not depend on the season, but must have a clean and unpolluted water source. Mushroom houses (kubung) are made with coconut leaf roofs/reeds or asbestos, made of air circulation equipped with ventilation in the form of doors or windows. There is a network of pipes that are given small holes, to drain hot steam during the sterilization process.

The scale of the mushroom business can be divided into 3, namely: a). Small-scale only uses one kumbung (4 x 7 m² with a production capacity (total production) of 200 - 250 Kg. b). Medium/medium scale uses 2-5 beetles with a production capacity of 400 - 1250 Kg. c). Large-scale use of more than 5 kumbung with a production capacity of more than 1250 Kg.

A critical step that must be taken properly when composting, the goal is to activate thermophilic microbes that have the fungus to remodel cellulose, hemicellulose and lignin so that they are easier to digest by fungi. During the composting process, heat will arise that can kill competing organisms which is detrimental to fungal growth.

In this process, equipment such as shovels, forks, plastic tarpaulins, drums, sprayers, baskets, knives, scales and thermometers are needed. It is also necessary to use cotton fiber as a growing medium, bran is needed as a source of carbohydrates, lime to neutralize the media, and chicken manure can be added to increase the nitrogen content in the medium.

Composting can be done indoors or in a covered room, even if it is not walled. But the floor must be cemented, if it is made on the ground, it must be covered with plastic/tarpaulin. The compost material is divided into two, namely one part is composted separately (main media only) and the other part is given additional media, then composted (main media and additional media). After the two composts are completed, the two types of compost are mixed evenly, all parts get the same part. The steps to make compost media are:

a. *Compost cotton waste.*

Cotton waste is made saturated with water by being watered or soaked continuously for 1 week, trampled until the cotton is cracked and can absorb water (wet) without floating on water. Sprinkle the plastic surface with chalk, the cotton fibers are stacked ± 30cm thick, 2 meters wide and 1.5 meters high length adjust. Cotton fibers are stepped on and sprinkled with lime to taste. Cover the pile of cotton with non-opaque plastic for 7-9 days, it can be helped with an old straw base.

During the composting period the cotton is turned over 2-3 times, every 2 days while adding bran and lime. The top layer of compost is moved to the bottom and vice versa. When the straw mat is reversed so

that it is not dense, the size must be maintained so that the fermentation can run perfectly and the moisture content is sufficient (60 – 65%). Characteristics of mature compost, the color becomes dark brown, soft texture, characteristic aroma and grows white colonies. If it looks dry, flush it with enough water.

b. Cover compost

The top-layer composting is done the day before the cotton composting process, and it would be better if it was done 1 week before cotton composting. The mixture of layer compost material consists of bran and cotton, mixed with 5 kg of lime until evenly distributed and does not clump. Add enough water (don't get too wet), and stir all ingredients until evenly combined.

Arrange the mixture of these ingredients neatly on the ground with a width of 80 cm, a height of 30 – 45 cm, and a length according to the conditions of the existing place. Cover tightly with plastic. Try not to have holes in the plastic that cause uneven decay and then let it sit for 5 days.

On the fifth day, the plastic lid is opened, and the compost is turned over using a rake and squeezed to prevent it from clumping. Mix with 50 kg of bran evenly and without clumping. Cover it back with plastic as before. The compost will be opened again when it is about to be put into the bucket.

c. Filling straw compost into the hut

Attach the plastic sheet along the path of the compost maker to the bucket. The process begins by opening the compost cover, and dismantling the compost little by little while decomposing it so that the compost does not clump using a dustpan, transporting the compost into the bucket.

Fill the top shelf first followed by the shelf below, by arranging the compost on the shelves to form 2 gulu and or beds according to the length of the shelf. The height of the slugs on the first and second shelves is between 40-5 cm while the shelves above it are approximately 30-40cm.

d. Putting cover compost into the hut

Put the compost cover in and crush the compost lumps until smooth. One day after the compost is inserted, spread evenly little by little with a thickness of 0.5 – 1 cm. Sowing starts from the inside of the stool and continues to spread compost on the edge of the shelf, a bucket is placed under the shelf to accommodate the compost so that not much falls to the ground.

Pasteurization

Pasteurization is the process of heating the room and planting medium of merang mushrooms in the hut to a temperature of around 70°C using hot water vapor for 12 hours with the aim of creating room conditions in the hut and the planting medium is free from wild mushroom spores and other disruptive microorganisms. The steps are as follows: Make sure all plastic walls and roofs

are not torn and leaking. Put seedling planting aids in the form of plastic buckets and used sacks into the hut to be sterilized before use.

Close doors and windows, so that air circulation does not occur. Arrange three drums filled with water in a row outside near the wall of the pond. Install bricks as heat conductors at the bottom of the drum. Install the blower cut between the 2 drums. Protect the steamer from rain or cold water. Make a hole in the wall to install the thermometer.

Once all the equipment is installed, turn it on as hot as possible and try to light a blue flame. Aim the spuyer so that the fire that comes out touches the arrangement of bricks under the drum. Pasteurization goes perfectly when the temperature reaches 60°C in the first 4 hours and 70°C in the next 4 hours. Maintain that temperature for 4 hours. If the above temperature is not reached, stop the pasteurization process and repeat the next day until the temperature is at least 70°C.

Planting Seeds

Sowing seeds on planting media, carried out 1 day after pasteurization in the afternoon, the temperature in the hut is around 35°C. All equipment including workers must be in sterile conditions, wash hands with 70% alcohol. The windows and doors of the hut must be opened 30 minutes before planting, the goal is to remove the ammonia gas formed during pasteurization. Seeds are spread evenly on the planting medium from the top shelf and then the bottom shelf, on the edge of the shelf adjacent to the plastic wall, more seeds are sown. Because in this part the light supply is more adequate so that it has a higher growth potential. Insert the seedlings under the shelf on the edges of just 2 planting holes per segment, to maximize the available planting media. Make sure the planting medium has been planted with the whole seed.

Maintenance

Maintenance activities (Fatma, Alifia Ulfatul 2017) include watering, door and window arrangements and steam maintenance. The activity of providing clean water to the fungal growth media, rooms, walls and floors of the coop aims to maintain the temperature and humidity of the room in the coop. The desired temperature for mold growth is 35-38°C (using a thermometer) with an air humidity of 95-98% (using a hygrometer).

The main pests are rats and termites, damaging the cobwebs and feeding on baglogs and growing fungi and preventing the appearance of nuisance organisms or other unwanted fungi.

The right harvest when the mushroom cap is large but the mushroom has not bloomed, use your thumb and try not to damage the planting medium around the young mushroom. Mushrooms that have been picked, clean the base using a knife and then store them in the basket and are ready to be marketed.

The economic analysis of the research was carried out by calculating the average cost incurred by the farmers of the Mitra Jaya Sejahtera Farmer Group and the Padamaran Mushroom Village Farmer Group in one production process, which can be seen as follows:

Table. 2 Average Cost of Merang Mushroom Farming per Person.

No	Cost Components	Prosperous Partners	
		Sum (Rp)	(%)
1	Fixed Fees		
	a. Kumbung Rental	44.643	2,50
	b. Levy	26.786	0,75
	Fixed Fee Amount	71.429	3,25
	Average Fixed Costs	40.000	
2	Variable Costs		
	a. Production Facilities	1.894.643	60,53
	b. Workforce	892.857	36,22
	Variable Cost Amount	1.561.000	96,75
	Average Variable Costs	1.936.666	
3	Total Farming Costs	2.858.929	100,00
	Average Cost of Farming	1.601.000	

The average revenue of merang mushroom farming in the Mitra Sejahtera artisan group was Rp.4,771,500 from 2 kumbung/person, after deducting production costs of Rp.2,858,928 from 2 kumbung/person, so that the income of merang mushroom farming was obtained of Rp.1,912,571 from 2 kumbung/person or equivalent to the income of merang mushroom farming of Rp.1,040,250 per cub, with an R/C of 1.65. This means that each victim of one unit cost (Rp.1.00) in the process of merang mushroom farming is obtained 1.65 units (Rp.1.65) This shows that the merang mushroom business in the mushroom artisan group in the Mitra Sejahtera group, namely the Mitra Jaya Sejahtera Farmers Group and the Padamaran Sejahtera Mushroom Village Farmers Group, Karangmangu Village, Kramatmulya District, is worthy of development.

The success of creating a new business of merang mushroom using media from cotton fiber, is a success in facing challenges in the global era. When the community is faced with tough business competition, the group of Mitra Sejahtera mamapu independent craftsmen who have competitive and comparative advantages, are able to build partnerships so that they do not depend on others. According to Samuel Hutington, here the human law applies, that those who are able to survive are those who are qualified (not strong).

From the revenue data and costs incurred, the break-even point of production and business price of merang mushroom is then calculated. The results of the analysis based on production and price, can be seen as follows:

Table. 3. Break-even Point of Merang Mushroom Farming per Person

No	Description	Unit	Prosperous Partners
1	Production	Kg	227,21
2	Total Cost	Rp.	2.858.928
3	Selling Price per kg	Rp./kg	21.000
4	Break-Even Point on Production	Kg	136,14
5	Break-Even Point on Prices	Rp./kg	12.823

The break-even point value of merang mushroom farming production is 136.14 kg. This means that the minimum merang mushroom production limit is 136.14 kg. If the production of merang mushrooms is less than 136.14 kg, then merang mushroom farmers will suffer losses. But on the other hand, if the production of merang mushrooms is more than 136.14 kg, then merang mushroom farmers will benefit. Based on the average production obtained by merang mushroom farmers of 227.21 kg, it is greater than the break-even point of production of 136.14 kg, which means that the merang mushroom cultivation business is profitable.

The break-even point value of the price of merang mushroom farming in the combination of the Mitra Sejahtera group, namely the Mitra Jaya Sejahtera Farmers Group and the Padamaran Sejahtera Mushroom Village Farmers Group, Karangmangu Village, Kramatmulya District, is Rp.12,823 per kg. This means that the minimum price limit for merang mushrooms is Rp.12,823 per kg. If the price of merang mushrooms is less than Rp.12,823 per kg, merang mushroom farmers will suffer losses. But on the other hand, if the production of merang mushrooms is more than Rp.12,823 per kg, then merang mushroom farmers will benefit.

CONCLUSIONS AND RECOMMENDATIONS

The small business community that is a member of the Mitra Sejahtera group, namely the Mitra Jaya Sejahtera Farmers Group and the Padamaran Mushroom Village Farmers Group, has succeeded in applying bio technology by carrying out a fermentation process on cotton fibers used as a medium for growing mushrooms. Comparison of research results with production of 227.21 kg while the results of previous researchers production of 246.67 kg. The feasibility value of farming as a result of the research is 1.65 while the result of the previous study is 1.73.

The success of business actors in jointly applying biotechnology that utilizes cotton fiber industry waste as a medium for growing Merang mushrooms, is the result of community empowerment to create an atmosphere or climate that allows the potential of the community to develop. The creativity of micro business actors who are carried out together on a home industrial scale, has been able to utilize waste into something useful with better production quality, more competitive and easier to manage so that this opens up business opportunities in a sustainable manner, even though rice as a natural medium is experiencing a scarcity.

ADVANCED RESEARCH

The content of the research is to assess the feasibility of merang mushroom farming which has begun to be less in demand by merang mushroom farmers because of the difficulty of obtaining straw as a growing medium.

The existence of cotton waste as an alternative can encourage interest in the merang mushroom cultivation business. For the next researcher in the development of scientific research, it is hoped that it will encourage researchers to explore the merang mushroom business which has begun to be pushed by the oyster mushroom business because the growth medium is easy to obtain.

Researchers can use other variables that have not been researched but have broad prospects.

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