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Economic Analysis of Oyster Mushroom Waste Utilization for Alternative Energy in Community Empowerment Program

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Abstract:
This study used a qualitative approach to reveal the process of making briquettes along with its economic calculations to measure Break Event Point (BEP) and profits in one year as a result of the implementation of community empowerment programs. The method used was the interview, observation, and documentation.As a tropical country, Indonesia has a high opportunity to develop oyster mushroom cultivation, especially in the highlands or mountains that are identical to the countryside. Young farmers who do not have the experience, need to be educated and trained to have a global outlook and are ready to accept the challenges of today's creative industries in Indonesia. The difficulties of having employment in the rural area force young people to go to the city to be factory workers or private employees because farmers in the majority do not own agriculture land so that they really depend on the landowner with no optimal profits. In addition, farmers currently only rely on crops that depend on weather conditions or natural factors, so that there is a significant effect if the climate does not support production it will result in crop failure. Therefore, it is necessary to empower farmer communities to utilize the agricultural waste they manage, to become another energy so that it can be used or supplied easily as an opportunity to increase farmers' income from other industrial sectors.Oyster mushroom baglog can be used as fuel briquettes. The briquettes are developed by utilizing the remaining bag logs of white oyster mushrooms (waste) to become charcoal briquettes as the alternative energy. Oyster mushrooms as agricultural products have considerable market potential, but the hitch lies on the non-optimal use of technology to produce more innovative products. In the process of producing oyster mushrooms, the use of heat energy for the baglog sterilization is done by evaporation. The fact that the evaporation process still uses diesel or gas fuel, motivate the researcher to develop the innovation by processing oyster mushrooms baglog into briquettes to be used for the evaporation process in the sterilization of bag logs production. The briquette industry can also be used for the benefit of home industries to replace gas fuel and other small industries that require fuel energy.The investment value of the briquette industry project of oyster mushroom baglog waste is Rp.150,000,000, consisting of warehouse facilities, notarial charges/licensing fees, land rent, office equipment, hydraulic machinery, printing tables, mixers and dryers, kiln combustion, workshops plan, and operational vehicles. The profit in 1 year is Rp.118,320,000 with the BEP in the 8th month is Rp.151,200,000.

Keywords:*Community Empowerment, Briquettes, Alternative Energy*

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I. INTRODUCTION

One sector that can be developed into a productive agricultural business is horticulture. Mushroom is one of the horticulture that has a number of advantages, including high vegetable protein content which is better for health than animal protein. The market share is very high and has not been fulfilled by the current national production level. Based on statistics from the Central Statistics Agency (BPS) in 2016, various mushroom production was 40.914 tons. This figure dropped to 37.020 tons in 2017. Meanwhile, the population of mushroom consumption in Indonesia per year is only 0.18 kg per capita [1]. This figure is lower than in Japan and Singapore with annual consumption levels reaching more than 1 kg per capita. Therefore, the government is encouraging mushroom consumption numbers for the people, as well as the Indonesian mushroom export regulations which is very popular abroad, especially in China, Korea, and Singapore.

Mushroom baglog or the remaining production from mushrooms are not thrown away, but can be used as organic fertilizer and can be processed into fuel briquette. This briquette can reduce the production cost of mushroom bag logs steaming sterilization by 50% compared to boiler machine (oil). Other research shows that briquettes can be alternative energy needed by households and industries, providing environmentally friendly benefits by minimizing waste or residual, can be an alternative business besides farming [2], [3], [4], [5], [6].

Figure 1
Mushroom Waste Briquettes

Figure 2
Waste Briquettes Fuel for steaming sterilization of Mushroom Baglog

Briquettes can be used for cooking at the household level, especially replacing kerosene and LPG gas. Briquettes originating from the Oyster Mushroom industrial waste began to be developed through several trials to products that are feasible to be produced, distributed and used for household needs. However, it still needs to be verified from the level of efficiency and stove technology, so that it is truly feasible to be used in the community as alternative energy.

Figure 3
Mushroom Baglog Waste Media

Figure 4
Simple Briquette Stove

Briquettes are lumps of charcoal made from hardened soft material. The factors that influence charcoal briquettes quality are the specific weight of the material or the specific weight of the powder, the fineness of the powder, the carbonization temperature, the pressure force, and the formula mixing for briquettes raw material. The briquetting process is a process that undergoes pulverizing treatment, mixing raw materials, molding with a hydraulic system and drying under certain conditions, so that briquettes that have a shape, physical size, and certain chemical features are acquired.

Farmers as the actor of the production of food raw materials play an important role in determining the quality and quantity of the production. On the contrary, farmers are only quiescent knowing that

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the crops tend to be influenced by the uncertain weather conditions. In addition, horticulture industry waste is usually thrown away so that it brings in a new problem, not processed, only buried or discarded into the river.

Farmers' ignorance needs to be facilitated in order that they will have new technology in managing the industry. These efforts are carried out through a process of community empowerment with training and mentoring activities. Of course, it is not only given to farmers but also to the teenagers who are also the strategic targets as productive age population. The output of the community empowerment process is economic independence and increased income, thus impacting the development of rural economies [7], [8], [9], [10].

As a process of increasing community competence in producing briquettes, the economic analysis aspect is the main variable in this project. The value of capital costs/investment in briquette production is Rp. 150.000.000 consisting of warehouse facilities, notary or licensing fees, land rent, office supplies, hydraulic machines and, molding tables, mixers and dryers, combustion kiln, workshop plans, operational vehicles. Net cash flow value after tax deducted for 1 year amounted to Rp.268.320.000. with BEP in the 8th month amounted to Rp.151.200.000. So, the profit in 1 year is Rp.268.320.000 - Rp.150.000.000 = Rp. 118.320.000.

II. RESEARCH METHOD

This research used a qualitative descriptive method to reveal the processes and steps used in producing the briquettes. While the financial analysis is used to measure the accumulation of Cash Flow, BEP, Investment Value and Profit. Thus, the financial calculation in this study is not a statistical research calculation, but an explanation of economic analysis seen from the viewpoint of production benefits for 1 year i.e. interviews, documentation studies, observations on the process of producing oyster mushroom waste briquettes.

III. RESULTS OF THE STUDY

Briquettes are solid fuel that can be used as alternative energy sources that have a certain shape. The selection of briquetting process should refer to a market segment in order to get optimal economic, technical and environmental values. Briquetting aims to obtain a quality fuel that can be used for all sectors as a substitute energy source. The following are factors that need to be considered in briquettes manufacturing:

1. Raw Materials

   Briquettes can be made from a variety of raw materials, such as bagasse, rice husk, sawdust, etc. The main ingredient that must be contained in the raw material is cellulose. The higher the cellulose content the better the quality of briquettes. Briquettes that contain high volatile contents tend to emit smoke and odor.
2. Binder

   To bond the raw material particles of substances in the process of making briquettes, a binder is needed so that a compact briquette is produced.

Briquetting technology is simply defined as a densification process to improve raw materials characteristics. The essential features of briquettes that affect fuel quality are physical, chemical and durability of briquettes, for example, the characteristics of density, briquette size, water content, and ash content.

The energy contained in briquettes depends on the concentration of methane (CH4). The higher the methane content, the greater the energy content (heating value) in the briquette, and vice versa. A good briquette requires a smooth surface and does not leave a black mark on the hand. In addition, briquette fuel must also meet the criteria: (1) easily ignited, (2) non toxic combustion gas emissions, (3) water and mildew resistant for long term storage, and (4) show high

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burning rate.

Good briquettes must also meet predetermined standards. The quality of briquettes production based on UK and Japan quality standards can be seen in the following table. It can be used as comparative data so that the quality of briquettes produced in this study can be revealed [10]. The quality of the briquettes can be seen in Table 1.

Table 1: The quality of briquettes

Analysis Types	Charcoal Briquette			
	U.K.	Japan	USA	Indonesia
Moisture Content (%)	3,59	6 – 8	6,2	7,57
Ash Content (%)	5,9	3 – 6	8,3	5,51
Density(gr/cm^3)	0,48	1 – 1,2	1	0,4407
Calorific Values(kal/gr)	7289	6000 – 7000	6230	6814,11

Resources: Department of Forestry and Estate Crops (1994) in Bahri, S (2007)

Molding and Pressing of Briquettes

Molding aims to obtain a constant shape and facilitate packaging and its usage. Molding briquette will improve the appearance and add its economic values. There are various types of molding devices that can be selected, depending on the purpose of their usage. Each molding requires certain hardness or compressive strength.

Pressing is one way to improve the quality of biomass as an energy source. Pressing briquettes aims to increase density, improve the physical characteristics of briquettes, and reduce handling problems such as storage and transportation. Briquettes made in cylindrical shapes constructed by two circular bases and connected by a curved surface, flat top and bottom surfaces, solid middle parts, most easily molded and having a diameter of 2-3 cm. This kind of briquettes is the most popular, because of its simplicity and space saving

Briquettes Drying

Molded briquettes still have a high moisture content that needs to be dried. Drying aims to reduce water content and hardened it to be safe from fungal disruption and physical collisions. Based on the method, there are 2 drying methods i.e. natural drying and artificial drying.

1. Natural Drying

   Briquettes can be dried by the sunlight or drying the molds arranged in a hollow or hollow wire basket, then spread out in an open place so that free sunlight enters. During drying, the briquettes are flipped back and forth so that the heat is evenly distributed.
2. Artificial Drying

   In artificial drying, the oven is used during all process of drying. It is employed to reduce carbon water content quickly without any climate and weather factors obstructions. The oven uses a heating element as its main component.

Briquette Making Process

The briquette production process is done through several steps. The steps for making briquettes is as follows:

1. Preparation of Raw Materials

   Raw materials should be prepared and cleaned from useless materials, such as stone. Try to make the material dry. The goal is to make the carbonization process faster.
2. Carbonization Process

   Charcoal burning or carbonization is a process where organic materials heated in a low-oxygen space during the combustion process takes place. To carbonize waste materials, a cleaned used drum can be utilized. The drum at first should be perforated with a nail on the base to let the air circulate into the drum.
3. Material Size Reduction

   Reducing the size of raw materials to fine particles is aimed to get a good briquette material. As a result of sieving, the material will

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be reduced. Sieving process aims to produce fine powder.

4. Mixing

   The adhesive material is mixed with smooth charcoal until it forms a kind of dough. This adhesive material is intended to make the briquettes not easily crumbled when it is burned.

5. Molding

   The ingredients are evenly mixed and when the charcoal can be coagulated, then the dough is molded. The form of the mold is attuned to the needs. Molding is performed by putting the dough into the mold, then press it until it is compressed.

6. Drying

   Molded briquettes are dried immediately to make them easily burned and not smoky. Drying can be done not only by the sunshine but also by means of artificial drying, e.g. the oven.

Financial Analysis

In composing the financial analysis, the technical assumptions are first determined as in table 2 below:

Table2: Technical Parameters Assumption

No	Technical Assumption	Unit	Amount
1	Production period	Hour	24
	Working days in a week	Day	5
2	Total briquette production per month	Ton/month	12
3	Labor		
	Administration and management	Person	1
	Production	Person	2
4	Selling prices to producers		
	Local (domestic)	Rp	2500
5	Tax	%	
	Tax percentage	%	20
	Equipment economic life	Year	5

Source: Results of primary data processing

Cash Flow Analysis

The development of cash inflows and outflows of the money used for briquettes production in one year can be seen in table 3 below:

Table 3:Cash Flow Analysis

No	Description	Month					
		1	2	3	4	5	6
A	CASH INFLOWS						
	1. Local sales of IDR 2500 / kg	30,000,000	25,000,000	35,000,000	30,000,000	40,000,000	35,000,000
	Total Cash Inflows	30,000,000	25,000,000	35,000,000	30,000,000	40,000,000	35,000,000
B	CASH OUT FLOWS						
	1. Capital Cost						
	- Raw material of 18 tons @ Rp300	5,400,000	4,800,000	6,000,000	5,400,000	6,600,00	6.000.000

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	- Fuel costs	600,000	600,000	600,000	600,000	600,000	600,000
	- Packaging costs	150,000	150,000	150,000	150,000	150,000	150,000
	2. Operational Costs						
	- Salary for 3 persons	4,500,000	4,500,000	4,500,000	4,500,000	4,500,000	4,500,000
	- Transportation costs	200,000	200,000	200,000	200,000	200,000	200,000
	- Repair and maintenance expenses	50,000	50,000	50,000	50,000	50,000	50,000
	- General administration	50,000	50,000	50,000	50,000	50,000	50,000
	- Other materials	50,000	50,000	50,000	50,000	50,000	50,000
	Total Cash Outflows	11,000,000	8,600,000	11,600,000	11.000,000	12,200,000	11,600,000
	TOTAL	**19,000,000**	**16,400,000**	**23,400,000**	**19,000,000**	**27,800,000**	**23,400,000**
No	Description	**Month**					
		7	8	9	10	11	12
A	CASH INFLOWS						
	1. Local sales of IDR 2500 / kg	45,000,000	40,000,000	50,000,000	45,000,000	55,000,000	50,000,000
	Total Cash Inflows	45,000,000	40,000,000	50,000,000	45,000,000	55,000,000	50,000,000
B	CASH OUT FLOWS						
	1. Capital Cost						
	- Raw material of 18 tons @ Rp300	7,200,000	6,600,000	7,800,000	7,200,000	8,400,000	7,800,000
	- Fuel costs	600,000	600,000	600,000	600,000	600,000	600,000
	- Packaging costs	150,000	150,000	150,000	150,000	150,000	150,000
	2. Operational Costs						
	- Salary for 3 persons	4,500,000	4,500,000	4,500,000	4,500,000	4,500,000	4,500,000
	- Transportation costs	200,000	200,000	200,000	200,000	200,000	200,000
	- Repair and maintenance expenses	50,000	50,000	50,000	50,000	50,000	50,000
	- General administration	50,000	50,000	50,000	50,000	50,000	50,000

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	- Other materials	50,000	50,000	50,000	50,000	50,000	50,000
Total Cash Outflows		12,800,000	12,200,000	13,400,000	12,800,000	14,000,000	13,400,000
	TOTAL	**32,200,000**	**27,800,000**	**36,600,000**	**32,200,000**	**41,000,000**	**36,600,000**

Capital Calculation/Investment Costs

The capital cost in the production of oyster mushroom waste briquettes can be seen in table 4 below:

Table 4: Capital Cost/Investment

No	Description	Total (IDR)
1	Warehouse facilities	2,000,000
2	Notary/licensing fees	5,000,000
3	Land rent	10,000,000
4	Office supplies	3,000,000
5	Hydraulic machines, print tables	15,000,000
6	Mixers and dryers	25,000,000
7	Burning klin	15,000,000
8	Workshop plans	25,000,000
9	Operational vehicles	50,000,000
	Total Investment	150,000,000

Based on the cash flows analysis in a period of 1 year, and subtracted by a tax of 20% obtained net cash flow which can be seen in table 5 below:

Table 5: Net Cash Flow

No	Month	Total	Tax 20%	Net cash flow		Description
1	January	19,000,000	3,800,000	15,200,000		
2	February	16,400,000	3,280,000	13,120,000	28,320,000	
3	March	23,400,000	4,680,000	18,720,000	47,040,000	
4	April	19,000,000	3,800,000	15,200,000	62,240,000	
5	May	27,800,000	5,560,000	22,240,000	84,480,000	
6	June	23,400,000	4,680,000	18,720,000	103,200,000	
7	July	32,200,000	6,440,000	25,760,000	128,960,000	
8	August	27,800,000	5,560,000	22,240,000	151,200,000	**BEP**
9	September	36,600,000	7,320,000	29,280,000	180,480,000	Profit
10	October	32,200,000	6,440,000	25,760,000	206,240,000	Profit
11	November	41,000,000	8,200,000	32,800,000	239,040,000	Profit
12	December	36,600,000	7,320,000	29,280,000	258,320,000	Profit
Total Cash Flow		**335,400,000**	**67,080,000**	**268,320,000**		

Based on the data of investment or capital values listed in table 4 which amounts to Rp. 150.000.000, thus Break Even Point (BEP) occurred in August. While profits in 1 year = cash flow - total investment, which is Rp. 268.320.000 - Rp. 150.000.000 = Rp. 118.320.000.

IV. DISCUSSION

Community empowerment is a concept that provides confirmation that human factors play an important role in an activity. This is based on the fact that human beings have a natural ability that if they are given certain treatment, they can use this ability to change themselves and others towards a better state. Increasing peoples chances of economic success in community empowerment programs need to be supported by the ability of creative production and program assistance [11], [12].

The term empowerment springs from the result of thinking and study of the human mind and western culture (Europe) which began to emerge around the 1970s and was disputed and developed continuously in the 80s, and the 90s until the end of the 20th century. Empowerment emerged as an important theme especially in the democratization, participatory, emancipatory movements including the women's movement and other oppressed groups movements in organizing society and the growth of

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new-populism and in progressive movements for peace and social justice [13].[14]

Community empowerment has a goal not only to provide changes for individuals in optimizing their strengths but also for groups existed in the community. Empowerment as a group strengthening tool, as it is stated in: empowerment is a tool to achieve goals (means to an end), to strengthen the capacity of their organizations/groups to be able to change current conditions, to posses the power of encouragement; and the occurrence of major changes that are indispensable in society [15].

The empowerment process through community empowerment programs is carried out in eight steps [16], which summarized as follows:

a. Develop small groups as the initial recipients of the empowerment program plan i.e. the empowerment that emphasizes activities in a small independent group.

b. Identify and build learning groups at the regional level by providing greater responsibility for students during the learning activities.

c. Select and train agents as facilitators who provide assistance, encouragement, guidance and so on.

d. Activate learning groups in which leadership played by students. Leadership and leaders will emerge naturally or by being chosen by the learners.

e. Organize facilitator meetings on the bases of democratic processes and non-hierarchical work relationships.

f. Supporting ongoing group activities by holding the same views and steps among students and educators in achieving goals.

g. Developing relationships among the groups by using learning methods and techniques that can lead to students' self-confidence.

h. Organizing a workshop for evaluation aimed to increase the degree of social, economic and/or political independence of the students in the community.

The concept of community education within the framework of empowerment should be regarded as an important matter. Empowerment is not limited to physical-material exploitation, but rather an attempt to increase the quality of intellectual, emotional, social, moral and religious abilities in order to be able to develop independently, proactively, participative, and emancipative. For this reason, community education has an important role in every dimension and sector of development in the empowerment paradigm.

There are two community empowerment strategies [17]:

a. The top-down strategy in which empowerment efforts are carried out hierarchically, tiered from the center to the regions, from the top to the lowest organizational level. This strategy has advantages such as speed, uniformity, and allows precise control. Therefore, from the aspect of time and energy released it can be considered efficient.

b. The bottom-up strategy is a response to overcome negative excess of the first strategy. This strategy states that even though the development of rural communities needs centralized guidance, it can only be made effective if the community organizations in the rural are able to receive, absorb, translate, and be able to speak on behalf of the community. It means that the organization is in a position to represent both the government and the community. This strategy has advantages i.e. the opportunity for people's freedom to express opinions, requests/demands to the government that are channeled democratically. Another advantage is the realization of consensus between the

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community and the government because of good reciprocal communication.

In essence, all empowerment strategies emphasize the importance of the commitment of the empowering party to reduce their strength and power and view the empowered party as not an object. Thus, the empowered party should be placed in a central position, so that it can foster strength and ability to determine its own future. In other words, community empowerment does not make the community more dependent on various charity programs, as basically success is gained through learning, hard work, commitment, and endeavor [18].

The spirit of entrepreneurship built-in the community empowerment program through the briquette industry that has been implemented is a strategy of economic independence through self-development stimulation by means of training activities.

In simple terms, entrepreneurship is a creative and innovative ability used as a basis, tips, and resources to find out the opportunities for success. Entrepreneurship is the implementation of creativity and innovation to solve problems and take advantage of the opportunities and challenges faced. Creativity is defined as the ability to develop ideas and find new ways to solve problems, while innovation is defined as the ability to implement creativity to solve problems and opportunities to increase life affluence.

The entrepreneurial development of each individual is not always the same. Differences in knowledge, interests, culture and environmental factors where a person lives will determine the kind of career they want in the future. Some factors that encourage entrepreneurship [19], is as follows:

a. An entrepreneur is a hero

   Someone who already has his own responsibility, family, and community, in general, will be motivated to increase life values.

b. Entrepreneurship education

   Shifting the myth of "entrepreneurs are born, not made" to entrepreneur has disciplines, modes, models, processes and can be learned "shows that entrepreneurship can be learned and practiced. Being an entrepreneur does not need to be the descendants of an entrepreneurial person.

c. Economic and population factors

   The development of independence attitude and economic improvement, in general, will drive entrepreneurship in producing what others need. At present and in the future, there is no restriction of being an entrepreneur, no matter the gender types, age, and social status are.

d. Economic and services shifts

   The development of goods production has a tendency to increase the number of goods in the market. This condition will trigger businesses to market these goods to consumers so that it has a tendency to increase goods marketing services business.

e. Free lifestyle, international opportunities, and technological advancements

   The ability to create the new and different, creativity and innovation as the foundation of entrepreneurship will spring up if you have the freedom to think and act.

Entrepreneurs who are open to new experiences will be better equipped to face all opportunities, challenges, and social changes, for example in changing the standard of living. People who are open to new ideas are innovative and creative entrepreneurs.

V. CONCLUSIONS

The community empowerment program aims to increase capacity, competence, and income as a

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manifestation of economic independence. Technology development in agriculture is continuously carried out to improve competitiveness and the challenges of production limitations that occur in the agricultural sector. Farmers not only rely on their crops but also use agricultural waste converted into briquettes as a technological transformation that has economic value. Farmers are trained to be skillful, independent and innovative in developing their agricultural sectors. Economic analysis shows that the briquette industry with the economic cycle for 1 year has promising opportunities and benefits, with a profit of Rp. 118.322.000 and reached the BEP in August. The condition of the above briquette business success should become the entrepreneurial spirit that grows among the participants of the program.

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