

BUSINESS DEVELOPMENT OF FISH MEAL AT PUGER WETAN VILLAGE

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ABSTRACT

Puger Wetan is the largest fisheries center in Jember. One of the fish type produced is *Sardinella Lemuru*. Due to its small size and prickly nature, it is rarely consumed directly. It is commonly sold as raw material for canned sardines. Canned sardines manufacture needs fresh Lemuru, because it will cause itching on the tongue if not fresh. Whereas, fishermen mostly piled the fish in the boat hatch then gave ice cubes, so that the majority of it will no longer be fresh when arrived in the mainland because its perishable nature due to its thin skin. As the result, most of fishermen's catch is not feasible for canned sardines and become leftovers. During this time, it will be sold at a low price. Fish leftovers that are not absorbed by the market are dumped into the river, becoming leftovers. The waste pollutes the environment and harms the health and hygiene. There will be more wastes during the fishing season, as more and more lemuru leftovers are dumped. This activity aims to resolve the problem by transforming the leftovers into fish meal, using appropriate tech machines. The activities are carried out in several stages. The first stage is the counseling about the negative impact of fisheries waste and the possibility of utilizing it into fish meal, also about the business opportunity that is still potential because domestic demand is still not yet met. The explanation of the importance of business management was also given. The third stage is the practice of making fish meal with the help of tools that have been previously converted technology. The fourth stage is the evaluation of activities for the benefit of partnering groups. Lemuru leftover utilization into fish meal is one of the important components in animal feed which can increase the fishermen income, while reducing environmental pollution.

Keywords: Fish meal, disc mill

1. Introduction

Puger Subdistrict is located in Jember District, approximately 47 km to the west, right on the edge of the south coast. As a fishing village, their communities are working in the field of fisheries, either as fishermen, fish traders, as well as fish processing business such as salted fish and shrimp paste. Fish types commonly found are Tuna, Lemuru, and Mackerel. Lemuru in particular can be caught almost all year round, although the numbers fluctuate, so that fishermen can catch fish every day as long as the weather allows. Lemuru caught by the fishermen is bought by collectors to be sold to the canned Sardines manufacture. Lemuru is rarely consumed in fresh condition because it has a lot of thorns and its size is relatively small, making it more difficult to be processed. Lemuru purchased by the collectors are the ones still fresh because its freshness can affects the quality of sardines. The ones were not purchased by the collectors become fish leftovers with low selling prices because among sellers of fresh fish, lemuru is classified as less preferred one because it is perishable and easily damaged.

Based on observations at the sites, fishermen usually piles the Lemuru above the boat hatch with minimal ice cubes. Due to this poor handling, its quality is quickly deteriorated. When they got to the ground, some have started to rot, so they are dumped, piled up in the riverside or dumped into the river, into the waste, and resulting oily water in the river. The number of rotten fish which cannot be sold makes the fishermen often suffered losses due to the sale of the catch which does not worth the effort and costs incurred to go fishing.

During Lemuru fishing season, around October through December, fishermen usually catch the fish in large numbers, so the amount of fish unabsorbed by the market and become waste is increasing. This is definitely disturbing the cleanliness of the environment, releasing bad smell, inviting flies that

can eventually cause disease, developing an area for the growth of pathogenic bacteria and viruses, as well as other negative impacts.

To reduce the negative impacts, and to increase the fishermen income, the fish leftovers must be processed in order to create added value. Based on the observation, the highest added value can be obtained by processing lemuru waste into fish meal. This business opportunity is highly prospective because the current fish meal industry is still small, so there is still a lot of fish wasted. This would result in waste of resources.

Fish meal commodities have prospective market opportunities, both for local and international market. The needs of fish meal as the main ingredients of animal feed in Indonesia is quite large, but due to low domestic fish meal production, then 90% of the ingredients must be imported. In 2011, imports of fish meal in Indonesia amounted to 167,224,729 kg, or \$ 44,384,799 with an average increase in imports per year by 39% [1]. Whereas in 2014, according to the Directorate General of Fishery Products and Marketing, the need for fish amounted to 90,000 tons, and the import of 80,000 tons of fish meal reached US \$ 480 million or 5.7 trillion rupiahs [2].

Based on the analysis of the situation, can be described some of the problems faced by the fishermen's group, those are:

1. The use of fish is limited as a product to be marketed directly (fresh fish), especially for raw materials of canned sardines.
2. Lack of knowledge on how to utilize fish leftovers so that only it is only discarded and become annoying waste.
3. The absence of adequate tools for the processing of fish waste into useful material, particularly fish meal.
4. The need for the development of enterprises to increase fishermen's income in addition to fishing. Especially when sea conditions do not allow, fishermen can't go to sea and therefore cannot earn.
5. Have yet to understand about business management and accounting.

Based on these problems, the main problem to be solved is the utilization of solid waste from the fish that is in the form of fish leftovers that are not accommodated in the marketplace and in the processing industry. With the utilization of fish waste, in addition to a positive impact in reducing environmental pollution, it also creates the diversification of the fishermen group businesses, increases income, and ultimately improves their welfares.

2. Literature Review

2.1 Fish Meal

Fish meal is fish or parts of it which oil is taken or not, dried and then milled. The main use of fish meal is as ingredients in animal feed. In general, each type of fish can be processed into fish meal. Selection of the type of fish that will be used as material for fish meal must consider its characteristics, economic value and availability. One of the characters that is important in fish is fat content because it affects the quality of the fish meal. Too high fat content will adversely affect the quality of fish meal. Pelagic fish, the fish that live in the upper mixed layer water, has a relatively high fat content. While demersal fish which normally live in deep water, has relatively low fat content. Fish categorized as low-fat if its fat content is 3-5%, and high if more than 10% [3].

Lemuru is one of pelagic type fish that is commonly processed as fish meal. To get rid of the fat content, first boiling before drying it. Lemuru is sardinella group, which fishing season peaks around November. Its body length is generally between 15 -18 cm [4], sparkling in the abdomen and bluish on the back [5]. Based on the research results Lemuru is high in protein so it can be used as an ingredient in animal feed. The content of nutrients in fish meal is 60-75% protein, 6-14% fat, 4-12% water and 6-8% ash content [6]. The fish meal as an ingredient in animal feed nutritious mixture. The percentage of fishmeal in animal feed for laying chickens and ducks 5-10%, domestic duck 12%, quail 10% [7]. Fish meal from lemuru can particularly increase the omega-3 in chicken eggs [8].

Out of 20 tons of wet fish can be processed into 9 tons of fish meal [9]. The byproduct of the manufacture of fish meal is fish oil. According to reference [10], lemur fish oil is the waste as the result of fish meal processing which contains Eicosapentaenoic Acid (EPA) and docosahexanoic acid (DHA) that is included in omega-3 fatty acids (linolenic). Results of research on tilapia gift (*Oreochromis sp*) has found that fish feed pellets stimulant (SPI) with 30% protein value can increase the body weight of tilapia gift (*Oreochromis sp*) from 100 g to 575 g in four months.

Fish meal contains high animal protein, composed of essential complex amino acids, including Lysine and Methionine, also contains calcium and phosphorus, as well as complex vitamin B, especially vitamin B12. When viewed from its quality side until now fishmeal is still irreplaceable. Indonesia has a great potential for the development of fish meal products. Small-scale industrial processing and manufacturing fish meal in Indonesia would be appropriate to be applied, given the availability of raw materials as well as the rest of the trash fish processed fairly large. The amount of imported fish meal arises by 11.20% annually. This shows that the fulfillment of fish meal production in the country has not been sufficient.

Fish meal has different types. Good quality of it has uniform granules, clean, free from insects contamination, fungi, pathogenic microorganisms, does not contain bones, fish eyes and other objects, as well as the distinctive smell of fish [11]. The better the quality of fish meal, the higher the price. Fish meal prices in the market are around 5,000 - 9,000 rupiahs per kg, depending on the protein content. Fish meal price is generally determined by the percentage of rough protein content. Fish meal contains relatively high crude protein, will be more expensive. Good quality imported fish meal has protein content ranged roughly between 60-74% with a fat content ranged between 31.72% - 57.02%, fat between 4.57% -20.68%, with water element between 7.33% -11.16%.

How to proceed fish into fish meal will go through several phases:

1. Fish boiled or steamed about 30 minutes or until tender and slightly crushed into fish cake
2. Fat or oil from fish will be separated and float on the surface of the cooking water
3. Fish oil is filtered to be separated from fish stew. Fish oil can be sold for a fish oil supplement ingredients
4. Cake fish dried under the sun to dry
5. Dried cake fish is grounded into fish meal using disc mill
6. Fish meal sifted so that the result is uniform, then packaged.

2.2 Disc Mill Machine

Disc mill machine is a machine used to crush the dried fish to become fish meal. Fish milling process utilizes mechanical energy generated from the engine to drive shaft rotation, and it is transmitted using V-belts (V-belt) then its rotation is used to drive disc shredder so that dried fish becomes smooth granules. Disc crusher is the most important component of the machine with pressure and friction between the two parts of the disc where one rotates and the other is fixed. Both disc will rotate simultaneously in opposite directions so it will be able to destroy the milled material. On the part of the disc there are bumps which function is to clamp the material. During the process, the material will undergo friction between the two discs so that its size becomes smaller and smoother.

Parts of disc mill [12]:

1. Entry Funnel: the entrance of the material to be milled.
2. The wall coverings and discs: the crusher of material because of the rotational movement of the disc towards the stationary wall coverings.
3. Exit Funnel: facilitate in accommodating the output material.
4. The air circulation room: facilitate the entrance and output of materials and material from the disc grinder.
5. Driveshaft: moving or rotating the disc on the disc mill, driven by electric motors using puley and belt as power distributor.

3. Methodology

Comprehensive effort is applied to resolve the problems of partners. Strategies adopted by improving human resources through education and practice of entrepreneurship, introduction of appropriate technologies, as well as improvement of business management. The targets are two groups of Puger Wetan villagers. Stages of activities carried out can be described as follows:

1. Counseling on the impact of fish waste, fish waste utilization technology to become fish meal and prospects.
2. Transfer of technology in the form of disc mill machine
3. Practice of lemuru fish making from lemuru leftovers
4. Counseling on business management, marketing tool and simple accounting organization

4. Results and Discussions

4.1. Counseling activities on fish waste impact, fish waste utilization technology transfer into fish meal and prospects.

Technology transfer activities on lemuru waste utilization into fish meal are in the form of counseling and training. Partners are taught on how to make fish meal. Partners are also given an explanation about the prospects and business opportunities of these products that are still wide open because there are still very few competitors.

To date, fish waste processing into fish meal is identical with the need for tools that are large and expensive. As a result, big scale entrepreneurs have greater role in this activity than merely community based. Community interest in this activity is likely lacking due to the provision of tools and funding constraints. Therefore, it is necessary to make an appropriate fish waste grinding machine into fish meal that is not too expensive. Fish grinding machine is a machine used to crush dried fish, grounded into fish meal. After that, fish meal used as a basic ingredient of animal feed, because the protein content in fish is very high.

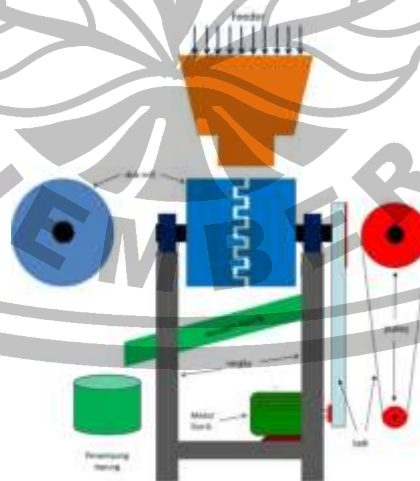


Figure 1. Disc Mill Machine Design

The technology induces in these activities is in the form of disc mill with a design as seen in Figure 1. There are two size tools in this activity, those are engine 7 HP and 20 HP. The 20 HP engine is intended for production scale, when the fish waste and leftover are abundant, so that the production is more effective and efficient. While the smaller one is intended for the production when the amount of raw lemuru processed for fish meal is not too much. This small machine is intended for the use and process of waste, so that can reduce the impact of waste towards the environment.

4.2. Practice of Manufacture fish meal from Lemuru leftovers

Products made in order to resolve partners' issue related to economic and environmental problems is fish meal. Practice on how to process fish meal is intended so that partners can experience on the firsthand how to make it, also how to apply appropriate technology tools used in the production process that is disc mill machine.

Products in the form of fish meal is packed in medium package to be sold to farmers who make their own animal feed. In addition, to facilitate the partners to market its products, partners have been associated with one of the local entrepreneurs who produce fishmeal in medium scale and have had regular customers in large quantities in several cities in East Java. Thus to better ensure the marketing process.

4.3. Administration and Management Counseling as well as how to create simple accounting

According to [13], creating accounting system is important if a business wants to sustain/survive in long term basis. Administrative records is a component that must be considered in the operation of a business. Its function is to record, monitor, and can be an analysis and evaluation material of business development in the future. Small scale businessmen are usually business owner who has dual function, that's why the managers in small scale businesses are dealing directly with all matters related to the business, production, resources, marketing, business development and others. As a result, it is absolutely necessary to have management capabilities as the foundation of its business survival.

According to [14], a simple accounting is started from the cash flow recording. Because in operations, small scale and home based businesses are still largely focused on cash transactions. Cash book is a major financial post where all the money is recorded centrally. The contents of a cash book record the entire sales and expenditure posts. Sales post includes the recording of all products selling. Expenditure records all things related to business expenses. Whether it's for obtaining raw materials, operational, and salaries of employees.

Recording starts from the beginning balances of capital submitted by business owners or derived from the balance of the previous month (recorded as incoming money). The balance is then managed by the business owner to provide raw materials to produce the product. After a certain period, the balance of the business can be seen. Namely the difference between money obtained and money spent on expenditure.

Accounting for small scale and home based businesses doesn't need to be complicated or expensive. With relatively inexpensive capital, business owner could have a simple accounting to record financial transactions. This is a step towards a better accounting system and to facilitate business owners in applying a more complete accounting system in the future.

4.4. Evaluation

Evaluation is done during the implementation of activities with a direct review on how partners implement all delivered and practiced materials as well as monitor the changes occur in the target groups, both in the business/production aspects, management and environmental hygiene. Based on observations and interviews, some important things can be achieved in this activity.

4.4.1. Benefit from Economic Aspect

From economic standpoint, this activity can increase the income of partners. This is partly because they can still earn despite not doing sea fishing through the manufacture of fish meal. The raw materials for fish meal are obtained from the fishing few days earlier that had been dried, or purchased from other fishermen or fish merchants. It will indirectly increase the income of other fishermen (other than partners) because the catch that is not absorbed by the

market can still be of economic value since it was bought by a partner for raw material in making fish meal.

Partners are expected to develop their business. If the business scale develops well, it will be able to absorb more workers and to reduce unemployment. The business development doesn't only need knowledge but also entrepreneurship capability, by mastering the ins and outs of entrepreneurship. This capability can be either talent or the result of exercise or practice. According to [15], Capabilities that should be owned by an entrepreneur include: capabilities to take calculate the risks, to think creatively, to manage, to communicate and interact as well as to master financial and marketing strategies. Thus, the training provided in these activities foster the entrepreneurial spirit that stimulates the emergence of other entrepreneurial ideas, so it is expected that the business is growing and the business diversification is achieved.

If seen from the technology converted machines, that are disc mill machine, the machine can be used for grinding other materials as long as they are dried, such as coffee, corn, rice, soybean, and others. Thus, in times of lean fish, the disc mill machine can still be used even to produce kinds of non fish. So its utilization and effectivity of the machine will be high, depending on the creativity of the partners in the development and other business diversification.

4.4.2. Benefit from Environmental Aspects

These activities can reduce the waste caused by solid waste of fish, so that the environment becomes more healthy and beautiful. Fish leftovers and trash which were previously unprocessed, left, and does pollute the environment, it is now put to good use by processing it into a useful product that is fish meal. Therefore, it can reduce the cause of the disease, namely itching, diarrhea, and thypus.

In general, partners are very excited about these activities. In fact, they had the idea to use the tools that have been granted to them for other things that are useful especially when the raw material for fish meal is less, among others grinding rice, corn or coffee into a fine powder form. In addition, the partners are also interested in processing the byproduct from processing fish meal, that is fish oil. This fish oil if processed correctly will contain the nutrients that are very high, and has a high value. Thus, it will increase their income and welfare.

Overall, various activities and solutions offered would be able to resolve the problems faced by both partners before the IbM program as in Table 1.

Table 1. Comparison of Before and After IbM Program

No.	Before IbM Program	After IbM Program
1.	Environment was polluted by fish leftovers that become a waste	Environmental pollution caused by fish leftovers is decreasing
2.	Fish leftovers, both dried or fresh that are not absorbed by the market will be dumped, unprocessed	Fish leftovers has added value by processing it into fish meal
3.	When no lemuru season, The fishermen's catch will be reducing so that they have low or even no income.	When no lemuru season, partners can still earn money by making fish meal using another type of fish
4.	no additional income during fish season because fish excess cannot be absorbed by the market (not sold)	Increased income especially during fish season because all the fish can be processed and has economic value
5.	Main profession is as fishermen	Has side job on the ground
6.	Didn't have entrepreneurship idea	Can own business that can bbe developed by producing fish oil, fish silage, etc.

7.	Did not understand business management	Understand simple business management and accounting
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5. Conclusions

Fish meal processing development activity through technology transfer and tools assistance as well as training and production practices benefit the partners and community residing around the group partners economically and environmentally. Economically, it can increase the income of the group partners through the fish leftovers processing into useful fish meal products and its business prospects are still bright, and also for community whose fish catch is not absorbed by the market, they still can gain economic value by selling their catch to the fish meal producers. The benefits for the environment is to prevent the waste of natural resources and to reduce environmental pollution because there are no more dumped unprocessed because they can be processed into fish meal.

6. Acknowledgement

Ministry of Research, Technology and Higher Education through IbM 2015 program.

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