Original Research Article

FINANCIAL ANALYSIS OF COSTS OF FISH FEED PRODUCTION WITH RESTAURANT WASTE AS BASIC INGREDIENTS (Case Study in Jatinangor District, Sumedang Regency, West Java)

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ABSTRACT

As an educational city, Jatinangor has a fairly large population density. In turn, it generates restaurant organic waste in large quantities. Excessive production of organic waste will be a problem if it is not accompanied by good management and utilization. One of the efforts in utilizing restaurant waste is to turn the waste as fish feed. This study aims to calculate the production of restaurant waste and analyze the cost of production of fish feed using restaurant waste flour. The production of restaurant waste was calculated using purposive random sampling, while the cost of feed production was determined by using variable costing method. Questionnaires and research primary data were used to collect data. The results obtained from this study were as such: production of restaurant waste in the Jatinangor area is 261.7 Kg/day, the cost of production for fish feed with the basic ingredients of restaurant waste flour is 70,013,127 IDR with a production capacity of 6,913.1 kg of fish feed per year, so that the cost of feed per kilogram is 10,127.60 IDR, and the selling price of feed is 12,200 IDR/kilogram with a profit of 20%. Thus, it can be seen that independent feed production using restaurant waste can be a solution in the utilization of waste and can also be used as a source of income for the surrounding community.

Keywords: Cost of Fish Feed, Feed material, Restaurant Waste Production

1.0 BACKGROUND

Jatinangor is one of the sub-districts in Sumedang Regency, which used as an education city and housed 4 major universities such as IPDN, IKOPIN, ITB and UNPAD. The existence of these campuses makes Jatinangor to be one of the centers of education in Indonesia and one of the districts in Sumedang with high population density. Based on data from BPS Sumedang Regency, the total population in Jatinangor in 2016 was 113,234 people with a population growth rate of 4.27% in 2010-2016 (BPS, 2017).

The high population and population growth in Jatinangor helped the food industry such as restaurants to thrive. The increasing number of culinary destinations in Jatinangor, makes the production of waste, especially organic food waste high. High waste production will be a problem if there is no good management and utilization. In Several countries, such as South Korea, Taiwan, China, Japan and the United States have done utilize waste for feed, approximately 40% of food waste has been converted into animal feed (pork, chicken and fish) (Chen and Lo, 2015). In Indonesia, food waste is usually ends up in landfills (7.5%) or used as compost (1.61%) (Dewilda et al, 2019). That is indicates that food waste recycled in Indonesia is far away behind other countries. One of the solutions to manage organic waste is to process the waste and turn it into fish feed ingredients.

Feed is one of the most important components in fisheries activity. About 60-70% of the total cost of aquaculture production is spent on feed (Andriani et al, 2016). Thus, it is necessary to independently develop feed using alternative feed ingredients that are easy to find and have great availability.

Alternative feed ingredients that have the potential to be used as feed ingredients are restaurant waste because they have high availability and have not been utilized properly, especially in the Jatinangor area. Valentiona et al (2018) stated that based on the data collected from 22 restaurants in Jatinangor, they produced around 150 kg of organic waste per day.

Based on the proximate analysis conducted to determine the nutritional content of restaurant waste, the results showed that restaurant wastes have potential to be utilized as alternative feed ingredients. The results of the proximate analysis of restaurant waste can be seen in Table 1.1

Table 1.1 Results of Proximate Analysis of Restaurant Waste Meal

Category	TLRM 1	TLRM 2	TLRM 3	Average
Protein (%)	27.10	23.12	22.33	24.18
Crude Fiber (%)	3.04	3.88	4.59	3.84
Fat (%)	10.46	11.78	13.38	11.87
BETN (%)	48.05	51.37	54.28	51.23
Energy (Kkal/Kg)	4,126	4,197	4,401	4,241.3

Info: TLRM is restaurant waste meal

Lovell (1989) stated that fish use protein as a source of energy in carrying out activities, thus the fish's need for protein is greater than that of terrestrial animal e.a chicken, duck and rabbit. Based on the table (table 1.1) it can be seen that the protein content in restaurant waste flour ranges from 22.33-27.10%. Handajani and Widodo (2010) in their book stated that fish feed ingredients need minimal protein content of 20%. So, it can be said that restaurant waste flour can be used as an alternative feed ingredient. Fat content in restaurant waste flour ranged from 10.46-13.38%, and crude fiber content of 3.04-4.59%. The amount of nutritional content in restaurant waste flour is directly influenced by the main components included in the waste. Utilize organic waste as the raw material of fish feed is able to reduce feed costs by 23.42-35.13% in one production cycle (Dewi et al, 2021), therefore fish production activities will be more effective and efficient.

Production cost is the amount of capital value spent in one production cycle from raw materials until it becomes finished materials (Kusumanto & Hidayat, 2018). Determination of the production cost is very important in production activities, this is because the results obtained from the determination of the cost of manufactured goods are used as cost control, decision making and determining the expected profit from a production activity (Bakhtiar et al, 2012). Sujarweni (2016) stated that the cost of production per unit is the amount of production costs contained in each unit of product. The production costs according to Setiawan et al. (2018) are all costs incurred in a production process consisting of fixed costs and variable costs. Thus, cost of manufactured goods can be interpreted as the result of dividing the total production costs (fixed costs and variable costs) with the amount produced goods in one production cycle.

2.0 MATERIAL AND METHOD

The method used in calculating the production of restaurant waste is purposive random sampling method. The sample taken is 30% of the total restaurants in Jatinangor area with criteria for the restaurant sampled are restaurant with Padang food, Sundanese food and Javanese food, which is 9 restaurant. Meanwhile the production cost is determined using variable costing method. This method is a method that takes into account the cost of raw materials and labor costs.

3.0 RESULTS AND DISCUSSIONS

3.1 General Condition of Research Location

Jatinangor District is one of the sub-districts in Sumedang Regency which is divided into 12 villages, 133 RW and 491 RT (BPS, 2017). Jatinangor has a topography of hills with an altitude of 725-800 m above sea level with an average annual rainfall of 318.75 mm3 and the distance to the Regency Capital is 25 km (BPS, 2017).

Jatinangor is a sub-district with a very high population density when compared to other sub-districts in the Sumedang Region. Based on BPS data (2017), it is stated that in 2016 the population density in Jatinangor District was 4,322 people/km2. This high population density is

supported by the existence of 4 universities, which make Jatinangor one of the educational destinations in Indonesia.

3.2 Calculation of Restaurant Waste Production

The number of Padang, Javanese and Sundanese restaurants in the Jatinangor area (along Jatinangor Street) is about 31 restaurants. Thirty percent of the total amount of restaurants were taken as samples. Therefore, the number of restaurants used as interview samples were 9 restaurants. Based on interviews that have been conducted, the production of restaurant waste can be seen in Table 1.2

Table 1.2 Restaurant Waste Production.

No	Restaurant	Waste Production (kg)
1	Warung Tegal Kharisma	± 2
2	Warung Tegal Azzahra	± 2
3	Warung Tegal Cemara 2	± 1.5
4	Warung Tegal Bahari Jaya	± 1.5
5	Warung Tegal Smile	± 3
6	Rumah Makan Ampera	± 23.5
7	Rumah Makan Cibiuk	± 30
8	Rumah Makan Padang Iko Nyo	± 1
9	Rumah Makan Padang Elok	± 5
	Total	69.5

Based on the data obtained above, the amount of waste generated from all samples interviewed were around 69.5 Kg of organic waste in the form of leftover rice, bones, meat and vegetables. The average waste produced is 7.72 Kg. Thus, the amount of organic waste produced by restaurants in the Jatinangor area is around 231.67 Kg (7.72 Kg x 31 Restaurants) per day.

3.3 Components of Restaurant Waste

The components that make up restaurant waste directly affect the quality and nutritional content of the waste. Thus, the waste collected from 5 samples in this study were sorted out into 3 different categories, which were carbohydrates (rice), animal (bone and leftovers meat), and vegetables to find out the average components that make out the wastes.

The samples were taken and sorted on 5 different days, and the average content of restaurant waste every day was determined. Based on the sorting, the following results were obtained:

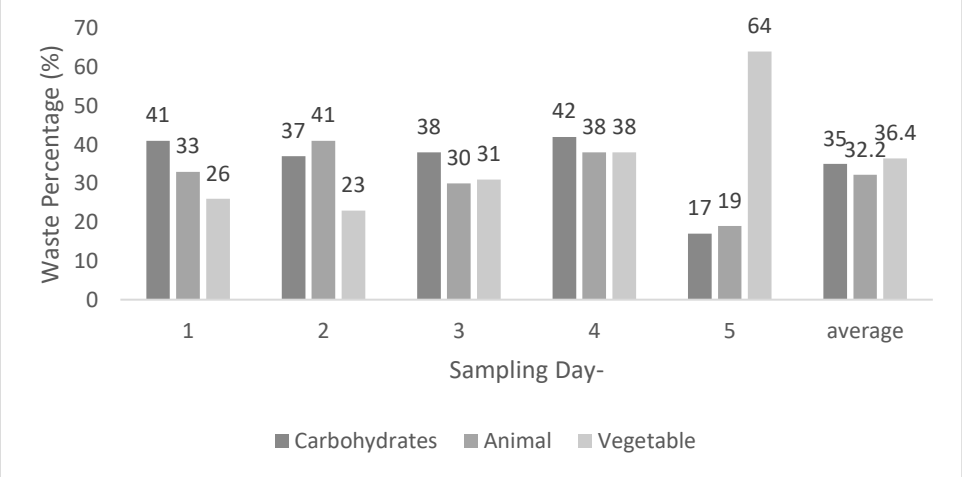

Figure 1. Percentage of Restaurant Waste Components

The graph (Fig.1) shows the quantity of waste components taken from 5 different samples. The results obtained include an average carbohydrate source (rice) of 35%, an average animal source derived from bone and meat leftovers of 32.2%, and an average of 36.4% of vegetable sources.

3.4 Cost of Fish Feed Production

The cost of fish feed production using restaurant waste flour is obtained from the calculation of raw material prices, overhead variable and fixed overhead. The raw materials used in the manufacture of fish feed can be seen in Table 1.3

Table 1.3 Cost of Fish Feed Production

No	Raw Material (Ingredients)	Total (kg)	Price/Day (IDR)
1	Fish Meal	4.75	48,500
2	Soy Meal	4.75	41.800
3	Restaurant Waste	2.61	9,000
4	Bran	5.52	22,100
5	CMC	0.82	820
6	Fish Oil	0.16	3,900
7	Vitamin Mix	0.33	924
	Total		127,044

Based on the table above, it can be concluded that daily feed production costs 127,044 IDR and will produce 18.94 kg of fish feed, so that in one year the production of fish feed costs 46,371,060 IDR with feed production of 6,913.1 kg. Direct labor costs are the costs spent to pay workers wages. In this study, there were 2 workers who were given a daily wage of 50,000 IDR per person.

3.5 Cost of Overhead Variable and Fixed Overhead

Overhead variable costs are costs spent for to the production process. In this study overhead variable costs were included fuel for taking restaurant waste flour, flouring costs and the costs for pellets production. Table 1.4 is the breakdown of the overhead variable costs which were spent in this study

Table 1.4 *Overhead Variable* Costs of Feed Production.

No	*Overhead Variable*	Total	Price/Day (IDR)
1	Fuel	1 Litre	7,000
2	Pellet production	1 time	15,000
3	Cooking Gas	3 Kg	24,000
4	Meal process	1 time	9,000
	Total		55.000

Fixed overhead costs are costs that is spent even though there is no production activity. Table 1.5 is the breakdown of fixed overhead costs spent in this study

Tabel 1.5 Fixed *Overhead* Costs in Fish Feed Production.

No	Tools	Unit	Unit Price (IDR)	Total Price (IDR)	Time Span (year)	Depreciation (IDR)
1	Pail	2	5,000	10,000	3	3,333
2	Scale	1	125,000	125,000	3	41,667
3	Basin	3	10,000	30,000	3	10,000
4	Knife	2	7,500	15,000	5	3,000
5	Cutting board	2	4,000	8,000	5	1,600
6	Oven	1	100,000	100,000	5	20,000
7	Bucket	2	5,000	10,000	3	3,333
			Total			82,933

3.6 Cost of Fish Feed per Kilogram

The cost of fish feed production per kilogram can be calculated by adding up all variable costs divided by the total product. However, it is necessary to classify the types of costs used first. Table 1.6 is the classification of costs.

Table 1.6 Costs Classification of Fish Feed Production

No	Type of Costs	Annual Costs (IDR)
1	Variable Costs	
	Raw Material Cost	46,371,060
	Labor Cost	36,500,000
	Overhead Variable Cost	20,075,000
	Total Variable Costs	**70,096,060**
2	Fixed Costs	
	Depreciation	82,933
	Total Costs Spent	**70,013,127**

Based on the table, it can be seen that the overall cost used in making fish feed using restaurant waste flour is 70,013,127 IDR with a production capacity of 6,913.1 kg. The calculation of the cost of production is as follows:

$$\text{COGS per kilogram of feeds} = \frac{Total\ Costs\ Spent\ /_{Days}}{Total\ Production\ /_{Days}}$$

$$= \frac{70{,}013{,}127\ IDR\ /_{365}}{6.913{,}1\ kg\ /_{365}}$$

$$= \frac{191{,}816.79\ IDR}{18.94\ kg}$$

$$= 10{,}127.60\ IDR/kg$$

Therefore, the selling price of fish feed with the basic ingredients of restaurant waste flour can be known:

$$\text{Selling Price} = \frac{Total\ Production\ Costs + Expected\ Profit}{Total\ Produk}$$

$$= \frac{191{,}816.79\ IDR + (20\%\ x\ 191{,}816.97\ IDR)}{18{,}94\ kg}$$

$$= \frac{191{,}816.79\ IDR + 38{,}363.36\ IDR}{18{,}94\ kg}$$

$$= \frac{203{,}180.15\ IDR}{18{,}94\ kg}$$

$$= 12{,}154.12\ IDR \approx 12{,}200\ IDR$$

Based on these calculations, it can be concluded that the selling price of fish feed with the basic ingredients of restaurant waste meal is 12,200 IDR per kilogram of feed. This value is not much different from the results of research by Ariana *et al* (2015) by utilizing tuna fish waste as fish feed with a selling value of 13,000 IDR per kilogram.

4.0 CONCLUSION

Based on these calculations, it can be concluded that the production of restaurant waste in Jatinangor is 231.67 kg per day. Meanwhile, the cost of fish feed production by utilizing restaurant waste flour is 10,127.60 IDR per kilogram, with a selling price of 12,200 IDR per kilogram. Therefore, the use of restaurant waste as fish feed ingredients can be used as a solution for managing and utilizing organic waste and as additional income for the surrounding community.

Future studies might want to focus on increasing the nutritional value of restaurant waste by the fermentation process, so that its quality as a feed ingredient will increase.

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