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POTENTIAL UTILIZATION OF RESTAURANT WASTE IN JATINANGOR REGION AND ITS PROCESSING TO A FISH FEED

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KeyWords
Fish Feed, Jatinangor, Organic Waste, Restaurant Waste, Utilization Potential

ABSTRACT

A mapping study of the potential utilization of organic wastes obtained from restaurants in the Jatinangor area has been carried out with the aim of obtaining information on the potential for restaurant waste and its alternative uses. Twenty nine restaurants from Jatinangor can produce as much as 105 kg of organic wastes each day. One of the uses of restaurant waste is that it can be used as fish feed. However, the direct application of restaurant waste as fish feed does not provide optimal fish growth because of the low nutritional content, such as protein. Fermentation is the process of breaking down organic compounds into simpler compounds by involving microorganisms. Fermentation is able to increase the nutritional value of restaurant waste, so that it can be used as fish feed ingredients. The nutritional value of fermented restaurant waste is 30.80% protein; 9.01% water content and 7.10% fat. Utilization of fermented restaurant waste has been applied in various studies such as being used as feed ingredients for catfish (*Clarias sp*.), tilapia (*Oreochromis niloticus*) and goldfish (*Cyprinus carpio*). The simple process of turning it into fish feed can increase the value of restaurant waste that has never been used before. Utilization of this organic waste will be able to increase the income of the community around the Jatinangor area.

INTRODUCTION

Wastes is one of the most complex problems faced by society, both in urban and rural areas. Public knowledge about waste management has become a concern and need attention. In urban and rural areas, the major quantity of waste were dominated by household wastes, such as food waste or food processing by products, which were commonly consisted of organic wastes. They were also massively produced by almost all restaurants in Indonesia. Along with population growth, the amount of household waste produced will also increase [1].

To date, restaurants wastes management in Jatinangor District generally still uses the old method, which is limited to collecting and piling it on the landfill (Final Disposal Site). Waste processing that is carried out is only limited to open burning the wastes, which tends to cause new problems in the form of pollution and smoke. In addition, year to year, the volume of wastes accumulates and requires more space for landfill. Processing of organic materials has been carried out using fermentation techniques using various materials [2]. However, new method must be introduced so that people can process this waste independently with easy techniques.

One of the efforts to reduce the volume of waste that is disposed of in the landfill is through the management of restaurant waste

by the community independently. The community is encouraged to pay attention to their environment, by selecting and sorting waste that can still be recycled for further sale or used as valuable goods. As for organic waste or kitchen waste, the community will be taught to process it independently into pellets for fish feed so that it has economic value. Material and organic processing has been carried out by means of fermentation to produce fish feed that has good quality [3]. Fermentation is a biological treatment that can increase the nutritional value of low-quality materials. The fermentation method usually uses cellulosic microbes, these microbes can be isolated from natural sources or from commercial microbial products such as probiotics [4]. However, a simpler method to be thought out so that people in general can manage their own organic waste. In this paper, the enormous potential of the presence of restaurant waste and its processing into fish feed in Jatinangor District will be explored.

MATERIALS AND METHODS

The research were consisted of two stages: 1) Identifying the number of restaurants and the volume of waste generated, and 2) Making fish feed from organic waste collected from the restaurant. Equipment for producing fish feed includes: bran, meat grinder, woven tray, garbage press, tapioca flour, bucket, shovel, garbage bag.

Data related to the amount of organic waste owned by restaurants in Jatinangor and the processing method for each restaurant were collected to determine the potential for organic waste that could be processed; and the produced feed would be proximately analyzed to determine its nutritional content and physical quality. The steps for making the feed can be seen in Figure 1.

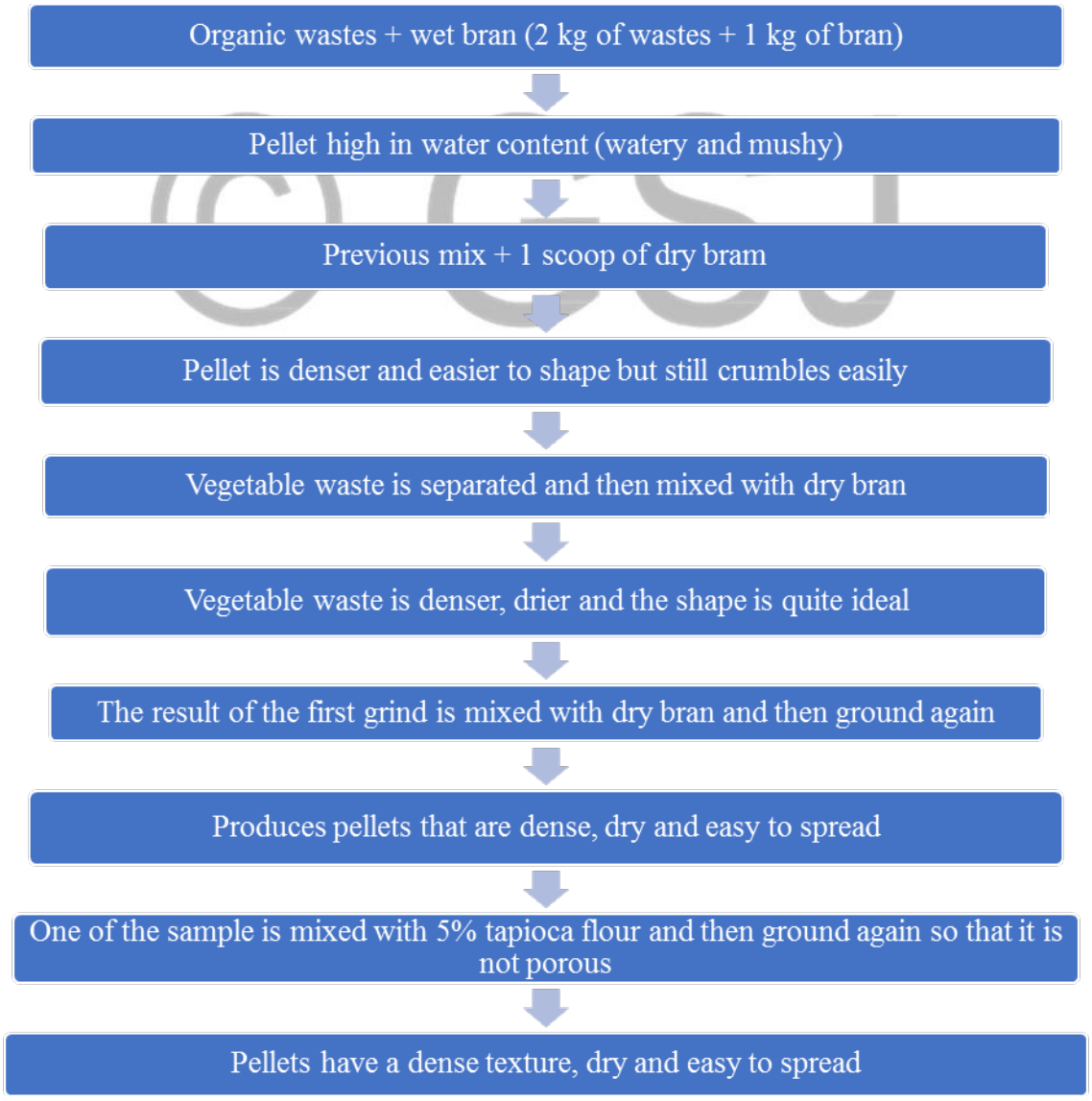

Figure 1. Experimental Process for making Fish Feed from Organic Waste

RESULT AND DISCUSSION

1. Identify the Number of Restaurant and the Volume of Waste

Based on the survey results, it is known that there are 29 restaurants in Jatinangor Sub-district which have been identified as having a relatively large volume of wastes. The following table shows the restaurant data with the amount of waste produced per day and its management in Jatinangor District (Table 1).

Tabel 1. Restaurant Data, Amount of Waste and Handling Method

No.	Restaurant Name	Amount of organic wastes/day	Waste Handling Method
1.	Warung Crisbar	2 trashbags (10 kg x 2 = 20 kg wastes).	Directly disposed of, not sorted beforehand, every night thrown in front of the shop and taken by the sub-district cleaner.
2.	Warung Ayam Goreng Laos	1 trashbag (10 kg wastes).	Directly disposed of, not sorted between organic and inorganic, have taken every day by the cikuda cleaners. There is no tariff because the officer is a neighbor of the owner of the Laos Fried Chicken Stall.
3.	Warung Padang Uni	1 trashbag of organic wastes (10 kg), 1 trashbag of inorganic trash (10 kg). Total wastes of 2 trashbags (10 kg x 2 = 20 kg wastes).	Organic and inorganic waste is separated, garbage is picked up by collectors every day and inorganic waste is sold at garbage collectors.
4.	Dapur Ina	1 trashbag (10 kg wastes).	Directly disposed of, not sorted first. This happened because the officers did not want to take the garbage separately and the garbage was not taken regularly, it could be taken once every 2 days or even more. Garbage is collected first and then disposed of after being asked by the Ciseke food court staff.
5.	Warung Ayam Hejo	Depends on the day, but at least 1 medium plastic bag measuring 5 kg. Organic and inorganic wastes is separated.	Directly disposed of, sometimes burned at the home of the restaurant owner, while inorganic waste is collected to be sold to garbage collectors.
6.	Warung Padang Salero	Do not collect organic waste, inorganic waste is subject to availability.	Organic waste is directly used as feed for cats, chickens and fish. If there is inorganic waste, it is taken to be disposed of to collectors.
7.	Warteg Pratama	2 trashbags (10 kg x 2 = 20 kg wastes).	Every day they are taken to the garbage collection at the Jatinangor market. Because garbage trucks don't pass every day. Organic and inorganic waste is not separated.
8.	Bakso Kangkung	2 trashbags/day. Organic and inorganic wastes is not separated.	Every day the garbage is picked up by the cleaners.
9.	Padang Takasimura	3-4kg of organic waste, 2kg of inorganic waste. Organic and inorganic wastes is separated.	People take organic waste every day to make pellets. Inorganic waste is burned every day.
10.	Waroeng Kang Sabi	1-2 trashbags/day. Organic and inorganic wastes is not separated.	Thrown to neighboring boarding house, pay (paid)
11.	COC	1.5 trashbags/day. Organic and inorganic wastes is separated.	Wate is delivered personally to the sub-district office collection point every day
12.	Warteg Pengkolan	Organic and inorganic wastes is separated. Organic wastes 2 bags.	Organic waste is disposed personally to the market.

		Inorganic wastes 1 sack.	Inorganic waste is picked up by garbage officer.
13.	Eatboss	Organic and inorganic wastes is separated. Total of wastes about 2 bags with size of 40x70.	Garbage is picked up by garbage officers (pay garbage fees)
14.	Warung Nasi Sambal Pedas Gurih	1 trashbag. Organic and inorganic wastes is not separated.	Garbage is picked up by the cleaners every day.
15.	Geprek Bensu	Organic and inorganic wastes is separated. Organic and inorganic wastes are 1 big trashbag respectively.	Garbage is picked up by the cleaners every day.
16.	Hipotesa Dalam	10-20kg of wastes/day. Organic and inorganic wastes is not separated.	Garbage burned behind the restaurant.
17.	Waroeng Steak	4 trashbags. Organic and inorganic wastes is not separated.	Garbage is taken by officers periodically
18.	Pajawan	1 big trashbag. Organic and inorganic wastes is not separated.	Picked up by the clerk (paid).
19.	Geprek rempah	1-2 trashbags. Organic and inorganic wastes is not separated.	Disposed by garbage officers every 2 days (paid)
20.	Ndower	3 trashbags. Organic and inorganic wastes is not separated.	Thrown into the garbage bin in front of the restaurant and taken by garbage officers. Cost 200k/month.
21.	Ramen bajuri	3 trashbags. Organic and inorganic wastes is not separated.	Taken by the cleaners. Cost 450k/month.
22.	Ibu eyang	2-3 trashbags. Organic and inorganic wastes is separated first, but ended in one big bags.	It is taken per day by residents at a cost of 15k and burned near the Puri Indah housing complex.
23.	Checo	Total wastes: 8 trashbags. Organic and inorganic wastes is not separated.	Garbage is placed in the checo garbage storage area, then garbage officers will take it every 3 days.
24.	Warung Nasi Chafizh	2 medium plastic bags. Organic and inorganic wastes is separated first, but ended in one big bags.	Garbage is picked up by the cleaners every day.
25.	Nasi Padang Fajar Indah	3-4 trasbags/day, Organic and inorganic wastes is not separated.	Garbage is collected behind the restaurant and picked up by officers from the sub-district.
26.	Warung Jembatan (Warjem)	2-3 trashbags/day, Organic and inorganic wastes is separated.	Garbage is collected behind the restaurant and taken by the cleaners.
27.	Nasi Uduk Najwa (Sebrang Checo)	1 big plastic bag/day. Organic and inorganic wastes is not separated.	Garbage is collected and disposed of at the Cibeusi market.
28.	Warung Gemas	5 trashbags/day. Organic and inorganic wastes is not separated.	Garbage is collected and burned independently
29.	SPG	1 sack. Organic and inorganic wastes is not separated.	Garbage is picked up by the cleaners.

Based on Table 1, information was obtained about the amount of organic and inorganic waste in each restaurant, the different ways of handling the waste of each restaurant, the flow of waste traveling from outside the restaurant to the end of the waste journey at the final disposal site. The amount and volume of waste produced by each restaurant varies depending on the production capacity and the number of consumers. In general, Jatinangor sub-district produces about 5 tons of waste every day. Based on the results of a survey of restaurants in Jatinangor, the waste generated from restaurant activities is not separated between organic and inorganic waste, but is immediately thrown away which is then transported by the garbage officers. The survey results also show that

there are only 2 (two) restaurants that manage waste to be used as catfish pellets.

Evaluating the results of the waste generated by restaurants around Jatinangor, the organic waste collected every day from 22 restaurants around Jatinangor were weighed 105 kg. The large amount of waste produced is actually an opportunity and can be utilized for fish feed ingredients. Waste from every restaurant in Jatinangor is collected in one day, then the waste is processed to make feed. Waste treatment in its fresh state is avoided to prevent bacterial contamination [4].

Restaurant waste is consisted of by-products of food preparation process and leftovers. Restaurant waste is categorized as organic waste, consisted of unconsumed components such as vegetable, rice, meat and fish leftovers. Accumulation of restaurant waste can have a negative impact on the environment, so efforts need to be made to overcome these problems, one of which is utilizing waste as alternative fish feed ingredient. Utilization of these wastes in the field of fisheries can be one solution to reduce feed costs. Commercial feed is very easy to obtain and its nutritional content fit the needs of the fish, but commercial feed costs about 60-70% of the total production costs incurred. Alternative feeds can utilize unused waste such as restaurant waste, therefore cut the cost. The requirements for alternative feeds are that they are abundant, contain sufficient nutrients for fish growth and unconsumed by humans [1].

The utilization of restaurant waste has been widely studied. Several studies regarding the use of restaurant waste as fish feed ingredients has been carried out. Setiawan in 2006 has conducted a study on the use of restaurant waste as fish feed mixed with rice bran [5]. Fahmi [6] conducted a study on a mixture of market waste, palm oil cake and fish waste on the nutritional content of magot which was applied as a feed for carp. Hukamana et al. in 2015 has been conducted research on household organic waste used as material for making African catfish pellets [7]. Nasser et al. in 2018 had been used restaurant waste in tilapia feed [8]. Furthermore, ZeinEddine et al. [9] conducted a study on the use of restaurant waste as a feed ingredient for trout (*Oncorhynchus mykiss*).

2. Making Fish Feed from Organic Waste

The production of feed begins with conducting a preliminary test of the nutritional quality of restaurant waste. A total of 858 grams of waste is then processed into pellets for fish feed (Fig 2). Then the test was carried out to determine the protein content in the fish pellets. Based on laboratory results, it is known that the protein content contained in the pellet sample is 20%. The high protein content may be influenced by the dominant waste content containing protein sources, such as fish, meat, tofu and tempeh.

(a) (b) (c)

Figure 2. The process of making feed is carried out by grinding feed ingredients (a), mixing with tapioca (b) and molding into pellets (c)

The resulting fish feed products were then proximately analyzed (Table 2), and the results were compared with standard feeds in the form of commercial feeds on the market.

Table 2. Comparison of Nutritional Content of Independent Feed and Standard Feed

No	Parameter	Nutritional Content (%)	
		Test Feed	Standard Feed*
1	Water Content	48.83	9.01
2	Ash	42.39	13.37
3	Protein	5.13	30.80
4	Fat	3.17	7.10

5	Carbohydrate	0.49	8.98

Information:
* Cahya [11] Fermented Restaurant Waste Feed

According to Achadri et al. [10], restaurant waste have nutrional contents of 10.89% protein, 9.70% and 9.13% crude fiber. The low levels of protein and high crude fiber were the obstacles to directly utilize restaurant waste as fish feed ingredients. So the waste must be processed first in order to meet the requirements of fish feed ingredients, and undergo fermentation process. The fermentation of restaurant waste can change the chemical composition from a complex structure to a simpler one. This process occurs due to the activity of enzymes produced from secondary metabolites of microorganisms such as bacteria, molds and yeasts [12].

Fermentation is a biological treatment that can increase the nutritional value of low-quality materials. The fermentation method usually uses cellulosic microbes, these microbes can be isolated from natural sources or from commercial microbial products such as probiotics. Fermentation is able to increase or improve the nutritional value of local feed raw materials so that they can be used as fish feed raw materials [13]. Furthermore, the quality of restaurant waste organic matter can be improved through the fermentation process [2]. Based on the results of the study, there were differences between the nutritional content of the test feed and the fermented restaurant waste feed (Table 2). The difference in nutrient content is caused by a fermentation process. In the test feed, the protein content of 5.13% was much lower than that of restaurant waste that had undergone a fermentation process, which was 30.80%. The low protein content in the test feed does not fulfill the criteria of good quality feed, and make the test feed unfit for fish farm. According to Beruatjaan et al. [14], generally, fish needs protein ranged from 35-50%; with carnivorous fish needs protein of 40-50% and omni vorous fish 25-35%.

Protein is one of the nutrients needed by fish. Protein is the main component of tissue that also builds up nitrogen compounds, such as nucleic acids, enzymes, hormones and vitamins, so their existence are crucial for fish survival and growth. In addition, protein also plays an important role as enzymes and hormones that support metabolism. Insufficient feed protein will inhibit growth, while excess protein will result in protein catabolism into energy so that only a small amount of protein is used to build body tissues [15]. Therefore, fermented restaurant waste can be used as high quality fish feed ingredients.

Several studies on the use of fermented restaurant waste as fish feed ingredients have been carried out by several researchers. Based on the results of research conducted by Sandra (2019), regarding the addition of 30% fermented restaurant waste flour to tilapia (*Oreochromis niloticus*) feed, it resulted in a growth rate of 1.57%; feed conversion ratio of 0.53 and survival rate of 90% [15]. According to Admawati et al. [16], the addition as much as 60% of fermented household waste to fish feed resulted in survival rate of 76% with a specific growth rate of 4.23. According to Cahya [11], the addition of 20% fermented restaurant waste flour to catfish feed resulted in a feed conversion value of 1.95 with a daily growth rate of 1.63%. Furthermore, based on the results of Anasih [17], research that the addition of fermented restaurant waste flour as much as 40% in carp feed, resulted in a feed conversion value of 0.80 with a daily growth rate of 1.05% and survival ranging from 70-88%. Based on the results of several studies, it can be concluded that restaurant waste can be used as fish feed, but to produce optimal fish growth, a fermentation process need to be carried out to increase the nutritional value of the feed.

Conclusion

Household wastes are the most produced waste in rural and urban areas. Waste from restaurants is produced from almost every restaurant located around the Jatinangor sub-district. This study is done to increase public awareness concerning the problems caused by accumulation and improper handling of restaurant wastes in Jatinangor district; and utilization of wastes to make fish feed. In conlusion, unwanted restaurant wastes can be processed through fermentation to increase its protein content, and utilized as fish feed with economical value. This pellets can be used so they can increase people's income in the Jatinangor sub-district.

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