

Conference Paper

The Economic Value of Restaurant Food Waste in Bogor

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Abstract

Food loss occurs in urban area restaurants, including in Bogor. The consumption activity in restaurants sometimes produces food waste, including of rice, vegetables or side dishes. The research objectives were (1) To identify the restaurant food-wasting process in Bogor, and (2) To estimate the amount and economic value of restaurant food waste in Bogor. The Indonesian National Standard (SNI) 19-3964-1994 about Sampling and Measurement Method and Composition of Urban Waste was used for sampling. Food waste in restaurants occurs from sellers and customers. The unsold food waste of restaurants in Bogor was predominately rice. The occurrence of rice waste was due to large cooking portions and the drying of rice during cooking, making it unable to consume. The food waste produced from unconsumed food by customers included rice and side dishes, such as meat, chicken and fish. Some reasons for food waste occurrence from visitor consumption were unpreferred food taste, large food portion and low appetite. The annual rice waste from unsold and unconsumed food in restaurants in Bogor was 29,742.84 kg or Rp 356,914,080. The annual amounts of meat, chicken, and fish waste are 14,780kg, 28,500kg and 8,460 kg, respectively. The economic value of meat, chicken and fish waste is Rp 1,655,640,000, Rp 712,480,000 and Rp 253,711,500, respectively.

Keywords: consumption, the Indonesian National Standard (SNI) 19-3964- 1994, urban waste, consumption chain, weight conversion factor

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1. Introduction

Food is human basic needs that must be fulfilled; nevertheless almost 98 percent of world's famine is in the developing countries, including Indonesia. According to data from Food and Agricultural Organization of United Nations (UN – FAO), there are 1.3 billions of food waste or loss each year as 1 of 7 people in the world on the same period are suffered from famine and more than 20,000 kids below 5 years old die every

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day due to famine. FAO (2014) has intensified a movement to support food availability improvement, besides an increased production site by declining the food material loss during production and distribution chain (food loss) and food loss on consumption chain (food waste) (Mulyo 2016).

One of food loss on consumption chains happens in restaurant. This happens due to consumption activity, specifically in the urban area, is not only for fulfilling the biological needs, but also becoming a lifestyle, therefore eating- out behavior occurs as a community life behavior. This behavior triggers the existence of many restaurants, as well as Bogor. According to the Department of Cultural and Tourism Affairs of Bogor (2018), there are 162 restaurants in Bogor.

The consumption activity in restaurant sometimes produces food waste, either rice, vegetables, or side dishes. This food waste becomes one cause of high food loss on consumption chain. The unconsumed food waste is influenced by some conditions, one of which is the food presentation way. These restaurant food waste data in Bogor can be used determine the amount and economic value that are loss due to food waste on the restaurant in Bogor, besides can be used as food presentation strategy or ideal portion determination, therefore can decrease the amount and economic value of food waste.

The special aims of this study were:

1. To identify the restaurant food-wasting process in Bogor.
2. To estimate the amount and economic value of restaurant food waste in Bogor.

2. Research Methode

2.1. Sampling method

The sampling method used to select the restaurant sample location was referred to the Indonesian National Standard (SNI) 19-3964-1994 about Sampling and Measurement Method and Composition of Urban Waste based on the study location. The sample calculation was:

$$S = Cd\sqrt{Ts} \quad (1)$$

Note:

S = the number of restaurant samples

Cd = non-housing building coefficient = 1

T_s = the number of non-housing buildings

Based on the population of restaurants based on the study site, the number of restaurants in Bogor was 162 restaurants (Department of Cultural and Tourism Affairs of Bogor, 2018), therefore the restaurant sample points obtained were:

$S = 1 \sqrt{162} = 12.7$ is rounded to 13 restaurants.

Restaurants that became the samples were divided into 3 categories, namely simple, middle, and luxurious restaurant. In this study, the number of restaurants that became samples contained 6 simple restaurants, 4 middle restaurants, and 3 luxurious restaurants.

2.2. The Calculation Method of Restaurant Food Waste Estimation in Bogor

2.2.1. Restaurant Food-wasting Process in Bogor

An interview related to the food-wasting process on restaurant in Bogor was performed on the restaurant owners. The data obtained from interview results were processed by using a descriptive analysis. Descriptive analysis was used to explain how the food waste occurred and reason behind the food waste either food remains during production or unfully consumed food. The result of this analysis will present the food-wasting process.

2.2.2. The Amount and Economic Value Estimation of Restaurant Food Waste in Bogor

To identify the amount of food waste, a food weighting method was performed referred to SNI 19-3964-1994. This method was performed by collecting the food waste that was separated from rice and side dishes, then moved into separated plastic sachet, given lable, and measured using a digital hung scale with 50 kg capacity. The sampling frequency or waste composition sampling was performed in 8 days continuously on the same locations. Sampling and sample measurement followed the procedure of SNI 19-3964-1994.

On food waste measurement, rice and side dish remains were separated from other food remains, then measured. Side dishes in this study contained meats, chickens, and fish. The measured food waste was still in a wet weight; therefore cooked weight should be converted in uncooked weight using a conversion factor to determine the food waste loss.

The weight conversion factor of cooked weight to become uncooked material for simple rice (rice without dressing/dry rice) was 0.5 (Anriany, 2013), while the conversion factor for wet rice, either on wet squeezed coconut weight or wet normal weight was correction factor based on Setyra (2013) with

0.347 for wet rice weight and 0.376 for wet squeezed coconut weight. The correction factors of cooked weight to be uncooked weight for meat, chicken, and fish were 1.8, 1.3, and 1.3, respectively (Kemati 2014).

Based on the food waste conversion factors of cooked food to become uncooked, then the following formula was used to calculate the amount of food waste:

$$\text{Uncooked food waste (Kg)} = \text{Cooked weight (Kg)} \times \text{cooked-uncooked conversion factor} \quad (2)$$

The economic value of unconsumed food waste when produced and consumed was calculated by multiplying the market price used with the amount of converted food waste. The following formula was:

$$\text{Economic value (Rp)} = \text{Uncooked food waste weight (Kg)} \times \text{Market price (Rp/kg)} \quad (3)$$

3. Result and Discussion

Food waste in restaurants contained food waste from sellers and restaurant customers. Food waste from sellers happened when the food was unfully sold, while food waste from customers was the unfully consumed food when customers visited the restaurants. This study estimated the amount and economic value of unfully sold and consumed food waste.

3.1. The Restaurant Food-Wasting Process in Bogor

In restaurant, there are two parties, namely seller and buyer, which have the potential to produce waste on each other. The food-wasting process could be identified from two sides, i.e seller and buyer. The food waste from seller was the unfully sold food, while from buyer was the unfully consumed food. The commonly consumed food was rice as main food added with side dishes, such as meat, chicken, or fish.

3.1.1. Unfully Sold Food-Wasting Process

In this study, the unfully sold food waste was rice. Rice was wasted due to nobody consumed it again, although the seller had considered the portion following the buyer target. The selling activity was performed from morning until evening, therefore caused food waste from the unfully sold rice.

Seller from restaurant had different behavior on the unfully sold rice waste. Based on Table 1 related to the respondent's answer distribution regarding the rice waste, there were 4 seller behaviors on rice waste, namely: throwing away the rice waste, giving it to other people, preserving it for reconsumption, and giving it to the pet.

TABLE 1: Seller Behavior on Rice Waste

No.	Behavior	Frequency (Σ)	Percentage (%)
1.	Throwing away the food waste	6	32
2.	Preserving for reconsumption	5	26
3.	Giving to other people	7	37
4.	Giving to the pet	1	5

Source: primary data, processed (2019)

Rice waste was mostly given to other people (37 percent) or throw away by seller (32 percent). Rice waste given to other people was commonly worth- consumed, then given to staff or family members that assisted the selling until evening. The throwing away rice waste was commonly dried rice waste remained from rice-cooker, thus unable to consume. The worth-consumed rice was also preserved for reconsumption (26 percent).

On throw away food waste process, there were sellers who separated the waste and not. Table 2 shows from 13 restaurant respondents, there is one restaurant that performed waste separation by differing the waste plastic bag used for different wastes, however the trash place was still on one place. Most restaurant respondents stated to not performing waste separation due to limited period and workers in performing this process.

TABLE 2: Waste Separation on Restaurant Respondents in Bogor

No.	Behavior	Restaurant	Percentage (%)
1.	Performing waste separation	1	7.69
2.	Not performing waste separation	12	92.31

Source: primary data, processed (2019)

3.1.2. Unfully Consumed Food-Wasting Process

Based on the food type discovered, food waste produced from unfully consumed food by restaurant customers contained rice either common rice or wet rice, and side dishes, such as meat, chicken, and fish. Based on the study results, there were some reasons on the occurrence of food waste from customer consumption, such as unpreferred food taste, large food portion, and low appetite. Customers commonly finish their consumed food following some reasons: delicious food taste, appropriate food portion, and hungry.

3.2. The Amount and Economic value of Rice and Side Dishes Food Waste on Restaurant in Bogor

Restaurant is one of waste producing places and most wastes are from food waste. Food waste is the unfully consumed food called as the unconsumed food. This unconsumed food will become the household waste. Most humans never realize how much the foods are wasted everyday. This food waste can cause loss on the economy, such as price or value of food waste, which can be called as economic value.

Based on the study results, there was a food waste in the form of unfully sold rice on restaurants in Bogor. Based on Table 3, rice waste produced from restaurant respondents was 0.035 kg/day/respondent. If multiplied by the number of restaurants based on the Department of Cultural and Tourism Affairs of Bogor (2019), the amount of rice waste in the restaurant was 5.67 kg/day. Annually, there is 2,070 kg of the unsold rice waste. If calculated based on the economic value, the loss of unsold rice waste on restaurant in Bogor was Rp 68,040 per day, or Rp 24,834,600 per year.

TABLE 3: The Amount and Economic value of Unfully Sold Food Waste

Note	Dried Rice	Wet Rice	Coconut Milk Wet Rice	Meat	Chicken	Fish
Cooked weight (kg/day/respondents)	-	0.101	-	-	-	-
Conversion factor	0.5	0.347	0.376	1.2	1.3	0.5
Uncooked weight (kg/day/respondent)	-	0.035	-	-	-	-
Selling price (Rp/Kg)	-	12,000	12,000	112,000	25,000	30,000
Economic value (Rp/day/respondent)	-	420	-	-	-	-

Source: Primary data, processed (2019)

The food waste produced from the unfully consumed food based on the study results happened on rice, meat, chicken, and fish. Based on Table 4, the food waste in the

form of rice is divided into two types, namely common and coconut milk wet rice. Based on the calculation result, the amount of common and coconut milk wet rice were 0.244 kg/day/respondent and 0.224 kg/day/respondent, respectively. The amount of rice waste can be added from the common and coconut milk wet rice, resulting 0.468 kg/day/respondent. If multiplied by the number of restaurants in Bogor, the amount of rice waste in restaurants is 75,816 kg/day or annually there is the rice waste of 27,672.84 kg. The economic value of rice food waste in restaurants is Rp 944,784 per day or Rp 344,846,160 per year.

The food waste on restaurants in Bogor was from the unfully consumed meat, chicken, and fish. The amounts of meat, chicken, and fish waste were 0.25, 0.482, and 0.143 kg/day/respondent, respectively. If multiplied by the number of restaurants in Bogor with 162 restaurants, the amounts of meat, chicken, and fish waste were 40.5, 78.08, and 23.17 kg/day, respectively. If calculated based on the economic value, the loss values produced from unconsumed meat, chicken, and fish waste are Rp 4,536,000 per day; Rp 1,952,000 per day; and Rp 695,100 per day. Annually, the economic values of meat, chicken, and fish waste are Rp. 1,655,640,000; Rp. 712,480,000; and Rp 253,711,500.

TABLE 4: The Amount and Economic value of Food Waste from Unfully Consumed Food

Note	Dried Rice	Wet Rice	Coconut Milk Wet Rice	Meat	Chicken	Fish
Cooked weight (kg/day/respondents)	-	0.702	0.596	0.208	0.371	0.285
Conversion factor	0.5	0.347	0.376	1.2	1.3	0.5
Uncooked weight (kg/day/respondent)	-	0.244	0.224	0.250	0.482	0.143
Selling price (Rp/Kg)	-	12,000	12,000	112,000	25,000	30,000
Economic value (Rp/day/respondent)	-	2,928	2,688	28,000	12,050	4,290

Based on the study results of food waste on restaurants in Bogor, rice was the most food waste either from unfully sold or consumed food by customers. Some causes of unfully sold rice were large cooking portion and occurrence of dried rice that was unable to consume. The unfully consumed rice had some reasons: Unpreferred rice taste, such as too mushy, and large reserved portion. If added, the unfully sold and consumed rice waste on restaurants in Bogor annually is 29,742.84 kg or Rp 356,914,080 (Table 5).

The most side dish waste in restaurants was chicken meat, as the amount of unconsumed chicken meat waste by customers annually is 28,500 kg along the economic value of Rp 712,520,000. Chicken meat relatively became the most food waste compared to others due to the attached meat on bones, making the customers preferred

TABLE 5: The Annual Amount and Economic value of Rice Waste on Restaurants in Bogor

Note	Rice		
	Unfully sold	Unfully consumed	Total
Uncooked weight (kg)	2,070	27,673	29,743
Economic value (Rp)	24,834,000	332,074,000	356,916,000

to not consume it. Chicken meat waste also happened as chicken menu was the most customers' favorite menu compared to other side dishes.

TABLE 6: The Annual Amount and Economic value of Side Dish Waste on Restaurants

Note	Meat			Chicken			Fish		
	Unfully sold	Unfully Consumed	Total	Unfully sold	Unfully Consumed	Total	Unfully sold	Unfully Consumed	Total
Uncooked weight (kg)	-	14,780	14,780	-	28,500	28,500	-	8,460	8,460
Economic value (Rp)	-	1,656,000	1,656,000	-	712,520,000	712,520,000	-	253,670,000	253,670,000

3.3. Food Waste Decrement Strategy on Restaurant in Bogor

Decreasing food dissipation due to fish waste occurrence is a cooperative work, either individually as producers or consumers in restaurants. Food dissipation is closely related to the individual behavior, value, and motivation against the food dissipation. Thereby, a strategy is required as an effort to decrease the restaurant food waste.

Efforts to decrease the restaurant food waste in Bogor can be performed either from seller or buyer side. Food menu that is unfully sold, i.e common rice, due to dried rice occurrence when cooking and largely cooked rice. In this condition, food waste decrement can be performed by noticing the cooking technique, therefore producing less dried rice. Seller can also reconsider the amount of cooked rice based on the average number of visitors. The unfully consumed food menus are rice and side dishes. Some conditions can be performed, such as:

1. Seller can reconsider the food portion cooked based on the average number of visitors.
2. Seller can notice on the food taste, therefore can be enjoyed and fully finished by visitors.
3. Seller can evaluate the food menus that are usually unfully eaten, therefore can consider to change the menus preferred by visitors.

4. Seller can perform a campaign about the importance of portion consideration before eating and increase the visitor awareness in respecting the food by informing the food waste produced every day or appeal related to food waste decrement.

4. Conclusion

The study results showed that restaurant food waste was produced from sellers and buyers. The unfully sold food waste of restaurant in Bogor was rice. The occurrence of rice waste was due to large cooking portion and dried rice existence during cooking, making it unable to consume. The food waste produced from unfully consumed food by customers contained rice and side dishes, such as meat, chicken, and fish. Some reasons of the food waste occurrence from visitor consumption were: Unpreferred food taste, large food portion, and low appetite.

The annual rice waste (food waste) from unfully sold and consumed on restaurants in Bogor is 29,742.84 kg or Rp 356,914,080. The annual amounts of meat, chicken, and fish waste are 14,780; 28,500; and 8,460 kg. The economic values of meat, chicken, and fish waste are Rp 1,655,640,000; Rp 712,480,000; and Rp 253,711,500.

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