How to Reduce Food Waste at Small Restaurant in Indonesia?

Zakiyah Zahara, Muslimin, Suryadi Hadi, Gatha Vesakha

Abstract*: This study aims to determine the decision-making process in reducing food waste found at small restaurant in Indonesia. The method used is descriptive method. The types of data collected are quantitative and qualitative data. Sources of data obtained from primary data and secondary data. Respondent sampling was done in a random manner after the sample size was determined using the Slovin formula. The technique of collecting data through observation, in-depth interviews and literacy studies. Data analysis using Analytic Hierarchy Process (AHP) to determine the weight of each criterion and sub-criteria. The consistency test used has a level of consistency index (CI) = 0 and consistency ratio (CR) = <10%. The results of the study show that reduce is the most important element followed by recycle and reuse in reducing food waste at small restaurant in Indonesia.

Keywords: Reducing food waste, AHP, reduce, recycle and reuse

I. INTRODUCTION

The city of Palu is the capital of the province of Central Sulawesi. As the provincial capital of Palu City is a city where administration comes from all regions. Palu is a city that has a large population of 368,086 people. Residents with high numbers also produce high amounts of waste. The amount of waste in Palu City can be seen in the following table.

Table 1 Waste Data of Palu City in 2011-2016

Origin of Waste	Amount of Waste per Year (m3)					
	2011	2012	2013	2014	2015	2016
Household waste	51.879	80.085	83.060	94.200	98.030	178.806
Market Waste	25.940	39.066	50.077	56.024	59.200	37.887
Business Area Garbage	19.455	28.323	30.402	30.900	31.808	17.681
Restaurant Industry	19.455	28.323	30.705	31.120	31.800	7.577
Public facilities	12.970	19.533	25.801	27.772	29.980	12.629
Total Waste	**129.699**	**195.330**	**220.045**	**240.016**	**250.818**	**254.580**

Based on the table, it can be seen that the amount of waste in Palu City from 2011 to 2016 has always increased. The amount of waste from the restaurant industry also always increases even though in 2016 it decreased significantly to 7,577 m3 from 31,800 m3 in the previous year. The table also shows that the amount of waste in Palu City reached 254,580 m3 in 2016.

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Warung Sari Laut or often known as "Mas Joko" is one type of restaurant industry in Palu City of the many existing food stalls industry. KWSLP or Harmony of Sari Laut Palu was established in 2014 by Mr. Bino Arty Juwarno, S.H., M.Kn. The beginning of the establishment of the Palu Sari Warung Sari Harmony was to house the sea cider stall businessmen who had mushroomed in Palu City at that time. The consolidation of all Warung Sari Laut in Palu City can be made a policy of one price of all existing stalls so as not to cause unfair competition. Another advantage provided by the establishment of KWSLP is the process of withdrawal of stalls tax to be more orderly. The number of stalls which are included in the Palu Sari Warung Sari Harmony is approximately 400 sea food stalls. Warung Sari Laut with a large amount of course can produce food waste that is not small. Food waste at sea cider stalls can occur due to various factors. For example, due to inadequate storage of raw materials, causing raw materials to break quickly, processing raw materials that are not good, and consumer behavior that often leaves food. So far, food waste produced by sea cider stalls is only placed in makeshift containers which are then thrown away or given to farmers.

So much food waste can of course have a negative impact on everything, for example contributing to damaging ecology, nutritional loss[1]. Food waste can also cause significant depletion of resources such as land, water and fossil fuels, and increase greenhouse gas emissions associated with food production[2].

This study aims to determine the decision-making process in reducing food waste found at Warung Sari Laut in Palu City.

II. LITERATURE REVIEW

A. Reducing Food Waste

1. Reduce

Because the impact of food production on natural resources is very large and increasing while food is growing in the food value chain, reducing food waste so far is the best way to reduce waste of natural resources. For example, if the supply-demand balance can be better adjusted at the beginning, it means not using natural resources to produce food in the first place, thereby avoiding pressure on natural resources, or using it for other purposes[3]. By preventing the formation of food waste it can reduce the use of resources needed for food production, labor and disposal costs, and reduce all environmental, economic and social impacts associated with food waste disposal. Prevention is the most efficient way to deal with food waste, because

prevention is about limiting waste of food in the front, while other categories are about food waste management[3]. Prevention to reduce the formation of food waste can be done by: (1) Increasing awareness about food waste by developing campaigns on food waste and promoting food waste audits; (2) Improve communication throughout the supply chain to meet food demand and supply by improving the organization within the institution and improving communication between various stakeholders in the supply chain; (3) Develop better harvesting, storage, processing, transportation and retail processes by improving harvesting and post-harvest storage techniques, improving processing techniques, improving packaging, improving transportation, improving retail sales, increasing quantity planning for food services, improving habits consumption, implementing laws to reduce food waste, implementing a policy framework and strategies to reduce harvest and post-harvest losses, implementing laws to prevent and reduce food waste, revising regulations on 'good to use before' dates, revising regulations on requirements the aesthetics of fruit and vegetables, and regulate unfair practices in the retail supply chain.

2. Reuse

Reuse is usually defined as using objects or material again, either for the original purpose or for the same purpose, without significantly changing the physical shape of the object or material. What distinguishes reuse and recycling is the latter changes the physical shape of an object or material. Reuse is generally preferred for recycling because it consumes less energy and resources than recycling. Reusing food waste mainly distributes it back to alternative markets, for example using surplus food for new business options, for charities, for cleaning houses, or for animal feed[3].

The best choice if there is a food surplus is to store it in the human food chain. This may require looking for secondary markets or contributing to feeding disadvantaged communities, thus preserving their initial goals and preventing the use of additional resources to produce more food. If food is not suitable for human consumption, the next best choice is to divert it to animal feed, thereby saving resources which would otherwise not be used to produce commercial food ingredients. Reuse of food and ready-to-eat food can be done by: (1) Developing markets for products that cannot last long in the food chain under certain conditions; (2) Redistribute food for people in need; and (3) Making livestock food if it is not suitable for human consumption.

3. Recycle

Recycling means converting waste into new substances or products, such as compost, while recovery implies energy production from waste (through anaerobic digestion). This category therefore consists of processing waste into nutrients and/or energy. The essence of recycling and recovery is product recycling, anaerobic digestion, composting, incineration with energy recovery and rendering. All of these options allow energy or nutrients to be recovered, so that they can provide significant benefits rather than direct dumping of waste into final disposal[3]. Recycling and recovery of food waste can be done by: (1) Creating food from by-products and leftovers; (2) Anaerobic digestion; (3) Composting that can be done by composting in a vessel or composting house; (4) incineration with energy recovery; and (5) Rendering.

B. Analytical Hierarchy Process (AHP)

Analytical Hierarchy Process is a model that provides opportunities for individuals and groups to build an idea and define a problem by obtaining opinions from the respondents and then providing solutions to the desired problem. The existence of this process allows people to test the sensitivity of the results to changes in information, and is designed to better accommodate human nature but does not force someone to go into a way of thinking that might not be in accordance with conscience. AHP is a powerful process for overcoming complex problems[4]. The thing to do to get a decision is to compare pairs of alternatives to be chosen using a questionnaire.

III. RESEARCH METHOD

A. Objects and Research Tools

This research object is Warung Sari Laut in Palu City. Then carried out observations, interviews and gave questionnaires to several sea cider stall entrepreneurs in Palu. The form of the questionnaire used refers to the AHP model by selecting the level of importance regarding reducing food waste contained in sea cider stalls in Palu City.

The tool used in this study is the Microsoft Windows 7 operating system and software for processing data is Ms. Excel.

B. Research Procedure

In this study, there are several stages of research procedures carried out to ensure maximum results and are easy to implement. The stages of the research procedure begin from the preparation stage then proceed with the data processing stage.

The preparation stage begins by determining the location of the survey. Determination of the location of the survey was carried out at Warung Sari Laut which was assumed to produce a considerable amount of food waste. After determining the location of the survey, the next step is to make a questionnaire. Questionnaires were made with the aim of being the main tool in the process of collecting data in the field. Questions in the questionnaire are made according to the AHP rules and as simple as possible so that respondents can easily grasp the intent of the questions in the questionnaire. After the previous stage has been carried out properly, the final step is to conduct an interview.

Next is the data processing stage. In this process the data obtained from the survey results will be processed using the AHP method and using Ms. Excel as a data processing tool, then the results of processing the data are then presented in table form.

C. Operational Definition of Research Variables

AHP is a decision support model developed by Thomas L. Saaty. This decision support model will describe the complex multi criteria problem into a hierarchy, according to (Saaty 1993), "Hierarchy is defined as a representation of a

complex problem in a multi-level structure where the first level is a goal, followed by factor level, criteria, sub criteria, and so on down to the last level of the alternative ". The use of hierarchy makes a complex problem can be broken down into groups which are then organized into a form of hierarchy so that the problem will appear more structured and systematic.

In this study the operational definitions of the variables are:

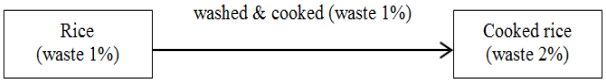
a. Food rubbish. Food waste, which is all kinds of food that has been processed by Warung Sari Laut, is food ready to eat, but not consumed by consumers.
b. Food material. The food ingredients in this study are food ingredients of Warung Sari Laut in Palu City, which consists of chicken, rice, tofu, tempeh and vegetables.
c. Food quantity planning. The meaning is how the Warung Sari Laut in Palu City plans to purchase certain quantities of food ingredients for a certain period of time so that there is no excess food which results in the formation of food waste.
d. Storage of food ingredients. Storage of food ingredients in this study is the process of storing all foodstuffs of Warung Sari Laut in Palu City starting from the storage area and the method of storing food ingredients.
e. Food processing. Food processing in this case is processing of Warung Sari Laut production activities from food ingredients to ready-to-eat food.
f. Consumer behavior. Consumer behavior in this research is consumer behavior whether always spending or leaving food served by Warung Sari Laut in Palu City.
g. Food redistribution. What is meant by food redistribution in this case is excessive food distribution to the people in need.
h. Making animal feed. This means that the remaining food of Warung Sari Laut in Palu City which is not spent by consumers can be used as animal feed.
i. Creating new food. What is meant by creating new food is to create other types of food from leftovers from Warung Sari Laut in Palu City.
j. Anaerobic digestion. Anaerobic digestion in question is whether food leftovers at Warung Sari Laut in Palu City have been processed into a source of energy in the form of biogas.
k. Composting. Composting in this study is food waste and food items that are not feasible at Warung Sari Laut in Palu City are recycled into compost.

IV. RESULTS AND DISCUSSION

A. Food Waste at Warung Sari Laut

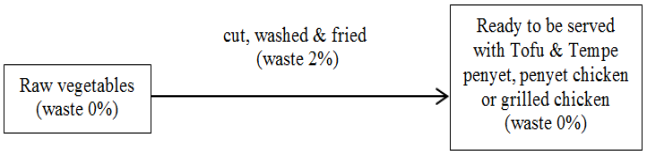
Food waste at Warung Sari Laut is as follows:

a. Waste from rice



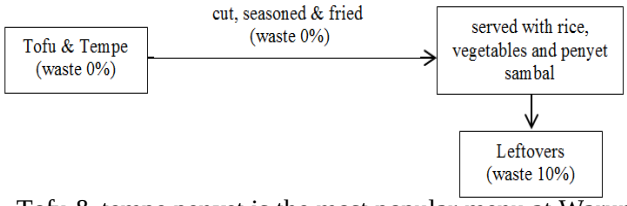
The waste contained in rice is grain which is still carried along with rice so it must be separated. After that the rice is washed. In the process of washing rice can be wasted due to the quantity of rice that reaches 20 kg but is put into a container that has a size that is not large. After washing the rice, it is then cooked into rice and at this stage produces waste in the form of rice crust.

b. Vegetable trash



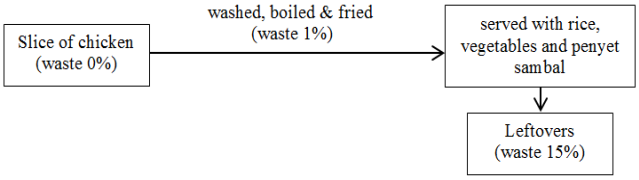
Commonly used vegetables are cabbage and long beans. The vegetable produces waste when it is cut to separate the old part from the vegetable. Then the vegetables are washed and fried to be added as a complement to the tofu & tempe penyet menu, penyet chicken and grilled chicken.

c. Tofu & tempe penyet waste



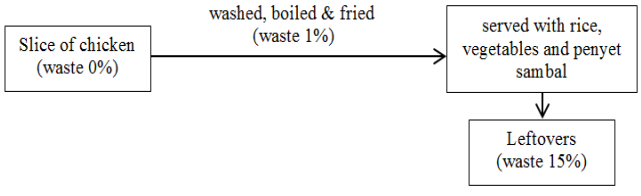
Tofu & tempe penyet is the most popular menu at Warung Sari Laut. The process of making tofu & tempe begins with cutting tofu & tempeh which is then given spices and fried. After that, tofu & tempe penyet are ready to be served with rice, chili sauce and vegetables. Food waste after being served to consumers on average the remaining food reaches 10% in tofu & tempe menu.

d. Penyet chicken waste



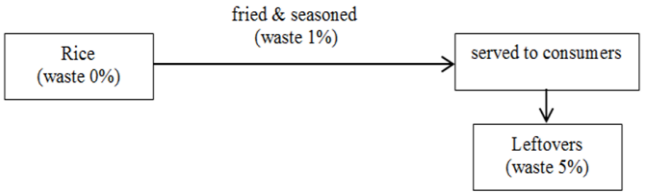
The process of making penyet chicken begins with cleaning and washing the chicken that has been cut previously from the market. In the cleaning process there is sometimes a small amount of garbage in the form of small cut meat and the remnants of intestines from chickens. Next is boiling chicken by giving enough salt to the cooking water and the chicken is ready to be fried. After that, the penyet chicken is ready to be served with rice, chili sauce and vegetables. After serving to consumers, the remaining food averages 15% on the penyet chicken menu. The rest of the food can be chicken bones, non-edible vegetables or rice that is not consumed by consumers.

e. Grilled chicken trash



Garbage chicken is not much different from penyet chicken. The only difference is in the manufacturing process by roasting chicken and adding soy sauce to the roasting process. So the trash is found during the cleaning process and leftover food waste produced by consumers.

f. Fried rice trash



Garbage on the fried rice menu at Warung Sari Laut occurs at the time of frying and when the consumer does not consume the food. When frying rice with more than 3 servings simultaneously it will make the rice a little wasted from the frying pan. Food waste according to sources depends on the type of rice and the processing of rice becomes the value that affects the taste of fried rice which affects consumers to spend or leave their food.

The amount of food needed every day at Warung Sari Laut. Basically, each shop has different needs, but the average needs of raw materials in sea cider stalls in a day are 20 kg of rice, 15 chickens, 60 tofu and 60 tempe, 6 cabbage vegetables and 5 bunches of vegetable beans long.

B. Questionnaire Results

From the distribution of questionnaires that researchers conducted in the field where the researcher gave an open questionnaire to eighty respondents, the initial average data was obtained as follows:

Table 2 Average Criteria Comparison Item Questionnaire Results

Criteria Comparison Items	Average
Reduce compared to **Reuse**	**7.00**
Reduce compared to **Recycle**	**5.00**
Reuse compared to **Recycle**	**0.33**

Based on Table 2 above, it can be seen that the average respondent prefers to reduce the criteria with an average scale = 7. Furthermore, respondents also prefer to reduce compared to recycle with an average scale = 5. However, according to respondents, reuse is less important than by recycling with an average scale = 1/3 or 0.33.

Table 3 Average Sub-literacy Comparison Item Questionnaire Results

Reduce Sub Criteria Comparison Items	Average
Storage of raw materials compared to **Processing of raw materials**	**0.14**
Storage of raw materials compared to **Planning of raw material quantities**	**3.00**
Storage of raw materials compared to **Consumer behavior**	**0.25**
Processing of raw materials compared to **Planning of raw material quantities**	**7.00**
Processing of raw materials compared to **Consumer behavior**	**3.00**
Planning of raw material quantities compared to **Consumer behavior**	**0.20**
Reuse Sub Criteria Comparison Items	Average
Food redistribution compared to **Animal feed**	**0.14**
Recycle Sub Criteria Comparison Items	Average
Creating new food compared to **Anaerobic digestion**	**0.33**
Creating new food compared to **Composting**	**0.14**
Anaerobic digestion compared to **Composting**	**0.20**

Table 3 above shows the average sub-criteria questionnaire results from respondents. In the table it is known in the reduce criterion that raw material storage is less important than raw material processing with an average scale = 1/7 or 0.14, storage of raw materials is more important than the planning of raw material quantities with an average scale = 3, storage of raw materials less important than consumer behavior with an average scale = 1/4 or 0.25, raw material processing is more important than raw material quantity planning with an average scale = 7, raw material processing is more important than consumer behavior with an average scale = 3 , quantity planning of raw materials is less important than consumer behavior with an average scale = 1/5 or 0.20. Furthermore, the reuse criteria show that food redistribution is less important than animal feed with an average scale = 1/7 or 0.14. Then the recycle sub-criteria show that creating new foods is less important than anaerobic digestion with an average scale = 1/3 or 0.33, creating new foods is also less important than composting with an average scale = 1/7 or 0.14, and the last Anaerobic digestion is less important than composting with an average scale = 1/5 or 0.20.

C. Research Results Criteria

Pairing Matrix of each destination in determining priorities reduces food waste at Warung Sari Laut in Palu City. In order to obtain the assessment weight of each goal, a table of paired comparison rating scales is made. The table forms are as follows:

Table 4 Pairing Comparative Matrix Between Object Elements

Criteria	Reduce	Reuse	Recycle
Reduce	1.00	7.00	5.00
Reuse	0.14	1.00	0.33
Recycle	0.20	3.00	1.00

The table above shows that the pairwise comparison matrix between the criteria elements has been arranged in the form of their respective reciprocal matrices. The numbers in the previous matrix have been changed from the value of the fraction in the form of a decimal value. Based on the comparison element matrix above it can be seen that reducing food waste (Reduce) is very clearly more important (7) compared to reusing food waste (Reuse). Reducing food waste (Reduce) is clearly more important (5) than recycling food waste (Recycle). While recycling food waste (Recycle) is slightly more important (3) than reusing food waste (Reuse).

Data in the calculation of this priority is obtained through questionnaires that have been distributed to respondents, amounting to eighty respondents who have been calculated using the Slovin formula. Assessment of eighty questionnaires from respondents that have been obtained, then the results are averaged using geometric averages. This is done because AHP only requires one answer for the comparison matrix. The results can be seen in the following table:

Table 5 Assessment of Priorities of Interest Between Objective Elements

Criteria	Reduce	Reuse	Recycle
Reduce	0.74	0.64	0.79
Reuse	0.11	0.09	0.05
Recycle	0.15	0.27	0.16

Based on the paired comparison table between variable above, we get the weight shown in Table 6 below:

Table 6 Results of Calculation of Priorities Between Object

Criteria	Reduce	Reuse	Recycle
Weight	0.72	0.08	0.19
Ranking	I	III	II

Elements

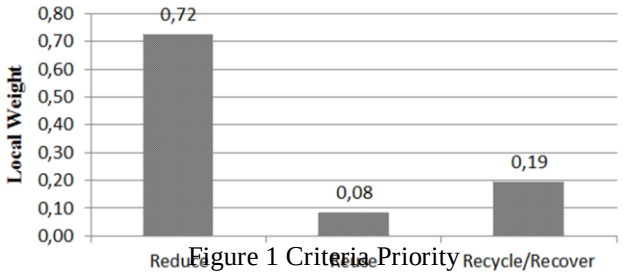


Figure 1 Criteria Priority

Table 6 and Figure 1 show that the elements reduce (reducing food waste) is a top priority with a weight value of 0.72. While the second priority is recycle (recycling food waste) with a weight of 0.19. The last priority is reuse with the weight value of 0.08.

D. Research Results Sub Criteria

The pair comparison matrix Sub Criteria is a derivative criterion of each criterion. The data obtained is primary data from a questionnaire filled by eighty respondents who also filled out the Criteria questionnaire. The sub-criteria along with the assessment weights are as follows:

1. Reduce

Following is the pairwise comparison matrix of the Reduce sub criteria.

Table 7 Pairing Comparative Matrix Reduce Sub Criteria

Sub Criteria	Storage of raw materials	Processing of raw materials	Planning of raw material quantities	Consumer behavior
Storage of raw materials	1.00	0.14	3.00	0.25
Processing of raw materials	7.00	1.00	7.00	3.00
Planning of raw material quantities	0.33	0.14	1.00	0.20
Consumer behavior	4.00	0.33	5.00	1.00

Based on Table 7 it can be seen that the pairwise comparison matrix between the criteria elements has been arranged in the form of their respective reciprocal matrices. The numbers in the previous matrix have been changed from the value of the fraction in the form of a decimal value. Based on the comparison matrix of the above elements it can be seen that the processing of raw materials is very clearly more important (7) compared to the storage of raw materials. The storage of raw materials is slightly more important (3) compared to the planning of raw material quantities. Consumer behavior is a little more important so it is clearly more important (4) compared to the storage of raw materials. Processing raw materials is very clearly more important (7) compared to the planning of raw material quantities. Processing raw materials is a little more important (3) compared to consumer behavior. Consumer behavior is clearly more important (5) compared to the planning of raw material quantities.

The assessment of eighty questionnaires from respondents that have been obtained, then the results are averaged using geometric averages. This is done because AHP only requires one answer for the comparison matrix. The results can be seen as follows:

Table 8 Priority Assessors in Reduce Sub Criteria

Sub Criteria	Storage of raw materials	Processing of raw materials	Planning of raw material quantities	Consumer behavior
Storage of raw materials	0.08	0.09	0.19	0.06
Processing of raw materials	0.57	0.62	0.44	0.67
Planning of raw material quantities	0.03	0.09	0.06	0.04
Consumer behavior	0.32	0.21	0.31	0.22

Based on the results of the calculation of pairwise comparisons between variables in the reduce sub-criteria above we obtain the weight shown in the following table.

Table 9 Priority Calculation Results in Reduce Sub Criteria

Sub Criteria	Storage of raw materials	Processing of raw materials	Planning of raw material quantities	Consumer behavior
Weight	0.10	0.57	0.06	0.27
Ranking	III	I	IV	II

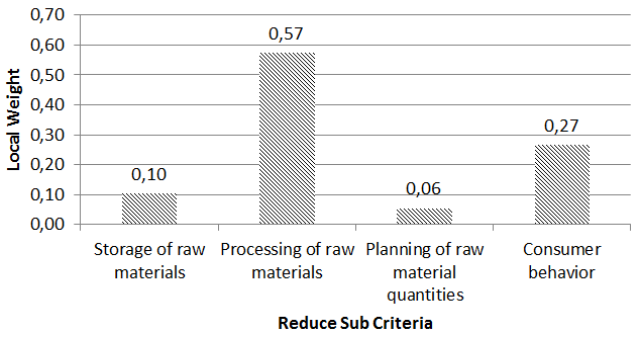


Figure 2 Priority of the Reduce Sub Criteria

From Table 9 and Figure 2 priority interests in the sub criteria reduce (reduce food waste) above shows that the processing of raw materials is a top priority with a weight of 0.57. Then the second priority is consumer behavior with a weight of 0.27. Furthermore, the third priority is the storage of raw materials with a weight of 0.10. The last priority is planning the quantity of raw materials with a weight of 0.06.

2. Reuse

Following is the pairwise comparison matrix on the Reuse sub criteria.

Table 10 Pairing Comparison Matrix Reuse Sub Criteria

Sub Criteria	Food redistribution	Animal feed
Food redistribution	1.00	0.14
Animal feed	7.00	1.00

Table 10 above can be seen that the pairwise comparison matrix between the criteria elements has been arranged in

the form of their respective reciprocal matrices. The numbers in the previous matrix have been changed from the value of the fraction in the form of a decimal value. Based on the comparison element matrix above it can be seen that animal feed is clearly more important (7) compared to food redistribution.

Assessment of eighty questionnaires from respondents that have been obtained, then the results are averaged using geometric averages. This is done because AHP only requires one answer for the comparison matrix. The results can be seen as follows:

Table 11 Priority Assessors in Reuse Sub Criteria

Sub Criteria	Food redistribution	Animal feed
Food redistribution	0.13	0.13
Animal feed	0.88	0.88

Based on the results of the calculation of pairwise comparisons between variables in the reuse sub criteria above, we get the weight shown in the following table.

Table 12 Results of Priority Interest Calculation in Reuse Sub Criteria

Sub Criteria	Food redistribution	Animal feed
Weight	0.13	0.88
Ranking	II	I

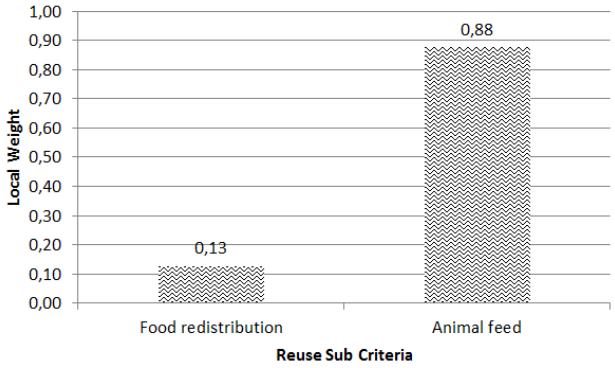


Figure 3 Priority of Reuse Sub Criteria

Based on the table and figure above, the priority of interest in the sub criteria of reuse (reuse of food waste) shows that animal feed is the top priority with a weight of 0.57 and the second priority is food redistribution with a weight of 0.13.

3. Recycle

Following is the pairwise comparison matrix in the Recycle sub criteria.

Table 13 Pairing Comparison Matrix Recycle Sub Criteria

Sub Criteria	Creating new food	Anaerobic digestion	Composting
Creating new food	1.00	0.33	0.14
Anaerobic digestion	3.00	1.00	0.20
Composting	7.00	5.00	1.00

In Table 13 above it can be seen that the pairwise comparison matrix between the criteria elements has been arranged in the form of their respective reciprocal matrices. The numbers in the previous matrix have been changed from the value of the fraction in the form of a decimal value. Based on the comparison element matrix above it can be seen that anaerobic digestion is slightly more important (3) compared to creating new foods. After that it can also be seen that composting is clearly more important (7) compared to creating new foods, and the latter can be seen that composting is clearly more important (5) compared to anaerobic digestion.

Assessment of eighty questionnaires from respondents that have been obtained, then the results are averaged using geometric averages. This is done because AHP only requires one answer for the comparison matrix. The results can be seen as follows:

Table 14 Priority Assessors in Recycle Sub Criteria

Sub Criteria	Creating new food	Anaerobic digestion	Composting
Creating new food	0.09	0.05	0.11
Anaerobic digestion	0.27	0.16	0.15
Composting	0.64	0.79	0.74

Based on the results of the calculation of pairwise comparisons between variables in the Recycle sub criteria above weights are shown in the following table.

Table 15 Priority Calculation Results in Recycle Sub Criteria

Sub Criteria	Creating new food	Anaerobic digestion	Composting
Weight	0.08	0.19	0.72
Ranking	III	II	I

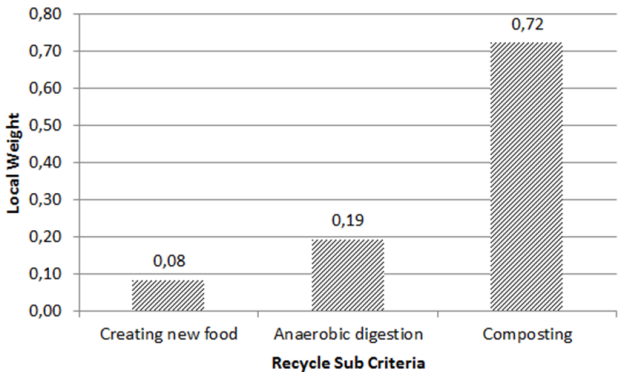


Figure 4 Priority of Recycle Sub Criteria

Based on Table 15 and Figure 4 priority interests in the Recycle sub criteria above, it shows that composting is a top priority with a weight of 0.72. Then the second priority is anaerobic digestion with a weight of 0.19. Furthermore, the third and final priority is to create new foods weighing 0.08.

E. Consistency Test

Consistency testing is the main prerequisite for assessing whether respondents are consistent in providing answers to each response in the questionnaire. The use of the AHP model that uses human perception as its main input, then inconsistency might

occur because humans have limitations in consistently expressing their perceptions, what else if they have to compare with many criteria. Based on this, the Consistency Test is considered very important to produce the expected answers. This consistent measurement is intended to see inconsistencies in the responses given by respondents. If CR <0.1 then the value of pairwise comparisons on the given criteria matrix is consistent. But if CR> 0.1 then the value of pairwise comparison on the given criteria matrix is inconsistent. So if it is not consistent, then filling the values in the paired matrix of the objective element or sub-criteria element must be repeated. The following table shows the value of the consistency ratio (CR) of the respondent's assessment:

Table 16 Consistency Ratio of the Respondent's Rating (CR)

Pairwise Comparison	CR	Information
Inter-element criteria (level 1)	0,05	Consistent
Between sub criteria of Reduce	0,06	Consistent
Between sub criteria of Reuse	0,00	Consistent
Between sub criteria of Recycle	0,05	Consistent

F. Global Priority

After each value of the objective element and sub-criteria is obtained then synthesis is carried out to get the overall priority weight of the existing criteria. Previously local weights / priorities must be sought for global values by multiplying local priorities with the priority level above. This global priority is carried out after the opinion metrics meet the inconsistency ratio requirements. In detail, the weighting results of criteria and sub criteria can be seen in the following table:

Table 17 Global Priority

Focus	Criteria	Local Weight	Sub Criteria	Local Weight	Global Weight	Priority
Determination of Priority for Reducing Food Waste	Reduce	0.72	Storage of raw materials	0.10	0.072	I
			Processing of raw materials	0.57	0.410	
			Planning of raw material quantities	0.06	0.043	
			Consumer behavior	0.27	0.194	
	Reuse	0.08	Food redistribution	0.13	0.010	III
			Animal feed	0.88	0.070	
	Recycle	0.19	Creating new food	0.08	0.015	II
			Anaerobic digestion	0.19	0.036	
			Composting	0.72	0.137	

G. Discussion

Table 17 shows the priority in reducing food waste at Warung Sari Laut in Palu City, and it can be seen that Reduce is the main factor weighing 0.72. Reduce (reduce) in food waste means reducing everything that causes food waste. Reducing food waste so far is the best way to reduce waste of natural resources[3]. Prevention is the most efficient way to deal with food waste, because prevention is about limiting waste of food in the front, while other categories are about food waste management [3]. In this case reducing food waste at Warung Sari Laut in Palu City is by increasing the processing of raw materials, realizing consumer behavior regarding the habit of not consuming food, improving the quality of storage of raw materials, and planning quantity of raw materials carefully.

Raw material processing is the first priority of the reduce criteria with a weight of 0.57. According to respondents if raw material processing is not done well, it will result in food waste because the raw materials used can be wasted or not suitable for consumption after processing. Consumer behavior is the second priority in the reduce sub criteria with a value of 0.27. Based on information from respondents, consumers often leave their food, which results in food waste at Warung Sari Laut. Different results are show which found that consumer storage and behavior had more influence on the emergence of food waste compared to processing raw materials[5]. While other studies suggest that to reduce food waste caused by consumer behavior, can be overcome by reducing the portion of food according to the needs of consumers[6]. The third priority is the storage of raw materials with a weight value of 0.10 and the last is the quantity planning of raw materials with a weight value of 0.06. Planning quantity of raw materials can cause food waste if planning is carried out inaccurately, for example inaccurate planning when facing work holidays or stalls closed under certain conditions.

The second priority in reducing food waste at Warung Sari Laut in Palu City is recycle. Having a weight value of 0.19 recycle in this case is to reuse food waste after processing. Based on the toolkit from FAO (2013), the sub-criteria of recycle at Warung Sari Laut in Palu City are creating new foods, anaerobic digestion and composting. Composting is a sub criterion with the first priority which has a weight value of 0.72. According to respondents, if composting can be carried out by the sea food stall business actors themselves, it can be a side income from the sale of compost produced. The second sub-criteria priority is anaerobic digestion with a weight value of 0.19. anaerobic digestion is the processing of food waste into an energy source such as biogas. The last priority is to create new foods with a weight value of 0.08. Being a sub-criteria with the priority that is least prioritized because according to respondents that food waste formed from Warung Sari Laut in Palu City is already not suitable for consumption by humans.

The third and final priority is Reuse with a weight value of 0.08, Reuse is a direct activity of reusing waste, both for the same function and for other functions[3]. The re-use of food waste carried out by Warung Sari Laut in Palu City is to prioritize providing surrounding communities with livestock so that they can be used as animal feed. [6]Controlling the appearance of food waste can be done by redistributing food to the poor directly or through food banks.

V. CONCLUSION

Based on the results of the process hierarchy analysis, it can be concluded several things, first, namely in reducing food waste can be done using the 3R method (Reduce, Reuse & Recycle / Recover). The sub criteria contained in the Reduce criteria (reduce) are the storage of raw materials,

raw material processing, quantity planning of raw materials and consumer behavior. Reuse has two sub criteria namely redistribution of food and animal feed. The third criterion is Recycle with sub criteria for creating new food, anaerobic digestion and composting. Then, the results of the analysis obtained are Reduce is the Top priority with a calculated weight of 0.72, then Recycle with a weight of 0.19, and the last priority is Reuse with a weight of 0.08.

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