Awareness Before and During Pandemic toward Food Waste: “Comparison between Indonesia and Japanese Students”

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Abstract. In recent years, food waste has become a global issue that often becomes the subject of public debate and has already been put into the SDGs programs which are targeted to be realized in 2030. A large amount of food waste is produced in the food service and infrastructure sectors, especially during this pandemic, which makes the foodservice sector difficult. However, this study compares and identifies students’ awareness of food waste in Indonesia and Japan. The data were primarily gathered through a questionnaire with 100 students in each country. This study uses the comparative concept to compare the results of research before and during the pandemic on students. Based on the results, this study discusses the extent to which students are aware of the behavior of leaving food, checking the expiration date, knowledge about food waste. Both Indonesian and Japanese students become more aware of the food waste that occurred.

1. Introduction
Food waste is defined as food that still can be eaten, but is lost from food production and consumption [1]. In simple terms, is food that can still be eaten, but thrown away. Food and Agriculture Organization states that a third of the food produced each year, amounting to 1.3 billion tons, is food waste [2]. The statement regarding food waste was reinforced by the Barilla Centre for Food and Nutrition which is stated “Changing habits and travel restrictions imposed by the COVID-19 pandemic are also having a huge impact on global food waste and loss.” [3]. From the end of 2019 until now, all countries in the world are fighting against the Coronavirus, which is a new outbreak that attacks the respiratory tract and the World Health Organization (WHO) announced in March 2020, COVID-19 became a global pandemic [4].

The government has implemented a policy of lockdown, social distancing, and others that are believed to be effective in reducing the spread of the Coronavirus. This had an impact on many restaurants, which cause people to prefer to cook at home or buy food online, and when buying food they will buy in large quantities to be used as stock [5]. Eventually, many foods lose their quality to the point of being inedible or rotten.
Based on the “Factors that Affecting Frozen Food Purchase Intention during the Covid-19 Outbreaking Indonesia 2020”, during the pandemic, frozen food consumers increased because it could be used as food during an emergency and could be stored for a long time [6]. It is known that most frozen food consumers are students under the age of 25 years. Factors that influence it are educated, lifestyle, habits of buying and storing food, especially for those who wander [7]. However, some people still do not understand about planning to buy food and checking the expiration date before buying food products. Behavioral and environmental knowledge in waste management is very important. When individuals cannot evaluate the freshness of food or do not know how to predict the expiration date, they tend to throw away the food. This means that people are still not aware of the importance of knowledge of waste management and checking the expiration date before buying food, can reduce food waste. Consumers who know better about proper ways to store food, produce less waste [8].

In accordance with the 12th agenda target of the Sustainability Development Goals (SDGs) point 3, regarding Responsible Consumption and Production which is: “By 2030, halve global per capita food waste at retail and consumer levels and reduce food loss along the production chain and supply including post-harvest losses.”[9]. It is considered as the main goal related to the industry to realize the life cycle from production to consumption, and from producer to consumer in the supply chain [10]. Sustainable development goal number 12 requires States to achieve responsible consumption and production patterns without exceeding safe environmental limits for the use of natural resources. Tightened regulations and commitments in national and international policies are urgently needed to reduce excess consumption and production-based environmental limits and avoid exceeding planetary boundaries [11].

Therefore, from this phenomenon, the authors want to do further research on the comparison of food waste before and during the pandemic in Indonesia and Japan, especially among students, and provide suggestions so that the target of the 12th agenda of the SDGs can be realized.

2. Concept and Method

This research refers to the Comparative concept. The comparative concept is descriptive research that wants to find answers on a fundamental basis about cause and effect by analyzing the factors that cause the occurrence or the emergence of a certain phenomenon. It is comparing two or more groups of a certain variable [12]. The main purpose of this research is to increase everyone's awareness about food waste problems that occur and be conscious of them in order not to cause food waste, especially students from Indonesia and Japan. The result expects by the authors is to do further research on the comparison between food waste before and during the pandemic in Indonesia and Japan, especially among students.

In this research, the authors have used quantitative methods of distributing questionnaires through social media such as (Ig, Line, and others). According to Paramita, the quantitative method is research that emphasizes theory testing through measuring research variables with numbers [13]. This study also analyzes statistical data and uses a deductive approach, which aims to test hypotheses. The research method is a scientific way to obtain data with certain purposes and uses [14]. Quantitative research in terms of objectives, this research is used to test a theory, present facts or descriptive statistics, and show relationships between variables and develop some concepts, develop understanding or explain a lot of things [15]. This approach departs from a theoretical framework, the ideas of experts, as well as the understanding of researchers based on their experiences, then developed into problems and their proposed solutions to obtain justification (verification) or assessment in the form of data support in the field.

This research uses a quantitative analysis method with Multiple Regression Analysis approaches. In accordance with the principles of quantitative research, which is scientific research, therefore all researchers must be equipped with theory. In quantitative research, the theory used must be clear, because the theory here will serve to clarify the problem under study, as a basis for formulating hypotheses, and as a reference for compiling research instruments. Therefore, the theoretical basis in a quantitative research
proposal must be clear with what theory will be used [16]. The authors expect to survey the comparison of food waste in Indonesia and Japan, especially among students.

3. Result and Discussion
The authors conducted this research together with two students from Wakayama University in Even Semester (April 2021 – August 2021). The results of the research and discussion are divided into 3, namely; the conditions of food waste in Indonesia, the conditions of food waste in Japan, and the comparison of the conditions of food waste in both countries.

3.1. The Condition of Food Waste in Indonesia Before and During Pandemic
Based on the Indonesia table before the pandemic above, it is known that from 100 Indonesian students, those who have awareness not to leave food are 56% strongly agree, 26% agree, 14% neutral and 4% disagree; those who check the expiration date are 65% strongly agree, 16% agree, 15% neutral, 2% disagree, and 2% strongly agree; those who know food waste are 32% strongly agree, 40% agree, 22% neutral, 5% disagree, and 1% strongly disagree; those who have a high level of students awareness toward food waste are 30% strongly agree, 38% agree, 23% neutral, 8% disagree, and 1% strongly disagree. Overall, Indonesian students before pandemic are dominated by those who choose strongly agree to the two factors that the authors researched, except knowledge about food waste and the high level of awareness toward food waste.

Table 1 Indonesia’s Before Pandemic

|                                  | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|----------------------------------|-------------------|----------|---------|-------|---------------|
| Awareness Not to Leave Food      | 0%                | 4%       | 14%     | 26%   | 56%           |
| Check the Expiration Date of the Food | 2%              | 2%       | 15%     | 16%   | 65%           |
| Knowledge about Food Waste       | 1%                | 5%       | 22%     | 40%   | 32%           |
| High Level of Students Awareness toward Food Waste | 1%              | 8%       | 23%     | 38%   | 30%           |

Table 2 Indonesia’s During Pandemic

|                                  | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|----------------------------------|-------------------|----------|---------|-------|---------------|
| Awareness Not to Leave Food      | 0%                | 3%       | 11%     | 27%   | 59%           |
| Check the Expiration Date of the Food | 2%              | 4%       | 13%     | 20%   | 61%           |
| Knowledge about Food Waste       | 3%                | 3%       | 16%     | 38%   | 40%           |
| High Level of Students Awareness toward Food Waste | 2%              | 3%       | 23%     | 37%   | 35%           |
Based on Indonesia during the pandemic table above, it is known that from 100 Indonesian students, those who have awareness not to leave food are 59% strongly agree, 27% agree, 11% neutral and 3% disagree; those who check the expiration date are 61% strongly agree, 20% agree, 13% neutral, 4% disagree, and 2% strongly agree; those who have the knowledge of food waste are 40% strongly agree, 38% agree, 16% neutral, 3% disagree, and 2% strongly disagree; those who have a high level of students awareness toward food waste are 35% strongly agree, 37% agree, 23% neutral, 3% disagree, and 2% strongly disagree. Overall, Indonesian students during a pandemic are dominated by those who choose strongly agree to the three factors that the authors researched, except the high level of awareness toward food waste.

Therefore, it is known that during the pandemic, many Indonesian students became more aware of food waste rather before the pandemic, but there are decreased on check the expiration date. Probably, it is because the pandemic condition is more serious made students became more aware of the food waste, but on the other hand, they became less check the expiration date of the food.

However, based on the analysis result using HAD, before the pandemic, only knowledge about food waste has affected the high-level awareness of the student toward food waste, but during pandemic awareness not to leave food, check the expiration date, and knowledge about food waste have affected toward high-level awareness of the student toward food waste.

3.2. The Condition of Food Waste in Japan Before and During Pandemic

Based on the Japan table before the pandemic above, it is known that from 100 Japanese students, those who have awareness not to leave food are 42% strongly agree, 36% agree, 13% neutral, 8% disagree, and 1% strongly disagree; those who check the expiration date are 38% strongly agree, 24% agree, 17% neutral, 10% disagree, and 11% strongly agree; those who have the knowledge of food waste are 6% strongly agree, 35% agree, 31% neutral, 24% disagree, and 4% strongly disagree; those who have a high level of students awareness toward food waste are 13% strongly agree, 19% agree, 33% neutral, 25% disagree, and 10% strongly disagree. Overall, Japanese students before pandemic are dominated by strongly agree to the two factors that the authors researched, except knowledge about food waste and the high level of awareness toward food waste.

|                      | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|----------------------|------------------|----------|---------|-------|----------------|
| Awareness Not to Leave Food | 1%               | 8%       | 13%     | 36%   | 42%            |
| Check the Expiration Date of the Food | 11%              | 10%      | 17%     | 24%   | 38%            |
| Knowledge about Food Waste | 4%               | 24%      | 31%     | 35%   | 6%             |
| High Level of Students Awareness toward Food Waste | 10%               | 25%      | 33%     | 19%   | 13%            |
Based on the Japan table during the pandemic above, it is known that from 100 Japanese students, those who have awareness not to leave food are 49% strongly agree, 39% agree, 8% neutral and 4% disagree; those who check the expiration date are 40% strongly agree, 32% agree, 11% neutral, 7% disagree, and 10% strongly agree; those who have the knowledge of food waste are 18% strongly agree, 44% agree, 25% neutral, and 13% disagree; those who have a high level of students awareness toward food waste are 22% strongly agree, 33% agree, 30% neutral, 13% disagree, and 2% strongly disagree. Overall, Japanese students during a pandemic are dominated by those who choose strongly agree to the two factors that the authors researched, except knowledge about food waste and the high level of awareness toward food waste.

Therefore, it is known that during the pandemic, many Japanese students became more aware of food waste rather than before the pandemic. However, based on the analysis result using HAD, neither on before pandemic nor during the pandemic, the awareness not to leave food and knowledge about food waste have affected toward high-level awareness of student toward food waste, except check the expiration date.

Table 5 Comparison between Indonesia and Japan Before and During Pandemic

|                              | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|------------------------------|------------------|----------|---------|-------|----------------|
| Awareness Not to Leave Food  | ID JP            | ID JP    | ID JP   | ID JP | ID JP          |
| B                            | 0 1              | 4 8      | 14 13   | 26 36 | 56 42          |
| D                            | 0 0              | 3 4      | 11 8    | 27 39 | 59 49          |
| Check the Expiration Date of the Food | ID JP | ID JP | ID JP | ID JP | ID JP |
| B                            | 2 11             | 2 10     | 15 17   | 16 24 | 65 38          |
| D                            | 2 10             | 4 7      | 13 11   | 20 32 | 61 40          |
| Knowledge about Food Waste   | ID JP            | ID JP    | ID JP   | ID JP | ID JP          |
| B                            | 1 4              | 5 24     | 22 31   | 40 35 | 32 6           |
| D                            | 3 0              | 3 13     | 16 25   | 38 44 | 40 18          |
| High Level of Students Awareness toward Food Waste | ID JP | ID JP | ID JP | ID JP | ID JP |
| B                            | 1 10             | 8 25     | 23 33   | 38 19 | 30 13          |
| D                            | 2 2              | 3 13     | 23 30   | 37 33 | 35 22          |

Note: B = Before Pandemic; D = During Pandemic; ID = Indonesia; JP = Japan
3.3. Comparison between Indonesia and Japan Before and During Pandemic

Based on the table 5, it is known that before the pandemic and during the pandemic, those who choose to strongly agree on the four factors that researched are dominated by Indonesia’s students; those who choose to agree on the four factors that researched are dominated by Japan's students, except knowledge about food waste before the pandemic and high awareness toward food waste before and during a pandemic; those who choose to neutral on the four factors that researched are dominated by Japan’s students, except check the expiration date during pandemic and awareness not to leave food before and during a pandemic; those who choose to disagree on the four factors that researched are dominated by Japan’s students; those who choose to strongly disagree on the four factors that researched are dominated by Japan’s student, except knowledge about food waste during the pandemic.

Therefore, the similarity to both countries based on the table above is there is an increase in awareness not to leave food, there is an increase in knowledge about food waste, and there is an increase in high awareness of the student toward food waste. However, the difference is on check the expiration date of the food, there is an increase in Japanese students, while there is no change in Indonesian students.

4. Conclusion

Based on the result and discussions above, it can conclude several things, such as:
- In Indonesia, during the pandemic, students became more aware of the food waste that occurred, but on the other hand, due to the coronavirus, students became less check the expiration date of the food. However, based on HAD, before the pandemic, only knowledge of food waste affects the high level of student awareness of food waste, while during a pandemic, awareness not to leave food, check the expiration dates, and knowledge of food waste affects the high level of student awareness of food waste.
- In Japan, during the pandemic, students became more aware of the food waste that occurred. However, based on HAD, before and during the pandemic, awareness not to leave food and knowledge of food waste affects the high level of student awareness of food waste.

Overall, this study suggests the importance of knowledge and awareness, and creativity of students in handling their food, so that food waste does not occur. With the lockdown and many who do not dare to eat out because of the corona, many people decided to cook at home, so indirectly they have trained their cooking skills and at the same time, they can become more aware not to leave food, because in a pandemic situation it is very difficult to find food ingredients. In addition, this will trigger them not to buy immediately, but makes a shopping list both in terms of quantity and quality, and check the expiration date so that the percentage of food waste will be reduced. Thus, this research is also expected to help realize the goals of the 12th SDGs which are regarding Responsible Consumption and Production, namely to reduce the occurrence of food waste, especially from Indonesian and Japanese students.

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