Impact on the food waste generation rate by food consumption styles

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I. Introduction
Past and present, the food, which is connected directly to the survival, is the most important element in human’s life. However, the present way for the food consumption has undergone great changes in comparison with the former. The former agricultural era can be expressed as self-sufficiency, local food, homemade and not-centralized recycling of food waste forward soil or livestock, while the modern society expressed as urbanization and industrialization has progressed for the decrease of farmer population, the increase of long distance foods, convenience foods and dining foods, and centralized food waste treatment. We need to assess the impact of the changes on the environment. Especially, in this study, we focused on the impact on the food waste generation. There are many studies about food waste recycling and treatment technologies, but there have been lack of studies considering consumption style of the matters. All wastes originate from the behavior of consuming something, so the link between the two is very essential question to construct more efficient waste management system.

This study is aimed to clarify the mechanism between food consumption styles (meals at home, convenience meals, meals outside the home) and food waste generation, and then to assess the food waste generation rate as a quantitative index.

II. Materials and Method
2.1 Definition of terms
First of all, we defined food consumption styles as following Figure 1. We classified various food products by three criteria. Those are place to cook, place to eat, and trends to change by social changes. Fresh food and processed food purchased for cooking are classified into meals at home, and ready-to-eat foods are classified into convenience meals. Finally, meals at restaurant and school lunch are classified into meals outside the home. Snack, alcohol, and beverages are excluded in this study.

Next, we defined food waste as following Figure 2. Food waste consists of inedible part and food loss. Inedible part is unavoidable part to waste, but food loss is generated in the form like leftover by personal carelessness or unsold food by the defects of the system though it is still suitable to eat. General studies about food waste have not classified inedible parts and food loss. However, the reason and behavior for wasting them are totally different. We need to look into the two parts for suggesting the solution for zero emission society.

Figure 1 Classification of food consumption style

Figure 2 Definition of food and food waste

2.2 Step of the study
The study was conducted as following steps.
1) To calculate allocation factors by consumption styles based on the consumed weight from Family Income and Expenditure Survey while considering the classification method shown in Figure 1 (unit price, food material composition in convenience foods or meals outside the home, and the weight change after cooking were considered to convert expenditure to the consumed weight)
2) To determine food flow in supply chain sectors (wholesale, manufacture, retail, restaurant, household) of each consumption style considering distribution routes by each food material (vegetables, beef, pork, chicken, and fruits) based on the food supply of Food Balance Sheet

3) To calculate food loss generation amount in each supply chain sector by subtracting inedible part portion from food waste generation statistics

4) To complete food and food waste flow by calculating food loss rate by net food supply of each supply chain sector

5) To compare food waste generation rate by same functional unit (1kg of net food intake)

III. Results and Consideration

3.1 Allocation factors of food materials

Fig. 3 shows what we are eating through each consumption style in present. It indicates meat, seafood, and fat and oil comprise a relatively large portion of convenience meals and meals outside the home compared with grain’s allocation factor or average factor. Averaged allocation factors of meals at home, convenience meals, and meals outside the home are calculated as 0.81, 0.08, and 0.11, respectively.

3.2 Food and Food waste flow in Japan of 2008

Japanese domestic net food and food loss flow were completed, and the result is shown in Fig. 4. The flow indicates allocation of net food supply to each food consumption style, distribution structure, food loss of each supply chain sector, and finally consumed amount to the human body. Using the flow, I would like to assess the situation on food loss generation in the food supply chain of Japan.

3.3 Food loss rates of food supply chain sectors

Fig. 5 shows how much of food loss are wasting in the supply chain sector. It indicates the efficiency of food consumption is declined by consumers. It is thought that it originated from the fact that food loss is linked to the cost in industrial parts, but there is no motivation for consumers to reduce food loss.

Figure 3 Allocation factors of food materials by food consumption styles

Figure 4. The flow of food and food loss in Japan of 2008

Figure 5 Food loss rates of supply chain sectors

Figure 6 Food waste generation by food consumption style