

# **Review of Household Food Waste Sorting Analyses in Japan**

## **- Classification System for Food Waste Avoidance -**

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International Workshop on Food Loss and Waste Prevention  
targeting Southeast and East Asian region  
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**Hajime Yamakawa**  
**Kyoto Prefectural University, Japan**

\* Some parts of this presentation are outputs of our research project, which is conducted with Tomoko Okayama at Taisho Univ. and Kohei Watanabe at Teikyo Univ. and is supported by the Environment Research and Technology Development Fund ( 3-1805 ) of MOE.

# Background (1)

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- Food losses and waste in the world: 1.3 bil. tonnes (FAO,2011)
- Substantial amounts of land, energy, water and fertilisers are lost in the creation of food products (IMechE,2013)



Target 12.3 of Sustainable Development Goals (SDGs)  
=>By 2030, halve per capita global food waste  
at the retail and consumer levels

Recycling of food waste cannot reduce impact of food production



We should place the most importance on  
food waste AVOIDANCE.

FAO (2011). <http://www.fao.org/3/a-i2697e.pdf>

IMechE (2013). <https://www.imeche.org/docs/default-source/default-document-library/global-food---waste-not-want-not.pdf?sfvrsn=0>

## Background (2)

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Avoidance of food waste should be prioritized



We should measure  
not only total food waste,  
but also avoidable food waste.

## Background (3)

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- Japan has long experiences to conduct food waste sorting analysis for avoidance.
  - Takatsuki at Kyoto Univ. and Kyoto city started detailed food waste composition analysis for avoidance in 1981 (Takatsuki, 2000).
  - Nowadays dozens of municipalities have conducted food waste sorting analysis for measuring avoidable food waste.





- Ministry of Environment (MOE) published a guideline for food waste sorting analysis (MOE, 2019)



These experiences can contribute to measure avoidable food waste in other countries.

# Overview

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- 1. Background
- 2. Food waste sorting analysis in Kyoto
- 3. Food Loss Statistical Survey by MAFF  
  
( Ministry of Agriculture, Forestry and Fisheries )
- 4. Guideline for sorting analysis  
of household food waste by MOE  
  
( Ministry of Environment )
- 5. Suggestions from Japanese experiences  
and our research

## 2. Food Waste Sorting Analysis in Kyoto

# Detailed Composition Analysis by Kyoto City and Kyoto Univ.

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- First detailed composition analysis was conducted in 1980.
- Background
  - Sorting Analysis for waste reduction  
To estimate potential reduction and to indicate influential factors
  - Existing sorting analysis : Only for plant design & management
    - Develop a new methodology  
introduce the idea of product classification  
into sorting analysis : about 120 categories at first
    - Include “untouched food” as a subcategory of kitchen waste
      - discarded edible food that retains  
more than 50% of its original shape

Takatsuki(1983): [https://www.jstage.jst.go.jp/article/jriet1972/12/7/12\\_7\\_425/\\_pdf](https://www.jstage.jst.go.jp/article/jriet1972/12/7/12_7_425/_pdf) (Jap.)

Reference: Ueta and Koizumi(2001): International comparative analysis of household waste composition with special reference to packaging waste, Environ Econ Policy Stud 4: 253-267.

<https://doi.org/10.1007/BF03354019>

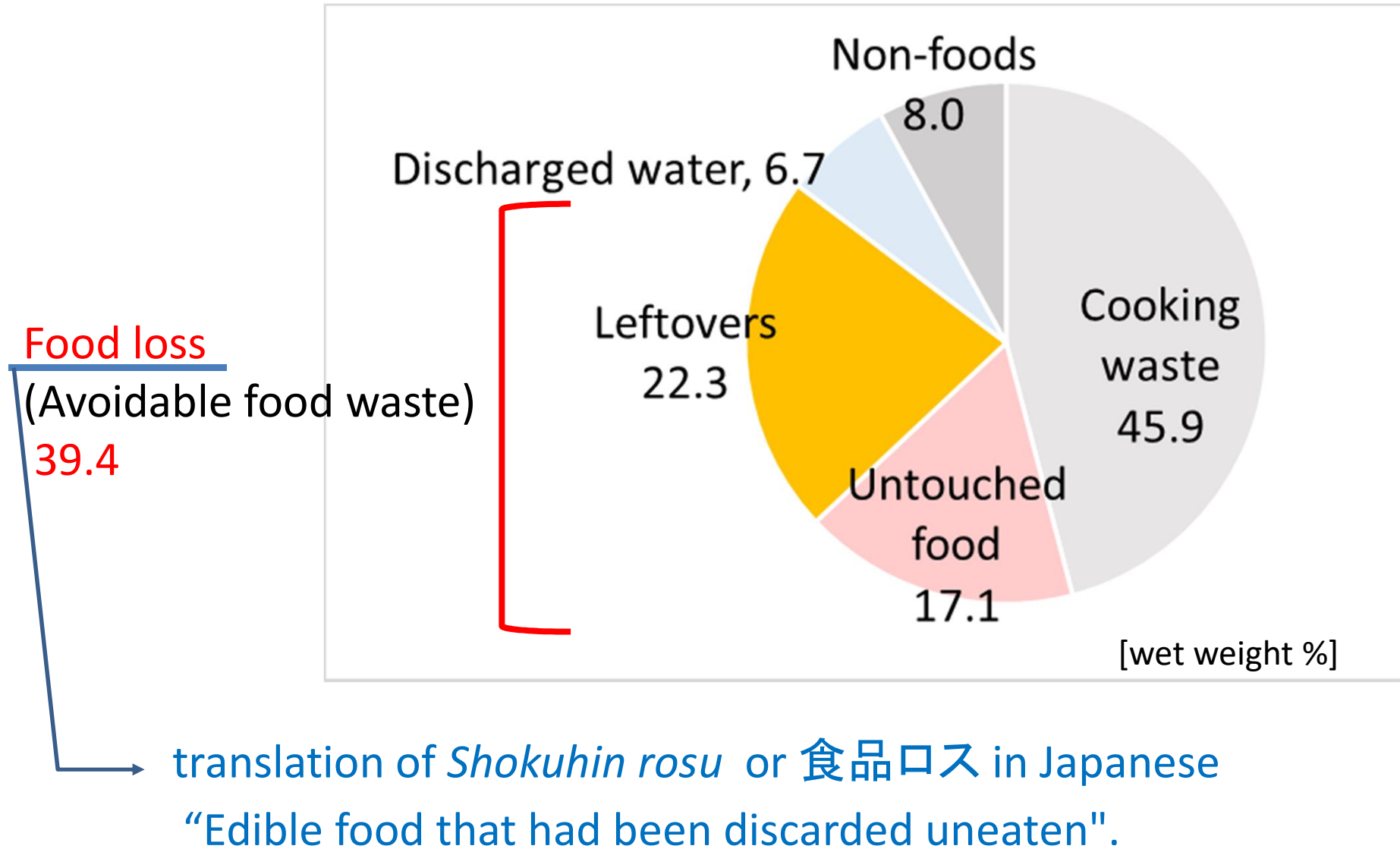
# Detailed Composition Analysis by Kyoto City and Kyoto Univ.

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- First detailed **FOOD** waste composition analysis in 1981
  - They conducted it in 1992, and continued in every five years after 1992, and in every two years after 2015.
- Main categories
  - Cooking waste
    - inedible food
  - Untouched food
    - discarded edible food that retains **more than 50% of its original shape**
  - Leftovers
    - discarded edible food that retains **less than 50% of its original shape**



# Results of food waste sorting analysis in 2012



# Detail Results of food waste sorting analysis in 2012

	Details	(%)		Details	(%)		Details	(%)
Leftovers	Vegetables	3.2	Untouched food	vegetables	5.1	Cooking waste	Vegetable waste such as peel	22.9
	Seafood	1.2		Fruit	1.6		Fruit waste such as peels	13.7
	Meat	1.0		Seafood	1.3		Fruit waste such as seeds	0.7
	Bread	0.7		Meat	2.1		Fish bones	2.2
	Noodles	0.4		Bread	1.3		Fish waste	0.2
	Rice	0.6		Sweet/Snacks	1.3		Bones other than fishes	0.6
	Others	15.2		Noodles	0.7		Fat	0.2
Discharged water		6.7		Rice	0.5		Seashells	0.6
		Seasonings		1.0	Eggshells		1.9	
		Processed food		0.3	Seaweed stem		0.4	
		Diary		0.1	Others		2.4	
		Seaweeds		0.2	Non-foods	Tea bags	4.0	
		Beverages		0.2		Waste from coffee processing	0.7	
		Others(foods)		0.4		Containers and wrappings	0.2	
		Others(Non-foods such as containers)		1.1		Dead flowers	0.2	
					Other impurities	2.9		

Yamada et al.(2017)

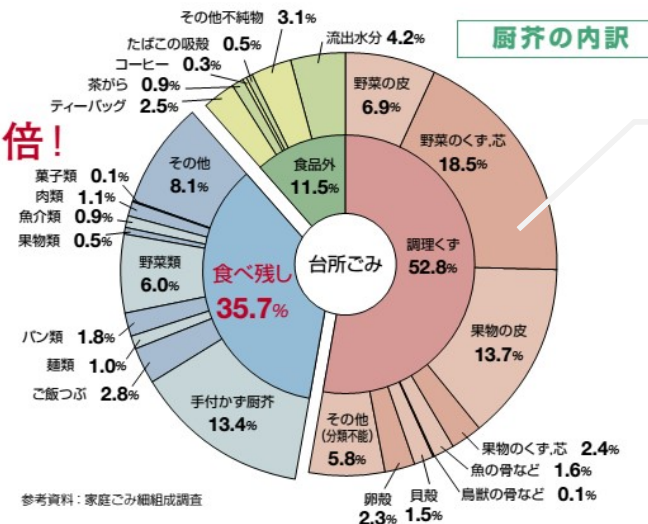
[wet weight %]

# Utilisation of Data for Publicity Activities



## 「食べ残し・手付かず食品」の排出量が2倍!

調理済み食品の利用や外食の増加で調理くずは減っているのに食べ残しや開封もされずに捨てられる食品は増えています。



Food waste composition data

## 買って捨ててかかった費用2

### 無駄に捨てられる食べ残し・手付かず食品の値段 (ある地区での調査結果により)

1世帯(4人家族の場合)が1年間に排出する「生ごみ」は約370Kgであり、そのうち、「食べ残し・手付かず食品」は約130Kgにもなります。

これらのごみを収集し処理した費用と無駄に食品を購入した費用を足し合わせると、なんと年間11万円近くも出費していることになります。

なんと!  
合計 ¥108,900

#### 無駄に捨てられる費用

食品を無駄に購入した費用 \* ¥101,500  
税金として支払ったごみ処理費用 ¥7,400

\* 科学技術庁資源調査報告第123号「暮らしと資源との関わりに関する調査報告」平成11年3月より加工

#### 50世帯3日分の手付かず食品



Photo of untouched food

Showing the wasted money by throwing away leftovers and untouched food

# Utilisation of Data for Setting Targets and Its Indicators

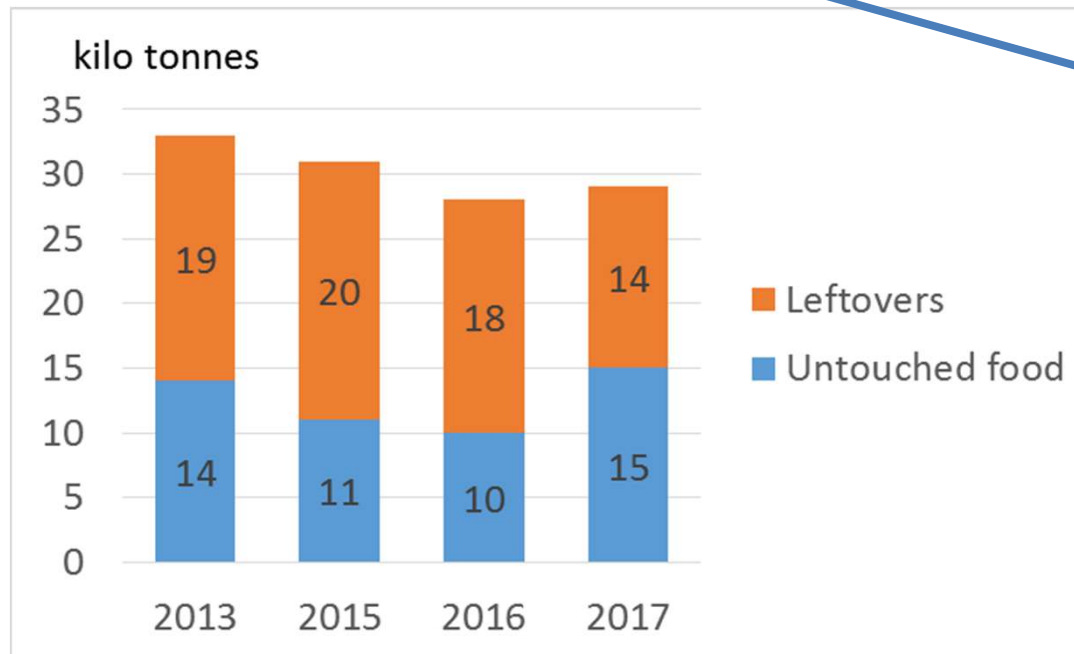
New Plan for Halving the Amount of Kyoto City Waste (2015-2020) (Kyoto city, 2015)

## ➤ Prevention Target



Yamada et al.(2017)

Amount of household food loss



estimated based on  
the results of sorting  
analysis

### 3. Food Loss Statistical Survey by MAFF

# Statistical Surveys on the Food Waste

## Occurring in Household Consumption and Catering (Restaurants)

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- Organisation : Ministry of Agriculture, Forestry and Fisheries(MAFF)
- Objectives :  
To understand the actual condition of “food loss” in households and food services, and  
to contribute to promote activities to reduce “food loss”

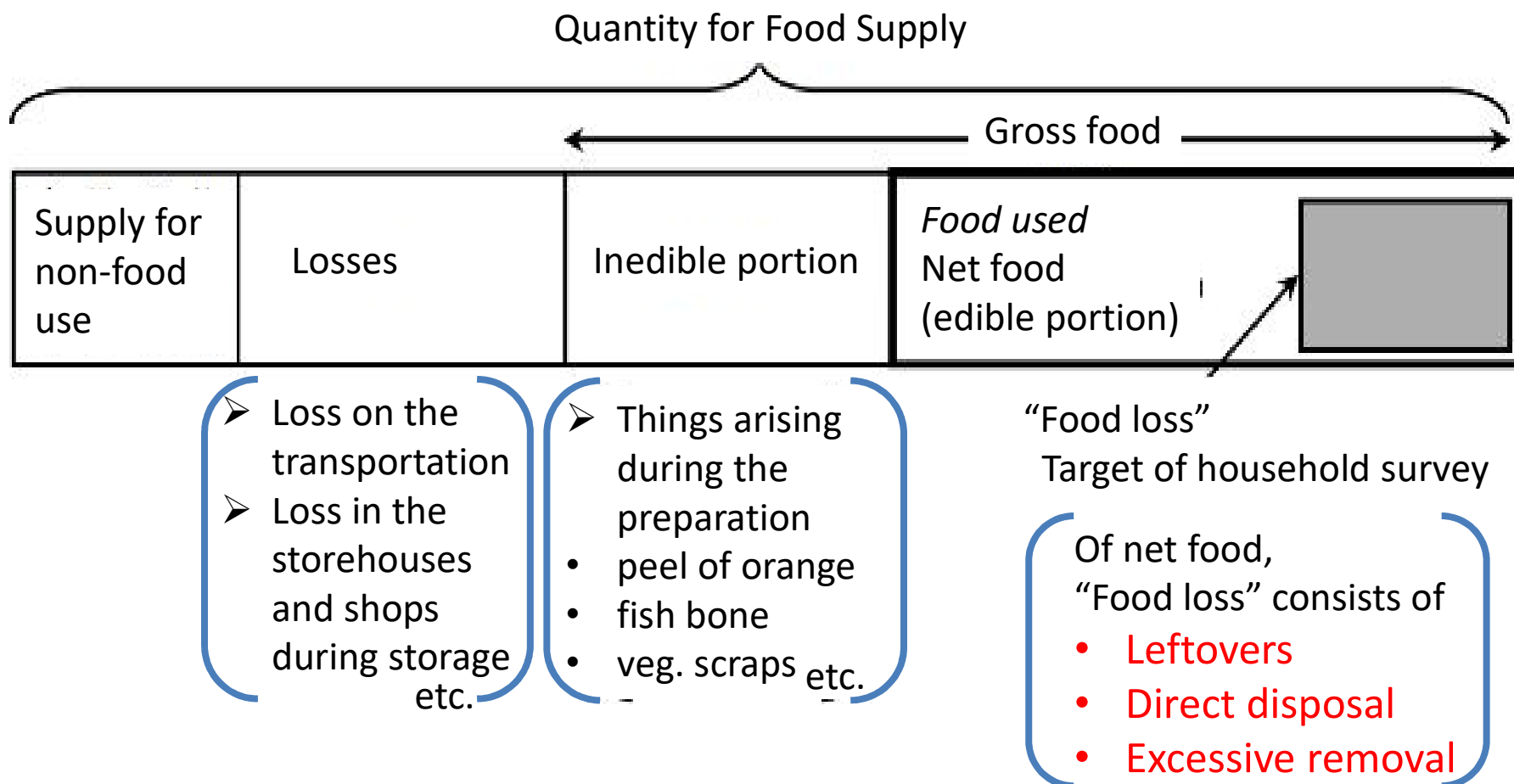
(The following describes only household surveys )

- Survey year : 2000 – 2007, 2009, 2014
- Population and samples :  
Population: all households in Japan  
Sampling method: non-random sampling for representative households  
Number of samples: 1, 000 samples at first, but decreased after that
- Survey method:  
Self-reporting questionnaire survey  
Required to weigh and record their data for successive seven days
- Data collected  
weight of parts of food removed, leftovers, food disposed without serving to the table, food used and food served for every ingredient or ready-to-be-eaten food

information for users of each survey report

MAFF : [http://www.maff.go.jp/j/tokei/kouhyou/syokuhin\\_loss/gaiyou/](http://www.maff.go.jp/j/tokei/kouhyou/syokuhin_loss/gaiyou/) (Jap.)

# Target of the Survey of Households



# Definition of the Composition of Household “Food Loss”

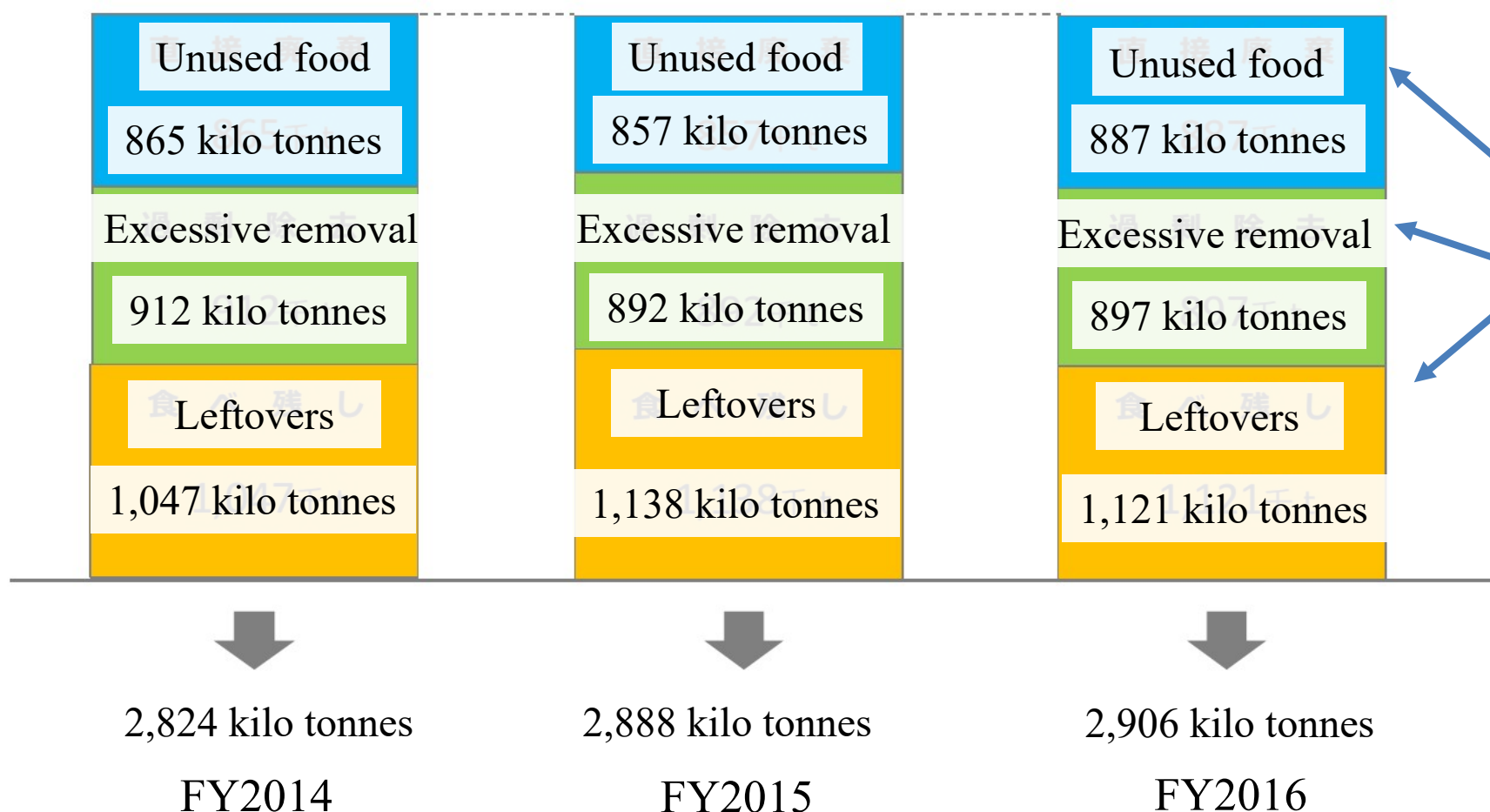
Leftovers	Disposed food that was left over, among cooking ingredients or ready-to-be-eaten food that <u>were used or served for a meal at home</u>
Direct Disposal	Cooking ingredients or ready-to-be-eaten food that <u>were unused or not served for a meal at home</u> because of expiration etc.
Excessive Removal	<p>Edible parts of disposed food that were <u>excessively removed when people removed inedible parts for preparation at home</u>, such as thickly peeled skin of radish</p> <p>Specifically, edible parts that were removed more than “refuse percent” shown in the “Standards Tables of Food Composition in Japan” by the</p> <p>Example)            If pineapple skins are peeled too thick and the amount exceeds the refuse percentage for pineapple of the Standard Table,            the difference will be counted as excessive removal            and the amount corresponding to the refuse percentage will be considered as inedible.</p>

MAFF : [http://www.maff.go.jp/j/tokei/kouhyou/syokuhin\\_loss/gaiyou/](http://www.maff.go.jp/j/tokei/kouhyou/syokuhin_loss/gaiyou/) (Jap.)

Parry et. al.(2015): <http://dx.doi.org/10.1787/5js4w29cf0f7-en>



# Estimated amount of household avoidable food waste in Japan



Estimated by using data of food waste sorting analysis.  
But the methodology varies among municipalities.

## 4. Guideline for sorting analysis of household food waste by MOE

This part shows the outline of MOE(2019). All pictures are from this document.

MOE(2019): 家庭系食品ロスの発生状況の把握のためのごみ袋開袋調査手順書(令和元年5月版)  
( <http://www.env.go.jp/recycle/tejyunnscho.pdf> )(Jap.)

# Outline of MOE guideline

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- 1. Sharing purposes
- 2. Planning
  - 1. Categories and recording data
  - 2. Sampling areas
  - 3. Sampling points
  - 4. Picking up scheme
  - 5. Amount of samples
  - 6. Working place for sorting
  - 7. Format for data recording
- 3. Sorting
  - 1. Sampling
  - 2. Measuring sample (weight)
  - 3. Sorting of food waste
  - 4. Measuring and recording after sorting
- 4. Reporting

It was stated that this guideline was prepared based on Fukuoka(2005) as a main reference.

# Concept of the Categories of Food Loss in the Guideline

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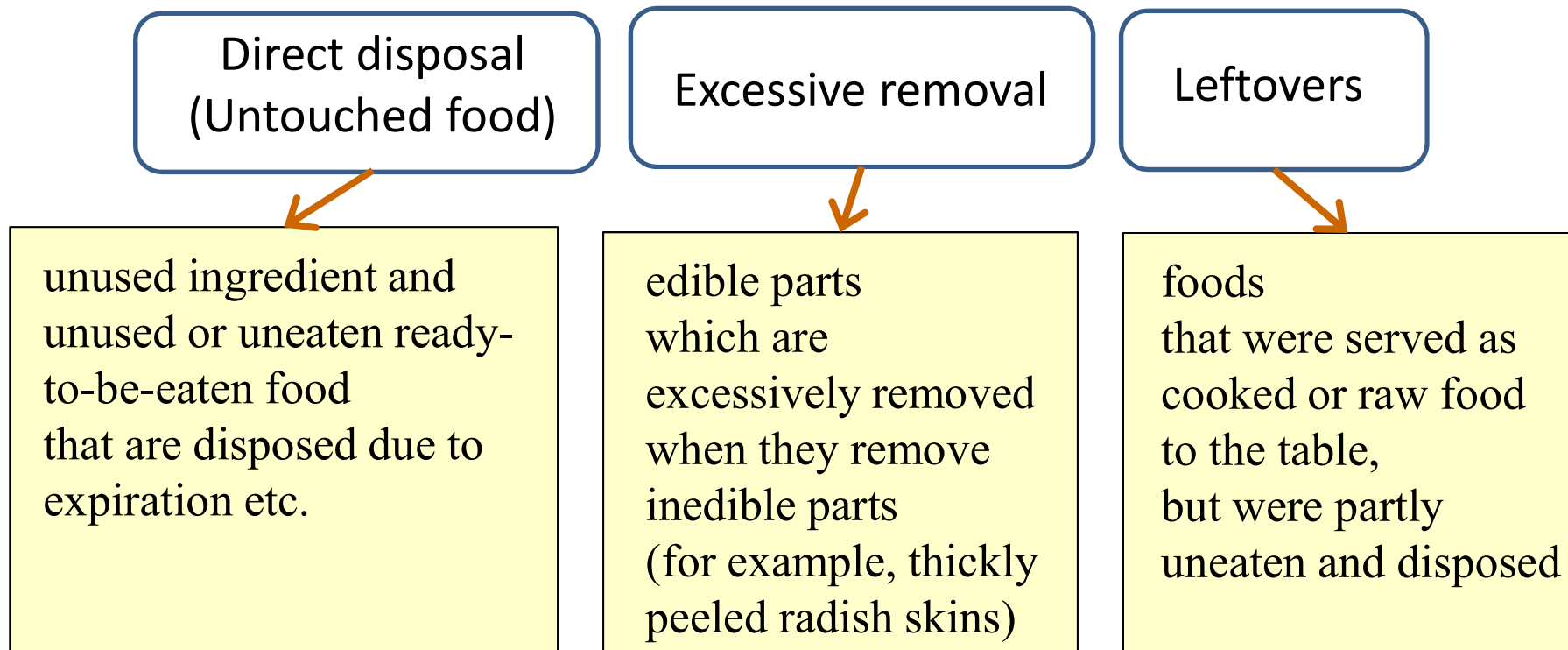
MOE(2019)

## Food waste (both edible and inedible)

- Inedible part: some parts of food that is necessary to be removed mainly in the process of cooking, such as skins of vegetables and fruits, fish and meat bones

## Food Loss (edible)

- Food loss: Edible food that had been discarded uneaten



# Categories and Subcategories for Sorting in the Guideline

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- 1. Cooking waste
  - **Inedible** part discharged in the process of cooking.
  - It **contains "excessive removal"** in sorting analysis.
- 2. Direct disposal (Untouched food)
  - 2.1 Disposed food that had been untouched after purchase ( **100% unused** )
  - 2.2 Disposed food that had been almost untouched after purchase. Food that retains more than about 50% of its original shape. ( **more than 50% unused** ) (optional)
  - 2.3 Disposed food that had been used or eaten to some extent after purchase. Food that retains less than about 50% of its original shape. ( **less than 50% unused** ) (optional)
    - \* This part was **classified into leftovers in existing investigations.**
- 3. Leftovers
  - Cooked or raw food that was **served to the table**
- 4. Others
  - Things that are often disposed with food waste but are not classified into above categories

MOE(2019)



Combination of Kyoto and food loss survey

## 5. Suggestions from Japanese Experiences and our research

# Issues of the Food Waste Categories in MOE Guideline

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- 1. Cooking waste
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  - Things that are often disposed with food waste but are not classified into above categories

MOE(2019)

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- Is cooking waste inedible?
  - What is the boundary between direct disposal(untouched food) and leftovers?

# Toward Improved Japanese Classification System

Categories		Definitions
Avoidable	A: Unused ingredients	Discarded unused food material for cooking. Unused food except unused ready-to-be-eaten food
	B: Unused ready-to-be-eaten food	Discarded unused food items prepared until the last step before consumption
	C: Leftovers	<b>Ready-to-be-eaten or cooked foods</b> that appear to have been disposed after being <b>partially eaten ( without packaging )</b>
Non-avoidable	D: Uneaten parts (Intentionally removed)	Parts of food materials <b>intentionally removed as uneaten parts</b> in the process of cooking or eating

Okayama et. al. (2019). Composition of household food waste in an urban area: A case study in Japan. Proceedings Sardinia 2019, 17th international waste management and landfill symposium, CISA publisher, Cagliari, A12 (3)



## How Are These Categories Based on Reasons to Dispose Useful?

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- What kind of behaviours should be targeted

## How Are These Categories Based on Reasons to Dispose Useful?

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Categories	Target behaviours
A: Unused ingredients	Buy proper amount of cooking ingredients. <u>Store and manage food in proper way.</u> Understand and respond to date labelling properly. Learn and utilise skill for using up ingredients.
B: Unused ready-to-be-eaten food	Buy proper amount of prepared food. Store and manage food in proper way. Understand and respond to date labelling properly. Make other meals with excessive dishes.
C: Leftovers	<u>Prepare proper amount of dishes.</u> Raise awareness of finishing the dish.
D: Uneaten parts	

## How Are These Categories Based on Reasons to Dispose Useful?

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- What kind of behaviours should be targeted
- Potential reduction
- To measure its effect more sensitively than by using total food waste



These categories will contribute to produce useful data for planning policies and activities for food waste avoidance.

*Let's try!*



Kyoto Prefectural  
University

Thank you for your attention!

Hajime Yamakawa  
Kyoto Prefectural University, Japan  
E-mail [yamakawa@kpu.ac.jp](mailto:yamakawa@kpu.ac.jp)