

Projects Commissioned by the Ministry of Agriculture, Forestry and Fisheries (MAFF)

Project of Trust Survey of Recycling in Food Industry, etc. (Survey on Methods to Reduce Food Loss and Waste for Sports Events)

Report (Executive Summary)

March 2019

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会社

1. Survey Purpose and Items

[Purpose]

In support of efforts to reduce food loss and waste in facilities such as the Olympic Village where the Organizing Committee directly provides food during the Tokyo 2020 Games, we will study potential approaches during the “serving” and the “consumption” stages, working with hotels that cater to teams of participating countries at the 2018 Volleyball Women’s World Championships (hereinafter referred to as the “Sport Event”)

[Survey Items]

1. Verify and investigate how to effectively educate on reducing food loss and waste and serving foods (Food Loss Measurement Survey)
2. Summarize how to effectively reduce food loss and waste in the Tokyo 2020 Games and challenges at the time of implementation

2. Food Loss Measurement Survey

2.1. Survey Summary

Food Loss Measurement Survey Implementation Summary

- We measured food loss and waste occurring at hotels accommodating teams participating in the 2018 Volleyball Women's World Championships in cooperation with the Fédération Internationale de Volleyball Association (FIVB), the Japan Volleyball Association, hotels and other parties concerned.

The Sports Event	The 2018 Volleyball Women's World Championships
Measurement Period	Lunch from Sep. 29 to Oct. 4, 2018 (excluding Sep. 30)
Venues	Hotels accommodating participating teams stay (in Yokohama City)
Food serving method	Buffet style
Measuring target teams	The Netherlands, Argentina, Germany, Cameroon, Mexico, Japan
Cooperating parties	Fédération Internationale de Volleyball Association (FIVB) The Japan Volleyball Association Kanagawa Volleyball Association Hotels in Yokohama City
Measurement implementers	MAFF and Mizuho Information & Research Institute, Inc. (MHIR)

Measurement schedule

Measurement Date	Championship Schedule	Food Loss Reduction Measures	Lunch Time Period	
			Before Game	After Game
Sat., Sep. 29	The 1st day of the championship	None (BaU)	The Netherlands, Argentina, Germany and Japan	Cameroon, Mexico
Mon., Oct. 1	The 3rd day of the championship	None (BaU)	The Netherlands, Germany, Cameroon, Mexico, and Japan	Argentina
Tue., Oct. 2	Rest date	The 1st intervention day (1) Serving food in small portions	(Rest date)	(Rest date)
Wed., Oct. 3	The 4th day of the championship	The 2nd intervention day (1) Serving a small portion of foods (2) Posting of educational posters	Germany, Cameroon, Mexico, and Japan	The Netherlands, Argentina
Thurs., Oct. 4	The 5th day of the championship	The 3rd intervention day (1) Serving a small portion of foods (2) Posting of educational posters (3) Posting of educational POP	Argentina, Germany, Cameroon, and Japan	The Netherlands, Mexico

Summary of Food Loss Reduction Meth

- We studied multiple proposals for serving and educational methods taking into consideration the effects of implementation, simplicity of implementation and scope to apply the method to the Tokyo 2020 Games and after hearing from relevant experts, determined that the following three methods should be implemented:

How to serve foods

Method to Serve Foods	Specific Methods	Expected Effects
(1) Serving food in small portions	Cut dishes served in large chunks, such as meat, into small portions and serve them	Reduce leftovers by using a small plate (avoid excessive servings on a wider plate)

Educational Method

Educational Method	Specific Methods	Expected Effects
(2) Display educational posters near buffet tables	Display methods to eliminate leftovers near buffet tables	Reduce leftovers by using a small plate (avoid excessive servings on a wider plate)
(3) Display triangle prism POP on an eating table	Emphasize social impact of eliminating leftovers	Reduce leftovers by using a small plate

Food Loss Reduction Methods (1) Serving food in small portions

- Meat (pork) dishes are selected to be converted to small portions among the dishes served. Even if cut into small portions, the meat dishes do not dry out and their appearance and taste can be preserved.
- Usually, one chop is cut into five or six portions, each of which weighing around 20 g, but the revised approach sees the number of portions increased to around eight, each weighing about 15 g.



Before implementing a small portion



After implementing a small portion

Food Loss Reduction Methods

(2) Display Educational Posters Near Buffet Tables

- A poster shows a message in three languages: English, Spanish and Japanese.
- The posters are displayed in four places: immediately before the starting point of a buffet table where diners take trays and tableware and behind buffet tables holding salad, meat/pasta and bread/pasta and behind buffet tables holding salad, meat/pasta and bread/fruit, which generated considerable leftovers on the first and second days of implementation.



Poster design



Around buffet tables where the poster is displayed

Food Loss Reduction Methods

(3) Display a triangular prism POP on dining tables

- Create 18-cm triangular prisms with three languages in the form of triangular prism POPs.
- Their design, featuring red as the main color, is eye-catching. Their messages praise the fact of avoiding leftovers and a smiling No-Loss (*) mark is indicated, underlining how a lack of leftovers constitutes a social benefit.



Japanese design



English design



Spanish design

NO-FOODLOSS PROJECT logo mark.
See Ministry of Agriculture, Forestry and Fisheries (MAFF) web site for details.
(http://www.maff.go.jp/j/shokusan/recycle/syoku_los/161227.html)

Reference: Setting of Triangular Prism POPs

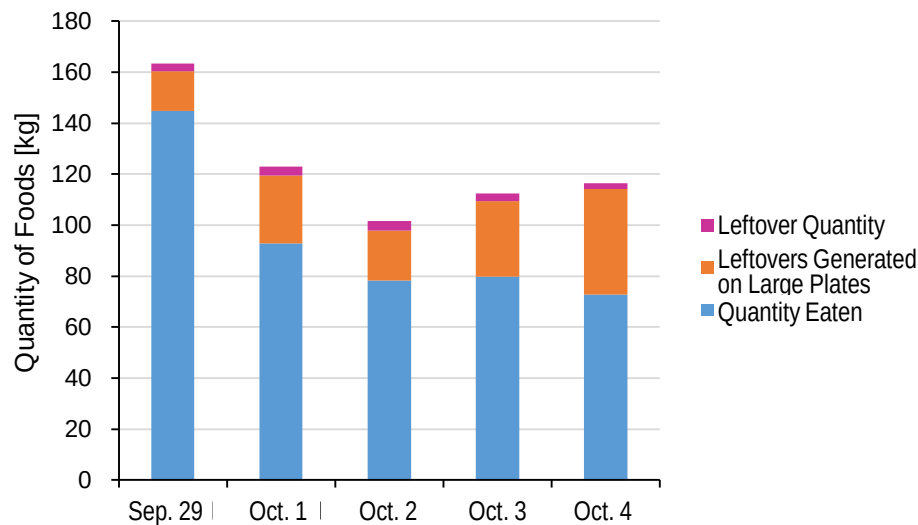


2. Food Loss Measurement Survey

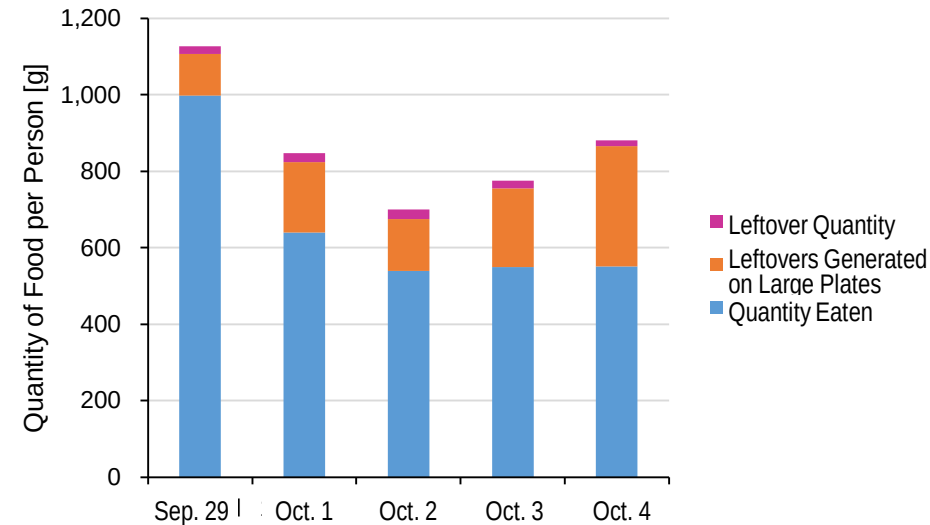
2.2. Measurement Results

Measurement Results (Final Form of Dishes Provided (Details))

- The leftover quantity was around 3 kg per meal (about 25 g per person (equivalent to a 1-cm slice of Japanese radish^{*1})).
 - The quantity of dishes eaten by the players amounted to around 80 kg per meal (about 550 g per person).
- *The intake per meal of 20-29-year-old women (median) based on the total daily intake was 534 g^{*2}.
- The quantity eaten by players decreased to 72.7 kg on Oct. 4 because 13 players did not take lunch at hotels.
 - The quantity eaten by players on Sep. 29 was 144.7 g, far exceeding 80 kg overall, because a gross measurement error was likely due to a mistake caused in cooperation with a PIC of the hall service.



Grand Total



Quantity per Person

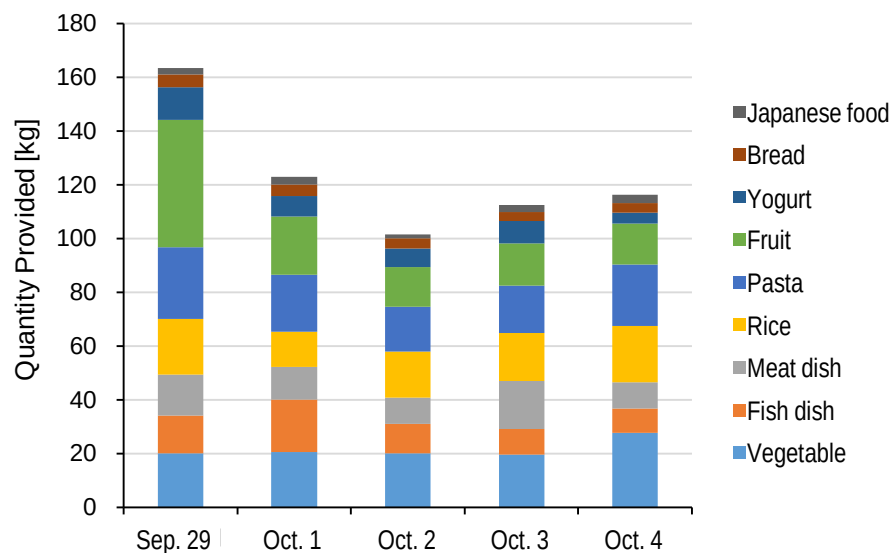
*1: AJINOMOTO HP

*2: Calculated based on "The National Health and Nutrition Survey in Japan 2017" Ministry of Health, Labour and Welfare (MHLW)

Measurement Results (Details of Quantity Provided)

- The quantity of dishes provided by each hotel to players, etc. was around 110kg per meal (about 760g per person).
*The intake per meal of 20-29-year-old women (median) based on the total daily intake was 534 g*1.
- Bread and yogurt were served in the dining room and may - in part - be carried over from breakfast to lunch or lunch to dinner. Accordingly, the measurement precision may be lower than for other dishes.
- With the daily quantity of fruit served in mind, there may have been a large gap in measuring fruit served on Sep. 29.
- The quantity of vegetables served on Oct. 4 was increased because potato salad (mashed potatoes) was added to the menu at the request of players, etc.

*1: Calculated based on "The National Health and Nutrition Survey in Japan 2017" Ministry of Health, Labour and Welfare (MHLW)

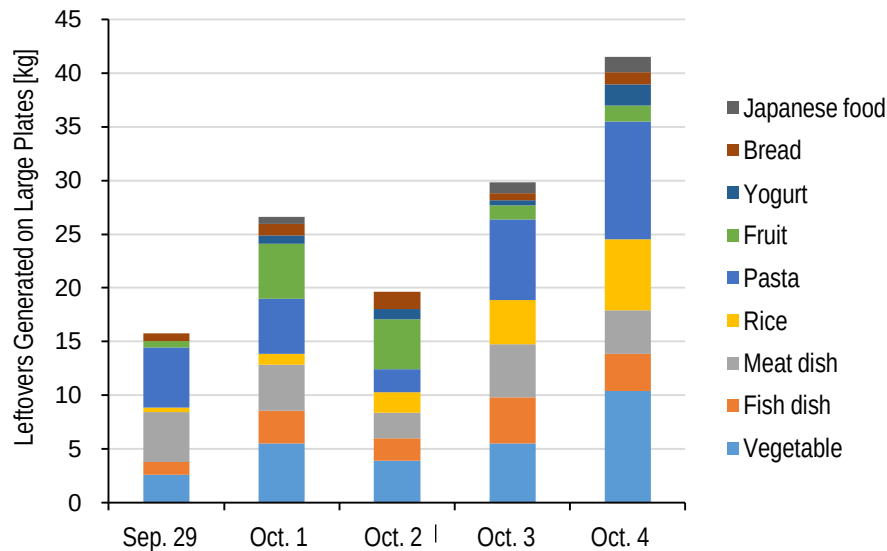


Quantity Provided [kg]	Sep. 29	Oct. 1	Oct. 2	Oct. 3	Oct. 4
10 Vegetable	20.1	20.7	20.1	19.6	27.8
20 Fish dish	14.1	19.6	11.0	9.7	8.9
30 Meat dish	15.2	12.0	9.8	17.8	9.8
40 Rice	20.7	13.0	17.2	17.9	20.9
50 Pasta	26.6	21.3	16.5	17.5	22.9
60 Fruit	47.4	21.7	14.7	15.8	15.2
70 Yogurt	12.2	7.5	6.9	8.3	4.0
80 Bread	4.7	4.4	3.9	3.3	3.6
90 Japanese food	2.4	2.8	1.5	2.6	3.3
Total	163.4	122.9	101.6	112.5	116.4

Measurement Results (Quantity of Leftovers on Wide Plates)

- Relish such as spinach and beans was included in the leftover from the fish and meat dishes on wide plates.
- In many cases, only relish for fish and meat dishes was left over and no meat or fish was left on the wide plates taken away during the meal.
- When multiple dishes such as shrimp and cuttlefish were served on a wide plate, players, etc. took only a specific food such as shrimp, while leaving behind other foods such as cuttlefish.
- We assume the quantity remaining on wide plates would tend to increase because hotels increase the number of dishes in line with players' requests for additional menus and increased food volume.

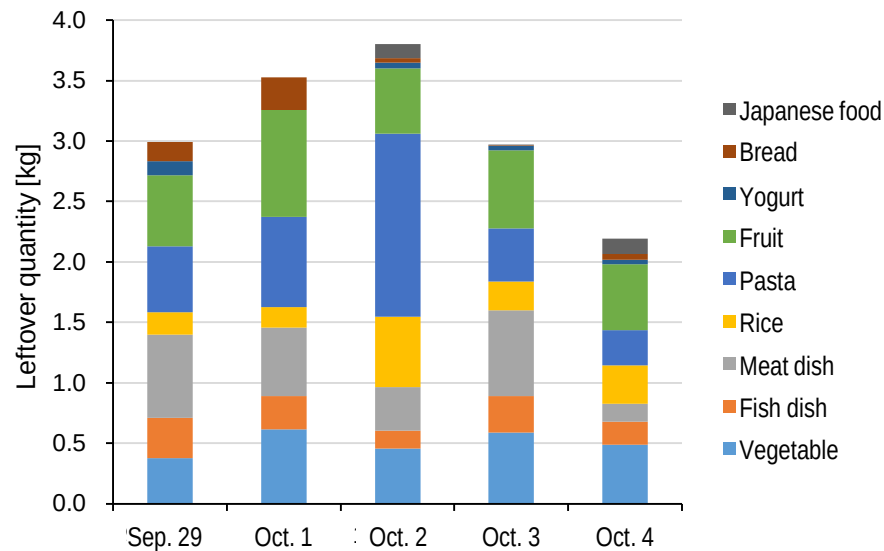
(Requests were made to increase pasta volume and add vegetables (mashed potatoes, etc.)



Leftovers Generated on Large Plates [kg]	Sep. 29	Oct. 1	Oct. 2	Oct. 3	Oct. 4
10 Vegetable	2.6	5.5	3.9	5.5	10.4
20 Fish dish	1.2	3.0	2.1	4.3	3.4
30 Meat dish	4.6	4.2	2.3	4.9	4.1
40 Rice	0.5	1.0	1.9	4.1	6.6
50 Pasta	5.6	5.1	2.1	7.5	10.9
60 Fruit	0.6	5.2	4.7	1.4	1.5
70 Yogurt	0.0	0.7	0.9	0.4	1.9
80 Bread	0.7	1.1	1.6	0.7	1.1
90 Japanese food	0.0	0.6	0.0	1.1	1.4
Total	15.8	26.6	19.6	29.9	41.5

Measurement Results (Details of Leftover Quantity)

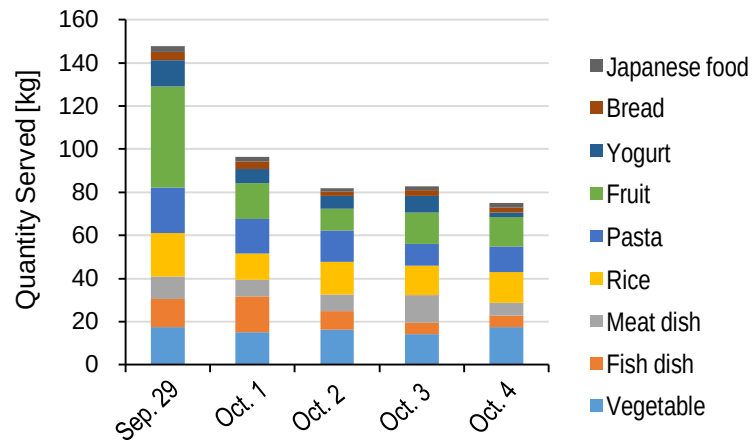
- The quantity of leftovers peaked on Oct. 2, since more foods that did not meet diners' preferences seemed to be served than other days.
- This was because the date was a rest date without any game. Players sampled unfamiliar dishes they would not normally eat but discovered that the tastes, etc., did not meet their preference and left more dishes.



Leftover quantity [kg]	Sep. 29	Oct. 1	Oct. 2	Oct. 3	Oct. 4
10 Vegetable	0.4	0.6	0.5	0.6	0.5
20 Fish dish	0.3	0.3	0.2	0.3	0.2
30 Meat dish	0.7	0.6	0.4	0.7	0.1
40 Rice	0.2	0.2	0.6	0.2	0.3
50 Pasta	0.6	0.7	1.5	0.4	0.3
60 Fruit	0.6	0.9	0.5	0.6	0.5
70 Yogurt	0.1	0.0	0.0	0.0	0.0
80 Bread	0.2	0.3	0.0	0.0	0.0
90 Japanese food	0.0	0.0	0.1	0.0	0.1
Total	3.0	3.5	3.8	3.0	2.2

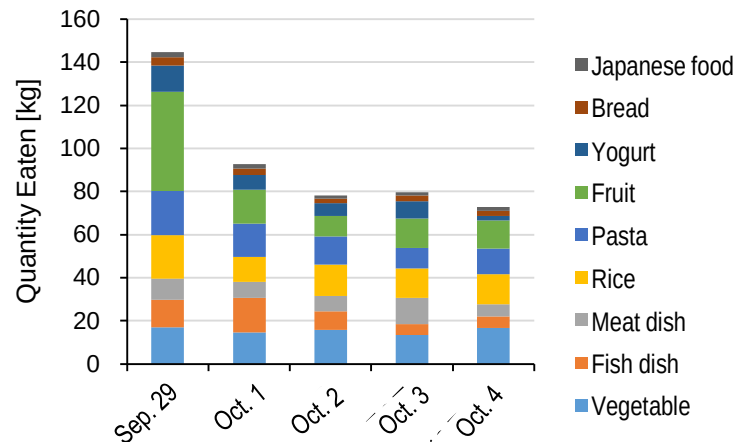
Measurement Results (Details of Quantities Served and Eaten)

Details of Served and Leftover Quantities



Quantity Served [kg]	Sep. 29	Oct. 1	Oct. 2	Oct. 3	Oct. 4
10 Vegetable	17.5	15.1	16.2	14.1	17.4
20 Fish dish	12.9	16.5	8.8	5.4	5.5
30 Meat dish	10.6	7.8	7.5	12.9	5.8
40 Rice	20.2	12.0	15.3	13.8	14.3
50 Pasta	21.0	16.2	14.4	10.0	12.0
60 Fruit	46.7	16.5	10.1	14.4	13.7
70 Yogurt	12.2	6.8	5.9	7.9	2.0
80 Bread	4.1	3.3	2.3	2.7	2.5
90 Japanese food	2.4	2.1	1.5	1.5	1.8
Total	147.6	96.3	82.0	82.6	74.9

Details of Quantity Eaten



Quantity Eaten [kg]	Sep. 29	Oct. 1	Oct. 2	Oct. 3	Oct. 4
10 Vegetable	17.1	14.5	15.7	13.5	16.9
20 Fish dish	12.5	16.2	8.7	5.1	5.3
30 Meat dish	9.9	7.2	7.2	12.2	5.6
40 Rice	20.0	11.9	14.7	13.5	13.9
50 Pasta	20.5	15.4	12.9	9.6	11.7
60 Fruit	46.2	15.6	9.5	13.8	13.2
70 Yogurt	12.1	6.8	5.9	7.9	2.0
80 Bread	3.9	3.0	2.3	2.7	2.4
90 Japanese food	2.4	2.1	1.3	1.5	1.7
Total	144.7	92.8	78.2	79.7	72.7

2. Food Loss Measurement Survey

2.3. Results of Food Loss Reduction Methods

Reactions of Players, etc. to educational materials

(2) Posting of posters near buffet tables

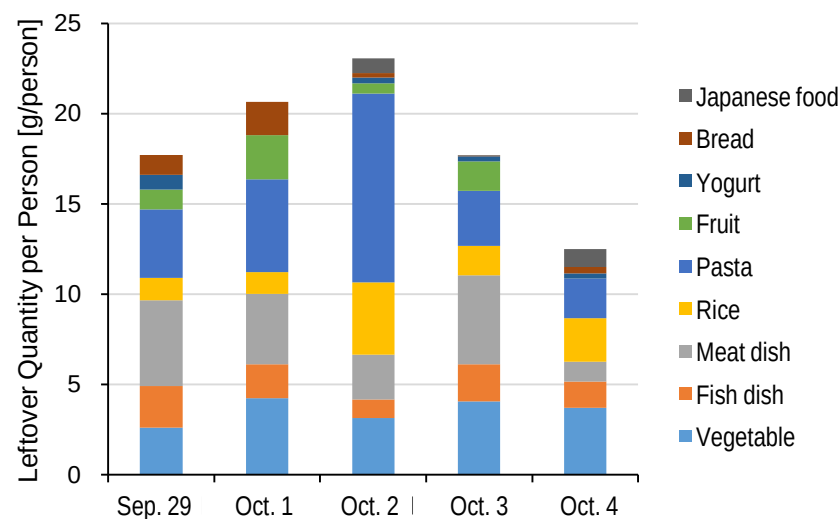
- When players stood in line to take the food, they seemed interested in the posters in front of buffet tables and pointed at them.
- However, when they could take foods on buffet tables without standing in line in order, they did not look at the posters.
- They often looked at the first poster in front of the buffet tables, but ignored posters behind the buffet tables holding salad, meat/pasta and bread/fruit.
- They looked at posters on the first day when they were posted. However, on the second day of posting, it seemed they paid little attention to the posters.

(3) Display a triangular prism POP on the dining table

- Some players picked up the triangular prism POP and discussed them with other players and others took pictures via their smartphones. It seemed that the POPs attracted more attention than the posters.

Educational Effect Analysis 1

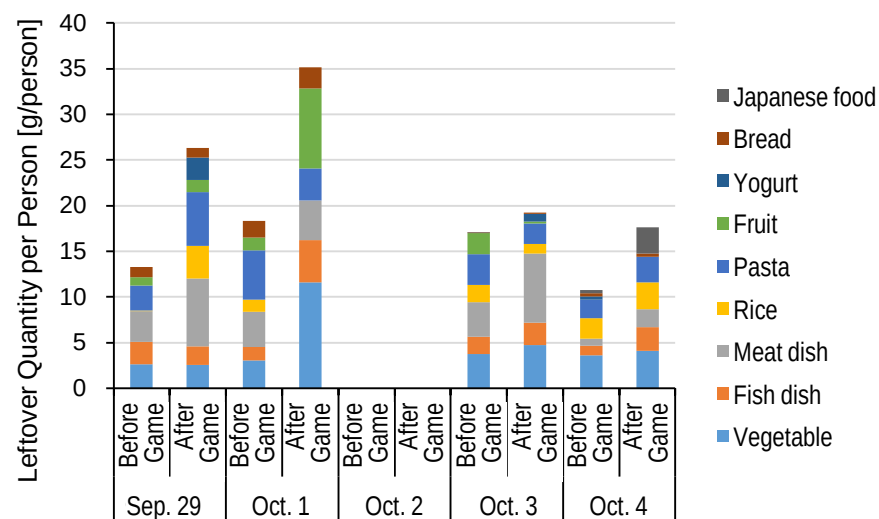
- On and after Oct. 3, education is implemented through posters and triangular prism POPs, which has seen the quantity of leftovers decline.
- Before implementing the education (on Sep. 29 and Oct. 1), the amount left over by players, etc., who lunched after games, was slightly under twice that before games but the gap was significantly reduced after implementing the education.



Posting of a poster

Posting of a poster
Posting of triangular prism POP

Leftover Quantity per Person
(grand total)



Posting of a poster

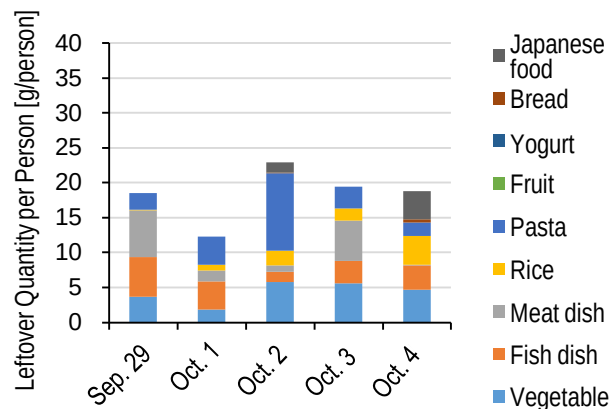
Posting of a poster
Posting of triangular prism POP

No data on Oct. 2, a rest date

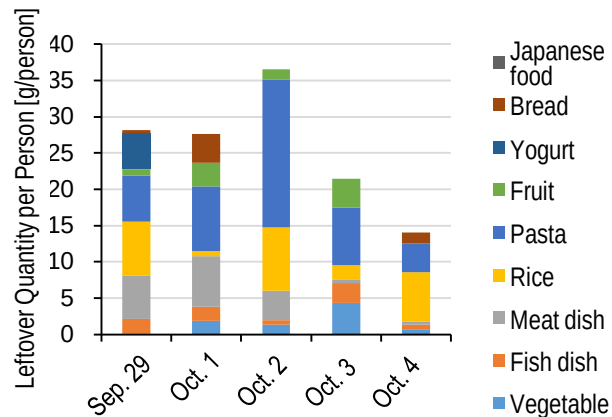
Leftover Quantity per Person
(Comparison between lunches before and after games)

Educational Effect Analysis 2

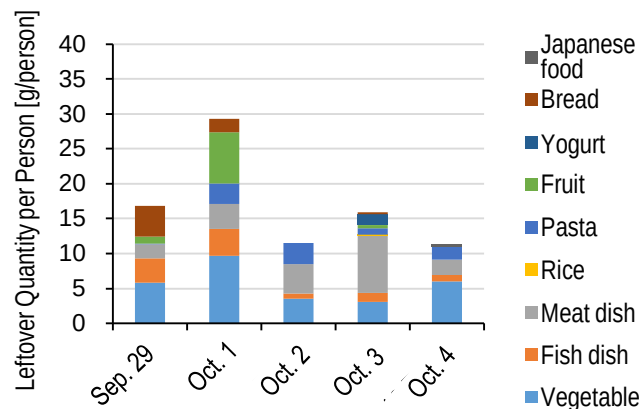
- The quantity of leftovers depends on which teams are involved.
- In general, education enables every team to reduce the quantity of leftovers.



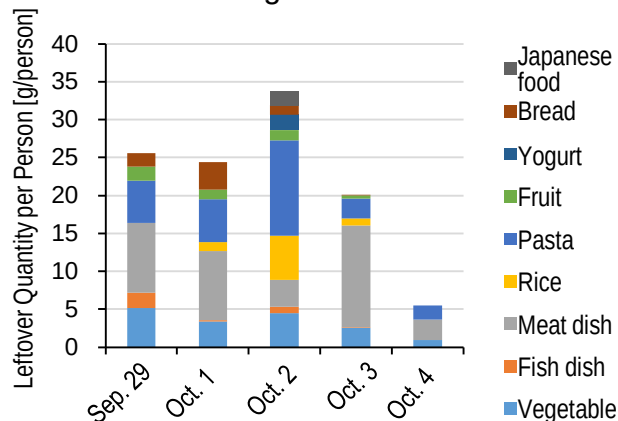
The Netherlands



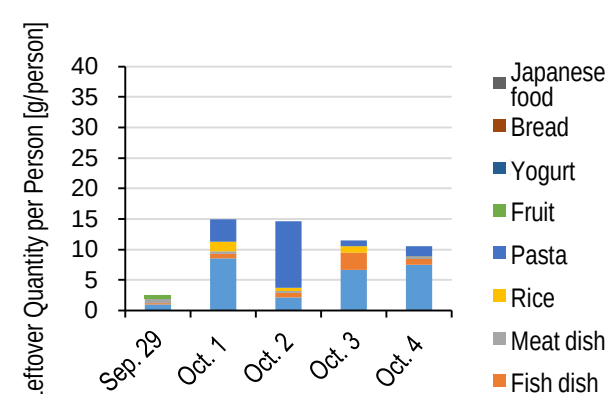
Cameroon



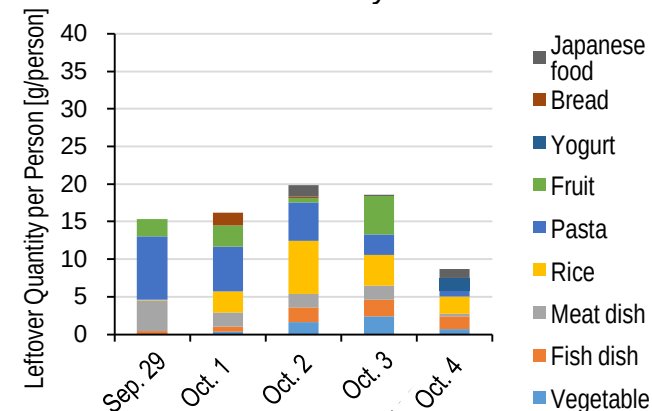
Argentina



Mexico



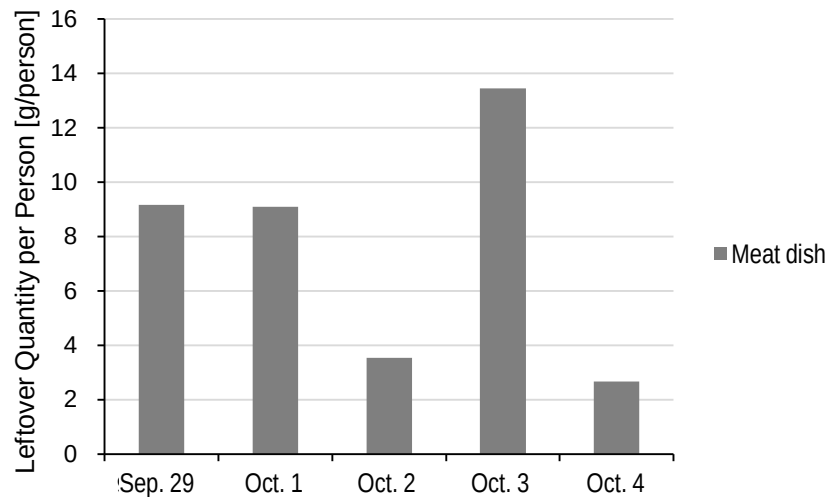
Germany



Japan

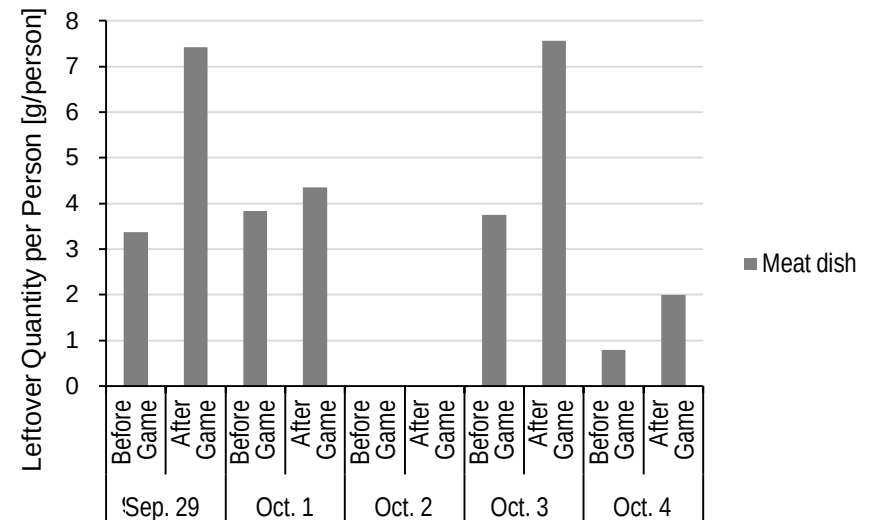
Effect Analysis of Serving food in small portions 1

- We analyzed only meat dishes served in small portions.
- We found no clear leftover reduction effect through serving small portions.
- This is because hotels were serving meat dishes after cutting the meat to proper sizes and virtually all such foods had already been served in small portions.



Serving small portion of meat

Leftover Quantity per Person
(grand total)



Serving small portion of meat

No data on Oct. 2, a rest date

Leftover Quantity per Person
(Comparison between lunches before and after games)

2. Food Loss Measurement Survey

2.4. Questionnaire Result

Questionnaire implementation

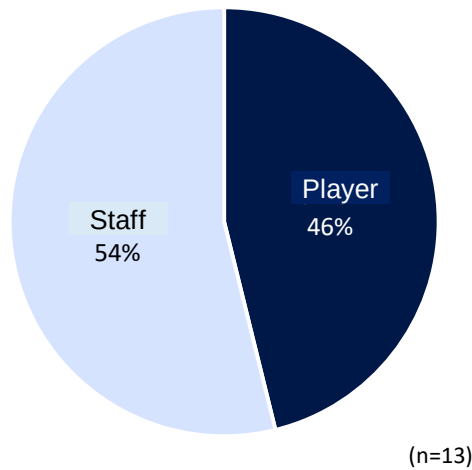
- We distributed a questionnaire to the players and staffs surveyed to ask for their reasons for leaving food behind and their opinions on how to serve foods and education methods.
- We prepared questionnaire in three languages, distributed a total of 145 forms after lunch on the fifth day of the implementation and collected them on the sixth day.
- We allowed voluntary answers with consideration for players and the number of sheets collected was 13. Despite the small number, responses showed the following trends:

Language	Countries
Japanese	Japan
English	Germany Cameroon The Netherlands
Spanish	Mexico Argentina

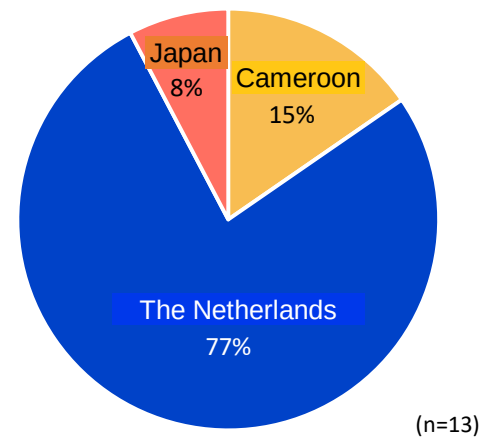
Main Question Items
• Genus/Genera • Experience of learning eating styles during expeditions and actual considerations • Tendency toward leftovers on past expeditions • Whether they had generated leftovers and reasons for leftovers during this stay. • Whether you recognize triangular prism POP and behavioral changes • Whether you recognize posters and behavioral changes • Countermeasures against leftovers, which will be effective in the Tokyo 2020 Games

Genus/Genera of Questionnaire Respondents

- The genus/genera of questionnaire respondents shows 46% players and 54% staff.



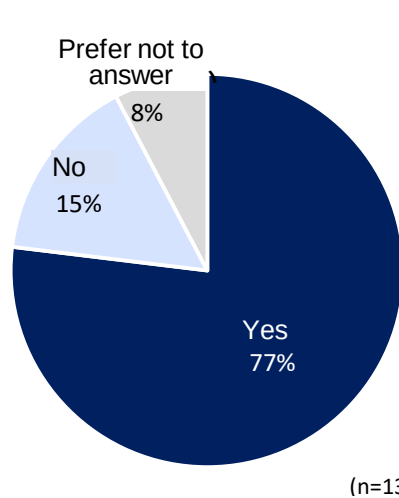
Genus/Genera of Respondents



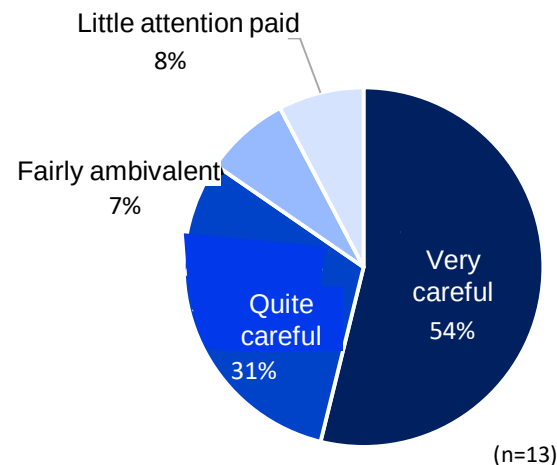
Teams of Respondents

Questionnaire Results (How to Eat Meals and Leftovers during Expeditions)

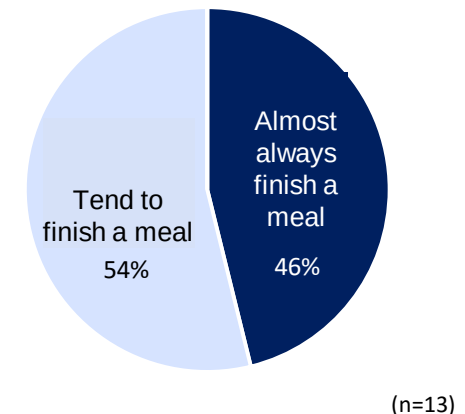
- 77% of respondents said they had learned the eating style during expeditions. All respondents whose were players answered they had had the learning experience.
- Those who were “Very careful” and “Quite careful” constituted 85% of the total.
- When answering about the tendency of leftovers on a usual expedition, 46% answered “Almost always finish a meal,” 54% answered “Usually finish a meal .” In other words, all answered they tended to finish meals on a regular basis.



Experience of Learning and Eating Style on an Expedition



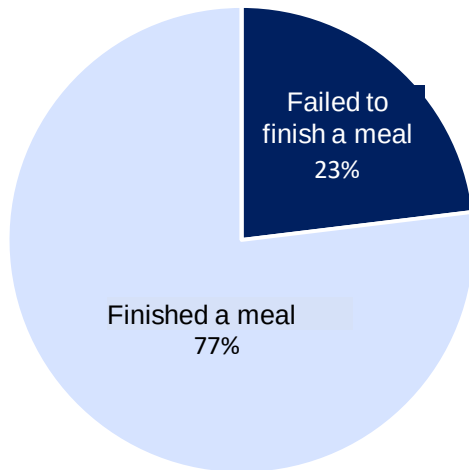
Consideration of Calorie and Nourishment when Taking Meals on an Expedition



Tendency toward leftovers on past expeditions

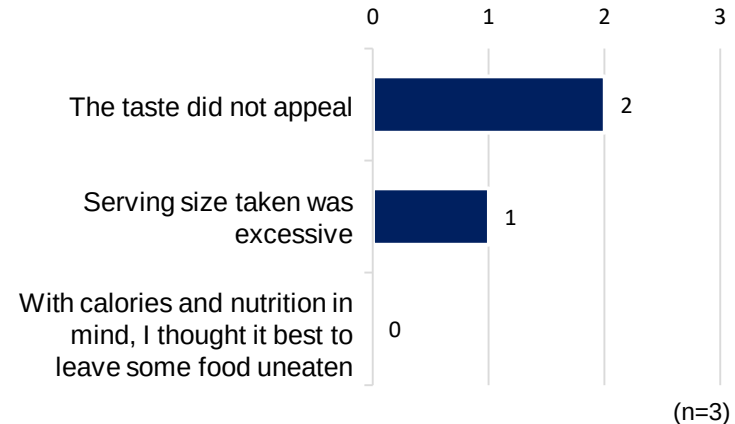
Questionnaire Results (Reasons for Leftovers)

- Asked whether they had generated leftovers during this stay, 23% said they had generated leftovers because they didn't like the taste, or the serving size was excessive.



(n=13)

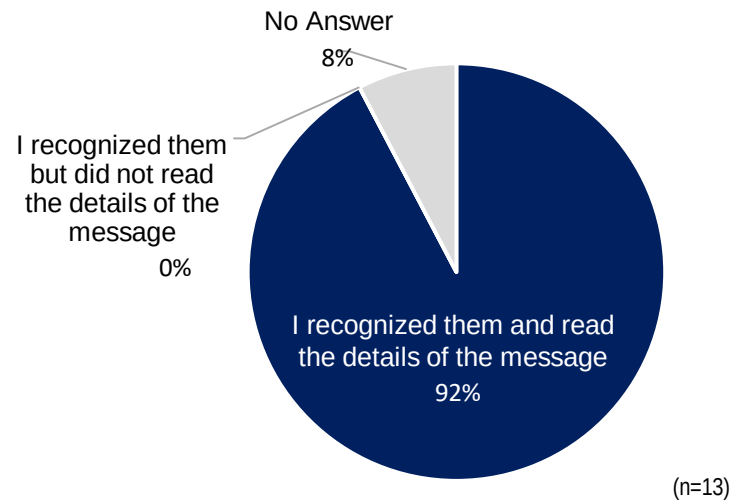
Whether they generated
leftovers during this stay



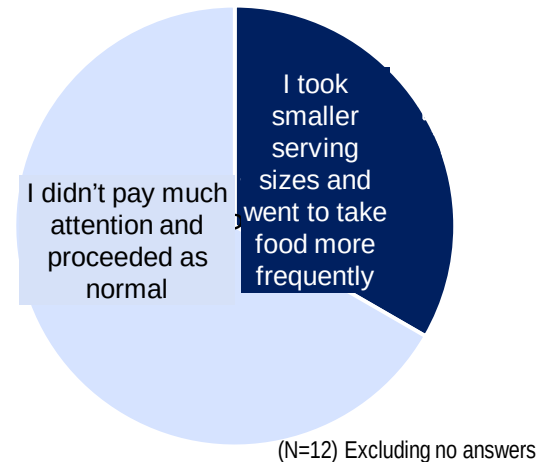
The reason for leftovers generated
during this stay
(Multiple answers allowed)

Questionnaire Result (Awareness of Posters)

- As for posters posted to reduce food loss and waste, all respondents except those who did not answer stated that they had read the message contents.
- Subsequently, 33% answered they “Took smaller servings and took foods more often.”



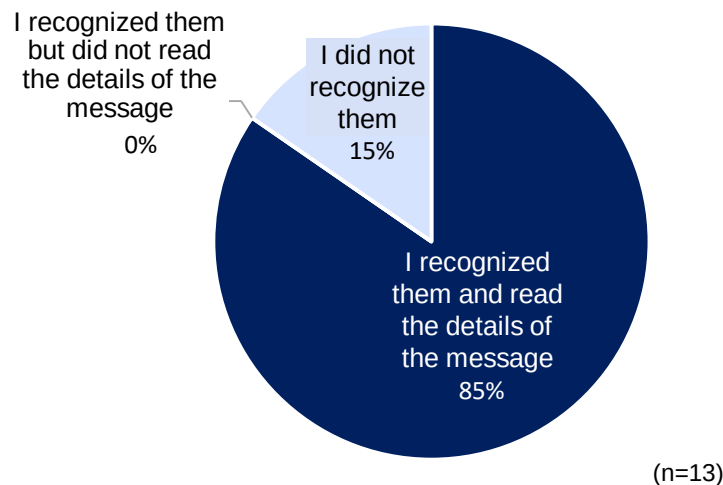
Poster recognition



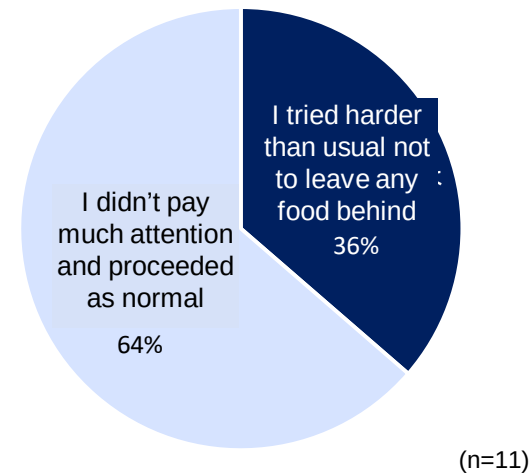
Behavioral changes of individuals recognizing posters

Questionnaire Result (Awareness of triangular prism POPs)

- As for triangular prism POPs, 85% of respondents recognized them and read the message contents while 15% did not recognize them. This indicates that triangular prism POPs were set on the final game date and some players did not eat lunch at the hotel.
- 36% of respondents who “recognized them and read the message contents” answered that they tried harder than usual to finish their meals.



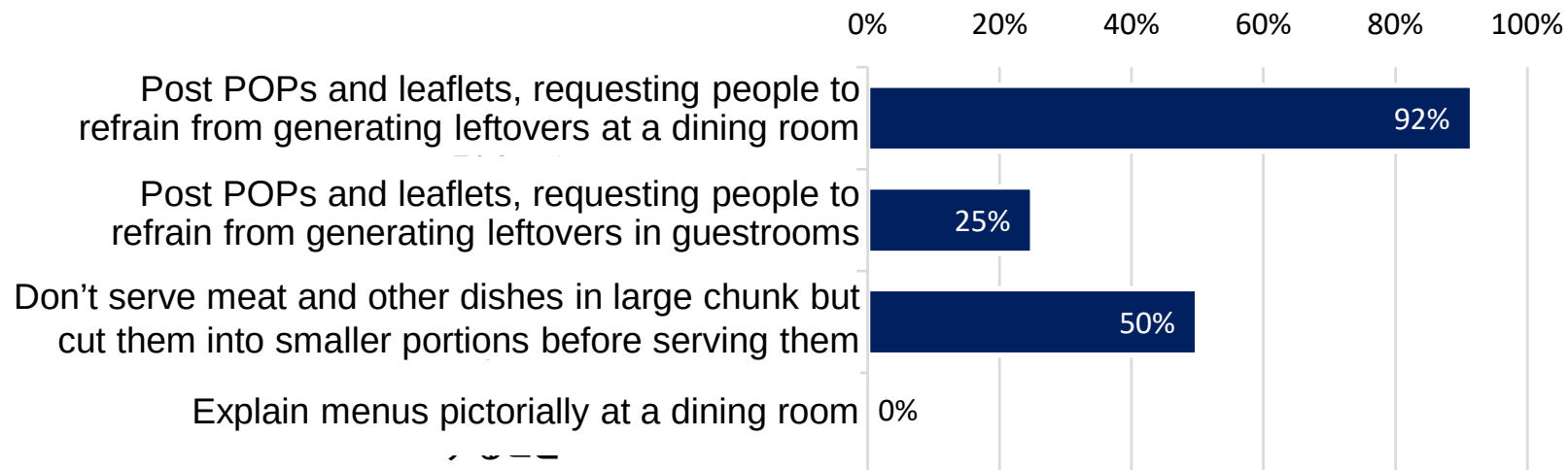
Recognition of triangular prism POP



Behavioral changes of individuals recognizing triangular prism POPs

Questionnaire Result (Countermeasures against Leftovers, Which Will Be Effective in the Tokyo 2020 Games)

- As for questions on countermeasures against leftovers, which will be effective in the Tokyo Olympic 2020 Games, the most common response given by 92% was “Posting of POPs and leaflets that request people to refrain from generating leftovers in a dining room” as POPs and leaflets posted this time and recognized by players.
- The second most common answer was “Avoid serving meat and other dishes in large chunks but cut them into smaller portions and serve them,” which was selected by 50%, half of all respondents.



(n=12) Excluding no answer

Countermeasures against leftovers, which will be effective in the Tokyo 2020 Games (multiple answers allowed)

3. Summarize how to effectively reduce food loss and waste in the Tokyo 2020 Games and challenges at the time of implementation

Summarize challenges at the serving stage

- We summarize below methods to serve dishes in moderate amounts at the serving stage per phenomenon generating leftovers:

Phenomena to Be Resolved	Why the Phenomena Occur	Suitable "Method for Serving Foods"	Requirement of Implementing "Method to Serve Foods"
Inability to take dishes in small quantities and tendency to take more than can be comfortably eaten.	Dishes are served in large chunks.	Implementation of small portions.	Ensure the food is visually appealing and served in small portions.
Unintentionally, taking more than can be comfortably eaten.	The serving cutlery is too big.	Downsize cutlery used to serve.	Prepare smaller serving cutlery.
	The serving plate is too big.	Downsize a serving plate.	Prepare smaller serving plates.
Tastes and quantities differing from expectations.	- Unfamiliar dishes are served. - Unaware of the quantity before ordering.	Use pictures, etc. to present the quantity and taste of a dish in advance.	Present pictures, etc. in advance
The quantity of dishes left over on a wide plate is smaller and an eyesore.	A wide plate is left as it is until all dishes have been served.	Transfer dishes on a wide plate to a small plate.	Staff can transfer dishes.

Summarize challenges at the consumption stage

- The following is a summary of methods to educate people on how to avoid generating leftovers at the consumption stage

	Phenomena to Be Resolved	Suitable “Educational Method” (Venue)	Suitable “Educational Method” (Media)	Notes in Implementing the “Educational Method”
Education Mainly Targeting Promotion of Loss and Waste Reduction Action	Excessive single servings.	Prominent place during meal order times, such as in front of buffet tables	- Poster - Digital signage - POP	- Multilingual feature - Method to continue attracting interests in case of ongoing implementation
	Generating leftovers without eating all dished served.	Dining table	- Triangular prism POP - Table sticker	- Multilingual feature - Prepare triangular prism POPs according to the number of implementing tables - Method to continue attracting interests in case of ongoing implementation
Education Mainly Targeting Efforts to Raise Awareness of Food Loss and Waste Reduction	- Excessive single servings. - Generating leftovers without eating all dished served.	Accommodation room	Pamphlet	- Multilingual feature - Measures to attract targets without any interest