

Greeting _____(1)

Hello, everyone.

Thank you for coming to my presentation.

This presentation is for my thesis proposal defence.

Today I am talking about the dark side of a food business. It is food loss and waste in a restaurant.

Especially, this study includes its definition and measurement, potential factors, statistical model, and its impacts on the society and the environment.

Reason

Why I chose this topic is that I have worked at restaurants for over 5 years, almost 10 years; as a server, kitchen staff, and management side.

- As a server, I was watching much still edible food going back and dumped.

- As a chef, I was trying a new menu ideas from food that was being thrown away.

- As a management side, I have been managing inventory and training employees on how to eliminate food waste.

And now I have the opportunity to step out of the restaurant and do some research on food loss and waste.

Statement of Purpose

The purpose of this study is to share readers with a better understanding of the food loss and waste as one of a case study.

Especially, how to measure the food loss and waste in a restaurant, what is the potential factor, and what is the consequence of it.

Audience

So, I suppose that this presentation provides information about one case of a restaurant in Prince George's around food loss and waste.

Therefore, I expect my audience will be those who are researching food loss and waste, managers running in a restaurant, and public policymakers who are working on food loss.

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Today's Menu

Now let's get a start.

Today's menu is like this.

- First introduction.

It will show you some facts about food loss and waste, and then my research questions will be there.

- Second, Literature review. This will cover previous research on food loss and waste.

- Third, Methods. This section explains how I actually measure food loss and waste.

- Finally, I will show you what can be inferred from the results of the measurements.

Introduction _____(3)

I would like to start with some numbers about food loss and waste.

Actually food loss and waste is a global and local issue.

What I mean, it happens everywhere in the food supply chain. According to FAO, it is estimated that one-third or one-fourth of food is lost or wasted.

And about 1.3 billion tons of food loss and waste is generated each year, and it is going up to grow every year . (44% per year).

In Canada, it creates about 35 million tons of food waste, and it said that Canada is the largest food waste generator per person in western countries in 2016.

In British Columbia, almost 40% of waste sent to landfills is organic waste. And then the majority of it is coming from domestic or households.

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Therefore, most studies of food loss and waste are basically focusing on households.

So, there is little research on food supply side.

Especially, even though the production or distribution sectors are still advancing, food service sector is not.

And I found an interesting number from a provincial report that is food waste in food service sector is between 1% and 15.5%,

and under some sets of conditions, it will be up to 52%.

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Since I have worked in several restaurants,

I would like to test this number, and

I came up with the following questions.

- What is the average volume of food that is wasted during processing and consumption in restaurants?

- What is the extent of food wastage in Japanese restaurants in Prince George?

- What are the main factors contributing to food loss and waste?

- To what extent is a social or environmental impact from food loss and waste generated by a single restaurant?

- What approaches are Japanese restaurant operators taking to reduce food waste generation?

Literature Review _____(6)

Now let's look at the past studies on food loss and waste.

So, what exactly is the food loss and waste?

Actually, there is no universally accepted definition.

In other words, the definition is different depending on the researchers or research organizations.

Here are some definitions used by four typical organizations: Food and Agriculture Organization of the United Nation, FAO EU, North America governments.

- First, FAO is one of the international organizations in the united nation, they work on globally efforts to defeat hunger. FAO defined food loss as

"Decrease in weight (dry matter) or quality (nutritional value) of food that was originally produced for human consumption."

and food waste is

"The disposal of food suitable for human consumption after it has been stored in a decomposed state or beyond its expiration date."

- Second, the Food waste definition by European Union is

"Any food, whether edible or inedible parts, removed from the Food Supply Chain to be disposed or recovered"

and unique point is that all food loss and waste refer to food waste, so there is no food loss definition.

Third, for the North American governments, US and Canada, they have a similar definition.

It is actually opposite to the EU's definition,

food loss is a decrease in food products throughout the food supply chain.

And food waste is overlapped with food loss, which is still consumable food but not consumed.

It is difficult to explain in words only, so the next slide describes each different in a diagram.

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Food loss and waste are basically grouped into food loss and food waste,

in the food supply chain: which is from food production, handling and storage, processing, distribution, and to consumption.

According to the FAO, food loss and waste means food loss from food production to processing, while food waste indicates food waste generated from distribution to consumption.

In the EU, there is no definition of food loss; all food removed from the food supply chain is Food Waste.

In contrast, the US and Canada use food loss as unconsumed food in food supply chain; while food waste is similar to FAO.

I have not included it on this slide, but academic studies tend to define 1-4 as food loss and the last 5, i.e., food discarded by the consumer level, as food waste.

As shown above, the criteria for Food Loss and Food Waste differ between research organizations and countries, but in general, Food Loss refers to food removed in the upstream processes of the food supply chain, while Food Waste is generated in the downstream processes.

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Except EU, all these-above definitions of Food loss and waste point to solid waste: that is food scraps, peels or leftovers.

How about soup? Is soup not food?

Well, I think that liquid form food waste, such as oil or soup, cannot be ignored.

This is because, for one thing, discharging the soup may put stress on sewage treatment or system and also on the environment, such as potentially damaging soil, rivers, and the air.

Second, it also leads to the loss of the hidden food used to make the soup.

Many studies have ignored because it is difficult to measure, but this study attempted to measure their weight as a trial study.

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Therefore, to summarize the previous definitions and apply them to our case study, the following diagram is shown below.

This study defines

food loss as the food weight decrease generated by food provider, which is cooking scraps generated in the kitchen during cooking or poor storage

and food waste as the food weight loss created by consumers, which is leftover food that is unconsumed by diners.

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Well, how can we capture the food loss and waste in a restaurant?

In the past studies, there are five main methods of obtaining food loss that have been explored.

- The first method is self-report.

This method involves recruiting volunteers, asking them questions about how much food waste each they produces per meal or day, and ask to record it.

This method has relatively low-cost merit, but high rate of drop out is a problem.

- Next method is a questionnaire or paper interviews.

This method collects food loss and waste data by interviewing each person or research site diners.

This method of survey is a cost-effective way of gathering information.

But, people usually tend to underestimate their food loss and waste, so the estimation is often biased.

- Waste composition method is one of the good methods. It is used to understand the different components that make up food loss and waste.

This method has huge advantage about overcoming of under-reporting problem and also for understanding why it

might have been produced;

However, this needs a lot of costs: requirement of labs and special skills.

- Mass balance method is called as material flow analysis or input-output analysis.

This method estimates food loss and waste by measuring inputs, for instance raw materials, and outputs like, food products along with changes in food weight.

When making estimates, the method sets various assumptions about the food processing and creates a input-output model.

This method can be used to quantify food loss and waste where it is not available to reliable measurements.

The final method is a direct measurement.

This method is the most popular method and, as you can guess, directly measures the weight or volume of food loss and waste.

This method might have a relatively high cost, but most accurate and does not need a high expertise.

In this research, we are interested in the volume of food loss and waste, so I will use number 5, which is direct measurement.

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Now we can think of cause side of food loss and waste.

What makes food loss and waste?

Actually, the causes or the factors are complex and complicated.

However, I will introduce a Finnish study that classified eight factors, which is best described.

1. The first factor is society.

Society as a whole forms the framework for people and businesses to operate.

In other words, the culture, norms, rules, regulation or laws influence people's behaviour, and it might affect food waste.

2. A company's business concept or model is an idea of how it operates in the market, which is reflected in all of its activities.

For example, compared to the à la carte style, buffet-style restaurants need to prepare more food, and if it is not consumed by the customers, it is thrown away.

3. The food purchasing process is another important component of food loss.

For example, when using frozen items, they might be a poor quality in comparison with fresh items, which might be an increase in plate leftovers. But on the other hand, if using fresh items only, they are easily spoiled and thrown away in the kitchen.

4. A restaurant's management influences the amounts of kitchen waste, serving loss and plate leftovers.

This is my experience, I have processed foods that are usually thrown away and combined with other ingredients to create new menus. This type of menu creation or devising reduces food loss.

5. Having new kitchen staff may generate food loss.

This is because they may make mistakes in cooking, which may lead to throwing food away.

Mistakes may also be due to interpreting or reading a recipe incorrectly or carelessly.

6. Food waste in restaurants is created by dine-in customers. If the quality or taste of the food is poor, or customers find that they are less hungry than they thought, even or if the food does not meet their expectations, it is easily left on the plate.

7. one of the most important influences on food waste in restaurants is competitors.

For example, if a competitor restaurant opens a new location or changes its menu, it becomes difficult to predict the amount of food needed at one's own restaurant.

If the food at one's own restaurant is not fresh, filling, and appealing, customers will easily drift to a competitor's restaurant.

Also, if demand is not accurately estimated, it will result in cooked items going to the trash.

8. Communication, or lack of it, has an influence on the amount of kitchen, and plate waste.

Without communication, information is not shared and working becomes difficult, in turns, it also reflects on how the staff deals with customers.

Communication is necessary with suppliers, customers and their orders, as well as between staff members in and inside the company.

The creation of kitchen waste can be reduced by better communication when, for example, complaints are made about poor-quality products or reacting to defective or incorrect delivery.

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These categorized factors are well-defined and in my experience, I have same experience.

But, unfortunately, these factors do not change substantially during this study.

For example, no new restaurants have opened in the neighbourhood, and no change in business management, procurement and employees have not changed.

However, in addition to these factors, I would say that calendar and weather conditions may also have an impact on food waste generation.

For example, this is not only in the food business sector, but also in the retail business,

usually, sales change from month to month and week to week, or day to day. This is called the calendar effect.

In addition to this, sales may also change depending on the weather.

As a simple example, ice cream usually sells well in hot weather but not in cooler weather.

This is because people's purchasing patterns change.

These changes in purchasing patterns may also affect food waste.

Therefore, in this study, we would like to create and verify a model that considers the calendar effect and the weather effect.

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Now, to test how much the effects of the calendar and weather affect the amount of food loss and waste, we will use a regression analysis.

It considers food waste as the dependent variable and the explanatory variables are the weather conditions of the day, the day of the week, or sales for the day.

Both the dependent and independent variables are measured in continuous numbers, so, we believe a regression analysis is valid.

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A typical linear regression analysis sets the following six assumptions.

However, there might be a problem here.

It is possible that using typical regression analysis may generate spurious regressions.

The main reason is that the food loss and waste data is measured every day and is not collected randomly, so there may be a random walk in the data.

Especially, weather, such as today's temperature depends on yesterday's temperature, which in turn affects tomorrow's weather.

Likewise, this might happen in the pattern of the food loss and waste. Possibly the volume of food waste may have some relationship to time.

Since most guests are regular customers, we believe that their behaviour patterns are affected on a day-to-day basis.

If this is true, the regular regression analysis does not work on a time-series data, and then it may result in the opposite results.

So, the next slide shows a danger of using regression analysis on time series data.

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(If we have time)

Let's create two fake data sets.

One data has just simply randomly generated data, and the other is a random-walk data which is dependent on one before.

Of course, both data, x and y, in both data sets do not have any relationship between each other.

And, if we take a linear regression model on the first data set, of course, it does not have any relationship between x and y. However, the second data set has an association even if they do not formulate any relationship.

Time-series data, i.e., when the currently collected data is dependent on one previous time, in this case it is difficult to estimate a true value with the usual regression model.

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Therefore, we will extend the fixed coefficient to a time-vary coefficient so that we can examine the two sequence data sets. Below is a summary of the equation of the model and the results of the regression analysis using the data used earlier. For the regression model, the coefficients depend on one previous value.

In the graph on the right, the top two graphs are almost identical and the last graph is the change in coefficients.

This estimated coefficient is almost near zero, indicating that it does not have any relationship.

In other words, in this study, we can avoid concluding that there is a relationship between food waste and weather or calendar effects, where there is no relationship at all.

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After completing the regression analysis, this study will research the effects of food loss and waste based on we collected data in a restaurant.

The impacts will be examined in the following three categories.

First, economic loss.

This mainly includes loss of resources, such as labour, material time and energy losses.

Second, environmental effects.

I will research about water pollution, soil erosion and green house gas emissions.

And last, social impacts.

This includes food insecurity and social inequality.

By evaluating the estimated economic, environmental, and social impacts of FLW,

it can be possible to lower those impacts through its reduction.

Through better supply chain management, reduced consumer food waste, and increased food recovery, a greener society could be created.

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Therefore, the research will be focused on these four areas.

1. Estimation of food waste over the study period.
2. The relationship between food waste generation and business operations.
3. The relationship between food waste and weather conditions.
4. And estimation of social or environmental impacts.

Method _____(19)

The method used in this study is based on quantitative analysis.

The data collection plan for the food wastes is as follows.

The study site, which is a restaurant that data collection, is a Japanese restaurant in the suburb area of Prince George.

This site is family-owned restaurant and open for lunch and dinner, each for three hours.

It is closed on Mondays and open the rest of the year, Tuesday through Sunday.

The items in the restaurant offer sushi and ramen, (noodles and soup).

As for the ramen, it typically serves about 900 grams per meal.

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So, how do I collect food loss and waste?

Based on our food loss and waste definition, this research uses two buckets and one colander, or strainer, a weight scale, and a pen and notebook for record.

One bucket holds food loss, i.e., cooking scraps generated during cooking.

The second bucket is fitted with a strainer and contains leftover food collected from customers' side.

This strainer separates the solids from the liquid form of leftovers.

At the end of the business, each bucket is weighed using the scale.

The weight of each is then recorded in a notebook.

In this study, permission and cooperation to weigh these leftovers and food losses was obtained from employees and restaurant owners.

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Well, how many samples, food loss and waste, should be collected?

The power analysis of the regression analysis shows that it needs 114 samples.

This is with a 90% confidence interval, allowing for a 10% margin of error and 10 explanatory variables.

The R code is written at the end.

Also, as a rule of thumb, for a regression analysis with 10 explanatory variables, we have to have 100 due to the one-in-ten rule.

And over 130 samples must be collected, if following Green's rule.

So, I will collect more than 130 data in this research.

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The following data is collected every single day.

From 1 to 3 are the dependent variables in the regression analysis and the rest are independent variables.

The number of customers is counted only those who came to eat at the restaurant.

Take-out is not counted.

Children are counted as one person.

Business variables are variables that are assigned when there is a change in management in the restaurant, a change in workers, or when a competing restaurant opens in the neighbourhood.

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The basic regression model is as follows.

The criterion for determining whether there is an association or not is the confidence or credible interval of the regression coefficient.

Expected Result _____(24)

After collecting samples, this research will estimate and analyze food waste generated by one Japanese restaurant.

Therefore, this study will derive the following analytical results.

Estimation of food waste within the study period and comparison with various factors and an estimation of their environmental and social impacts, and implications for food waste reduction.

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Food loss and waste collection began in September and is now in its fifth month.

More than 100 data has been collected.

Also, I have created basic histograms and plots.

Plan _____(26)

I will plan to carry out the following schedule in the future.

I will finish food loss and collection by mid-March.

After that, I will summarize my research findings and rake up my master's thesis.

That's all for my presentation.