

# Food Waste Management from the Airline Caterers

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**Abstract.** *The food waste crisis is a major problem affecting the world, about one third of the world's food is being lost and discarded. And food waste has been recognized in the Sustainable Development Goals with a specific target to halve per capita global food waste at consumer levels and reduce food losses by 2030. So, food waste has been neglected in aviation sector. Also, the International Air Transport Association reported that 5.7 million tons of cabin waste was generated on airlines, up to 80.5% of which was leftover food and beverages. The airline business is a capital-intensive industry that consumes a large amount of resources in order to provide its services. The provision of food for airline passengers demonstrates an unsustainable consumption and production pattern and food waste from flight catering poses a significant sustainability issue, not only because valuable caloric content is lost, but also the loss of land, water and energy required in the production of food. The objectives of this article are 1) the impacts of food waste from the airline caterers. Which affected economic and environment because of the unnecessary raw materials, that caused pollution, and 2) the food waste management guidelines to reduce the amount of discarded food with the 3Rs (reduce, reuse and recycle).*

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## 1. Introduction

Airline catering is a massive industry, providing over a billion meals to passengers every year. At this scale, airlines and caterers have the task and sourcing, preparing, and delivering hundreds of meals for every flight.

The airline catering must produce approximately 240,000 food items per day [1]. This is because of the fact that the food had to be served on board to the passengers, the crew, including the captain. Therefore, it has to pay special attention with the rest of food waste or discarded during manufacture and after service process.

International Air Transport Association (IATA) [2] research indicates that over 20% of cabin waste comprises untouched food and drink and with in-flight catering market of \$15 billion in 2017, this represents a significant

incentive to improve planning and logistics. Food waste is emerging as a global issue with up to one third (1.3 billion tons) lost or wasted each year. This has been recognized in the Sustainable Development Goals (SDGs) with a specific target to cut global food waste per capita in half by 2030. Airlines and their service providers must work collaboratively with regulators to ensure that aviation makes a positive contribution to this SDG target.

## 2. Methodology

Airline caterers' services are supply chains for transportation food and drink to the aircraft. Due to the high-frequency of flight and many airlines, so airline caterer has to manufacture food to serve on flight to many airlines. The airline catering model is based around logistics. "Flight catering is 80% logistics and 20% catering (some said 70:30 and others 90:10) [3].

Food waste or food loss is food that is not eaten. The causes of food waste are numerous and occur throughout the food system, during production, processing, distribution, retail and consumption. The amount of food loss [4] is between one-third [5] and one half [6] of all food produced.

### 2.1 Environment impacts

Food waste is a major impact of agriculture on climate change, and other environmental issues. The Food and Agricultural Organization estimated (FAO) in 2014 that food waste lost causes a global economic, environmental and social about \$2.6 trillion a year and is responsible for 8 percent of global greenhouse gas emissions [7]. Moreover, food waste that is not handled or reclaimed properly, i.e., through compost, can have many negative environmental consequences.

Among other things, food waste consists of, [8] how it is produced, [9] and where or what it is discarded from or generated by [8]. Definitions also vary because certain groups do not consider (or do not traditionally consider) food waste to be a waste material, due to its applications.

United Nation Sustainable Development Goals aims to reduce food waste by 50 percent worldwide by 2030. So, the Food and Agriculture Organization of United Nation: FAO and United Nation Environment Programme: UNEP has recommendations for solving food waste and excess food by dividing into 5 steps, as follows 1) Prevention 2) Production 3) Recycling 4) Recovery and 5) Disposal.

The waste hierarchy ranks waste management options according to what is the best for the environment which in turn will lead to business benefits. It gives top priority to preventing waste in the first place. When waste is created, it gives priority to preparing it for re-use, recycling, recovery, and disposal (e.g., landfill) [10].

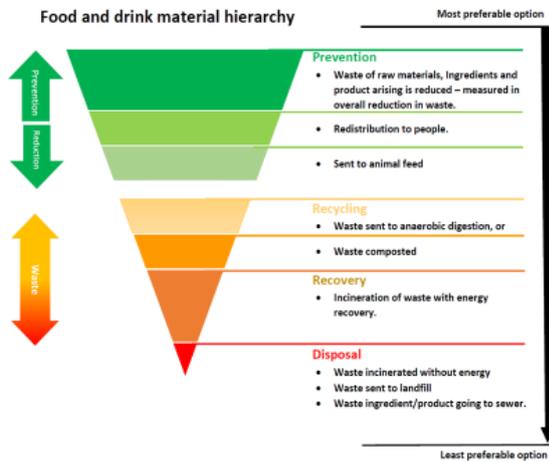


Fig. 1 Catering waste hierarchy [10]

The waste management hierarchy suggests that reduce, reuse and recycling should always be given preference in a typical waste management system. However, these options cannot be applied uniformly for all kinds of wastes [11].

### 2.2 Halal Kitchen Flight Catering

The case study of Halal food production process identifies the amount of food waste generated from Halal kitchen flight catering production by conducting a food waste composition analysis, vegetable wastes accounted for 47.58 percent of the total food waste generated [12]. [Fig.2].

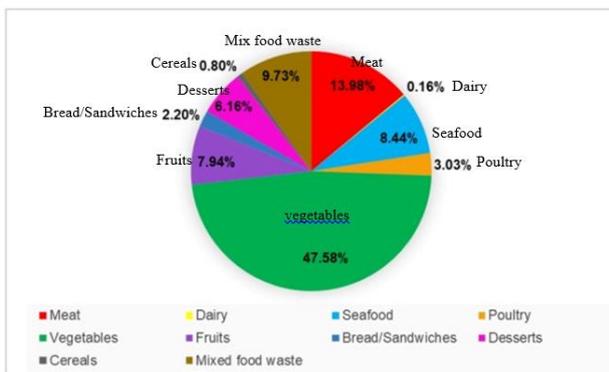


Fig. 2. An analysis of food waste from flight catering: A case study of halal food production process. [11]

This research found that vegetable wastes accounted for 40–50 percent of the total food generated in the operation. From the quantitative analyses, it is recommended that the company prioritize its efforts in reducing waste by starting a dialogue with airline customers on the benefits of food waste reduction. The material flow diagram clearly illustrates the hotspots in the halal production process. Although the meal portioning process did not generate the highest amount of food waste, but in terms of edibility, this process generated the highest amount of wasted food (edible parts). Measures should be established in order to address the inefficiencies in the resource use. The company can reduce vegetables waste by selecting high quality suppliers, improve the effectiveness of selection and quality control process by providing additional training, changing the washing process and investing in new technology that facilitate staff in their jobs [12].

### 2.3 Economic Impacts

Thai Airways estimates that it will reduce 400kg of food waste per day, saving approximately 20 million baht (US\$648,298) per year. In the first year of the program, Thai Airways will focus on reassessing the food manufacturing process and supply chain, beginning from ingredient procurement, Thai Catering food production, menu planning, packing and loading, and cabin waste management [13]. Since the purchase of raw materials production of the aviation catering food, menu planning by developing a pre-ordered menu system, food production and take-on, as well as in-flight waste management.

For example: In-house analysis between open stock VS receiving VS forecast VS issue for Fish Chilean Seabass fillet I.Q.F by reducing costs and increasing food industry productivity from Thai airline caterer in 12 months.

Fig. 3 and Fig. 4 show the in-house supply chain analysis for the fish chilean seabass fillet and fish salmon fill fully trimmed, respectively. The problem of analysis was the higher of beginning product on July, due to a problem of cargo received from June cargo since they have to wait for account debit.

Some airline uses the pre-order to save raw material such as; Singapore Airline (SQ) has introduced “Book and Cook” allowing premium class passengers to select meals from sixty menus on outbound routes from Singapore. SQ has also extended the system for returning flights but with a more limited menu choice [14].

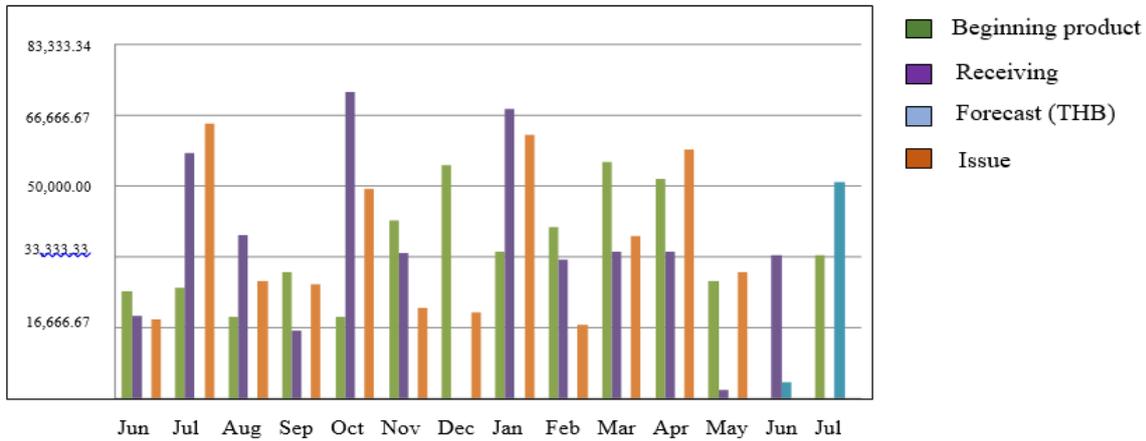


Fig. 3 Analysis of fish chilean seabass fillet (In-house supply chain) (1USD = 30 THB)

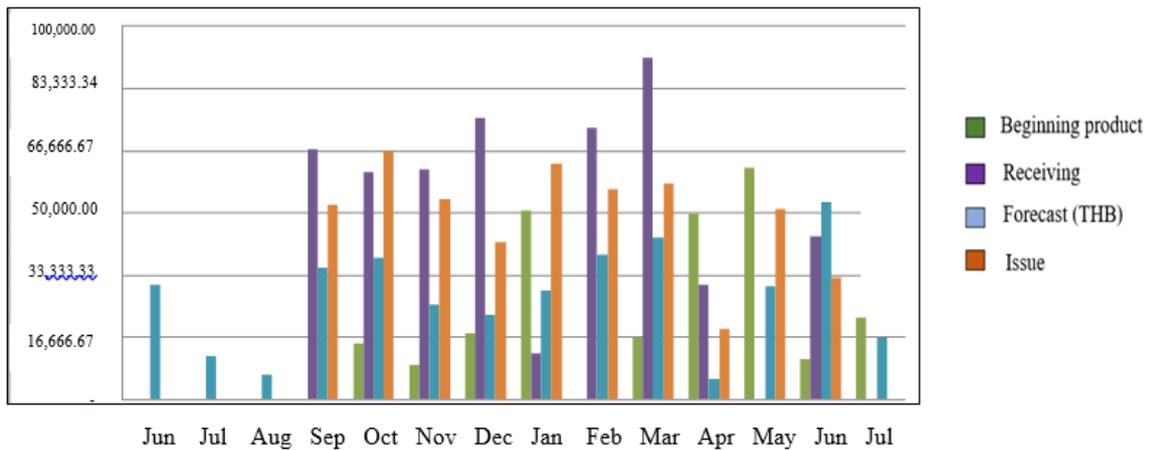


Fig. 4 Analysis of fish salmon fill fully trimmed (In-house supply chain) (1USD = 30 THB)

The analyzed data in terms of re-use recycle and landfill is summarized as follows:

**Re-use** is the act of using an item again without the necessity for treatment or processing [2]. The airline caterer might not be able to re-use a food. This is because of the fact that they had to prepare all meals according to the order from the airline. Even though some menu plans are similar, some leftover such as white and red wine can be reused as an ingredient sauce, as shown in Fig.5.



Fig. 5 Some leftover, red wine from airline caterer

**Recycling** is the treatment or process of waste materials into new products for further use [2]. As a caterer, they probably dislike waste; it affects their bottom line, along with the planet. To everyone involved in an airline caterer, food waste is something that they try to avoid at all costs. When planning the menu, they keep food waste in mind; be creative and think about multiple uses for leftovers. Leftover chicken breast, for instance, can be made into a fricassee or pie, and vegetables that are on the verge of spoiling can be pure into soup [15], shown in Fig.6.



Fig. 6 Some leftover, can be made into a fricassee or pie

**Landfill:** The disposal of waste by burying it. A landfill site is an area of land or excavated site that is specifically designed and built to receive wastes [2].

### 3. Results and Discussions

Thai Airways has joined the Food Waste Management program to reduce resource waste (Food Waste Management) [13], which will help to reduce the amount of waste generated from food production in the aviation kitchen, together with reduce the amount of food leftover from being served on board. This will enable Thai Airways to manage resources efficiently and reduce the impact on the environment. Thai Airways has expected to reduce food waste by approximately three percent year-on-year [16].

According to Fig. 3 and 4, Thai can reduce a raw material and save the money after the adjustment amount 55,600.88 USD.

Summary raw materials reduction inventory: for a kind of fish before and after adjustment, as shown in Table 1.

Raw material production	Before adjustment (USD)	After adjustment (USD)	Difference value (USD)
Fish Chilean Seabass Fillet	51,915.67	33,697.50	-18,218.17
Fish Salmon Fillet Fully Trimmed	50,047.43	21,903.38	-28,144.05
Grand Total: Fish	101,963.10	55,600.88	-46,362.22

**Table 1** Summary of raw materials inventory. (in-house supply chain) (1USD = 30 THB)

British Airways (BA): has committed to improve resource efficiency through waste minimization, increased re-use and recycling and reduced reliance on landfill for disposal. The airline has committed to address food waste through working with its catering partners. The airline has published a target to recycle 50% of waste generated

through its ground operations at London Heathrow and London Gatwick [2].

Airline catering company, Emirates Flight Catering (EKFC), has committed to reducing food waste by 35% across its central operations in Dubai. EKFC hopes to reach this goal through a partnership with Winnow, an artificial intelligence (AI) company, which aims to gradually roll out an advanced food waste management system in the catering facilities. AI and machine learning will be leveraged to enable EKFC to automatically monitor and control food waste [17]. Around one-third of all food grown in the world goes to waste and landfill. EKFC has already undertaken various initiatives to reduce that wastage. In an effort to use the whole product, in the financial year 2019-20, EKFC saved close to 500kg of food items each day, including fruits, vegetables, bakery items and meat, to be used in small goods, or were reused for different purposes in the company’s retail operations [17].

In 2020, THAI Smile expects to reduce food wastage by 16.5 tons per year: 5.7 tons from domestic flights and 10.8 tons from international flights, which is the equivalent of 100,000 meals per year [13].

Air New Zealand (NZ) reports annually on recycling performance at Auckland ground sites and has set a target of 85% recycling by 2018 and zero waste to landfill by 2020 [18].

The 6 concepts [19] can reduce food waste as follows:

1. Make a meal plan and grocery list. It is an important to make a meal plan and a grocery list before start order. Check the stock of, what is in freezer and pantry?
2. Store ingredients correctly. Such as; meat should be in the freezer. Fresh product should be placed in the vegetable drawer and keep the ones that will spoil faster on top. Fruit, put some in the fridge, and keep the rest out for easy access.
3. Cook ingredients with a shorter shelf life first. [Fig. 7].

Use ASAP, 3-5 days.				Use soon, 5-7 days.				No rush, 2 + weeks.			
Asparagus		Kale		Artichoke		Eggplant		Beets		Parsnips	
Basil		Okra		Arugula		Endive		Carrot		Potato, Large	
Bok Choy		Onion		Bell Peppers		Leeks		Celery		Sweet Potato	
Chives		Snow Pea		Broccoli		Lettuce/ Mixed greens		Ginger		Rosemary	
Cilantro		Spinach		Radishes		Mushrooms		Lemon		Thyme	
Escarole		Tomato		Cabbage, Savoy & Napa		Scallions		Lime		Turnip	
				Cauliflower		Winter Squash					
				Cucumber		Zucchini					

**Fig. 7** Ingredients for cooking [1].

4. Reuse the remains of ingredients. Leftover vegetable such as trimmings can be stored in a stock bag and stored in the freezer. When the bag is full, it can be able to turn the leftover into homemade stock.
5. Turn leftovers into new meals. Meat sauce from one night can be made into tacos the next. Plain rice one day can be fried rice the next day. And a huge crock pot of slow-cooked meat can be used for sandwiches, salads, burritos, and more for the whole week.
6. Utilize the freezer. Freezing meals can save and reduce costs.

#### 4. Conclusions

Some airlines are now offering meal choices pre-ordered by passengers before their flights. Due to pre-ordered meals reduce the number of meals over-provisioned especially for premium class passengers. Passenger experience is enhancing as they receive the meals they want, reduce the amount of leftover generated.

For reused and recycle, most of airline caterers bring some leftover of ingredients and wine to make soup stock or sauce. And leftover vegetable that cannot be reuse, they are plan to composting. Composting is an excellent way to reuse food and minimize food waste. For example, any part of a raw vegetable can be composted (peels, stems, blemished sections, etc.), as well as stale bread, the skin of fruits, and egg shells. With composting, any seemingly unusable food scraps can be put on the side or into a compost bin, which will break down the scraps and turn them into a type of soil that can be used for gardening, or taken to a compost plant where it will also be broken down and reused.

Future trends:

As airlines continue to demand higher quality inflight food offerings at lower prices, in flight caterers and suppliers are continually exploring new, innovative and diverse ways of remaining competitive.

More diversity of onboard offer: Airlines throughout the world are experimenting with different ways of serving meals to passengers. These options include buy-on-board food products, buy-at-the gate options, giveaway-at-the-gate and offering a picnic bag rather than tray-set.

Process Improvement in Flight Kitchens: With the external pressures from customers and competitors, it is not surprising that all flight-catering firms are seeking ways to reduce their costs by operating more efficiently.

More blurring of stakeholders in the supply chain: Suppliers have begun to eliminate some elements of the supply chain so that they can supply airlines from wherever their factories are located. This is often in direct competition with airline caterers and typically involves

using disposable packaging that eliminates the need for tray and even trolley assembly.

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