



AUDITING FOOD WASTE IN SELECT PUBLIC SCHOOLS IN THE PHILIPPINES

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ABSTRACT

Research studies in sustainable consumption, production and agriculture emphasized the amount of food losses and wastage generated in the various food supply chain stages. Food waste in the consumption stage is evident in fast-food industries like restaurants, households, and institutions. In schools, much of the literature points out that food waste is a huge predicament since it accounts for the majority of the aggregate school waste. Thus, this paper was thereby undertaken to investigate the extent of food wastage, focusing on select public schools in a city in the National Capital Region. To establish such, the amount of food waste from the aggregate school waste was audited. Demographic variables like age structure and time of break were put under investigation to establish whether such variables indicate any relationship with the amount of food waste. Adopting a descriptive-correlational research design, findings revealed that food waste was not a major component of the aggregate school waste since school canteen management in these public schools implements a “measured serving” system. In view of the relationship between time of recess and amount of food waste, statistics showed that there is no significant relationship between the variables. The findings deviated from extant literature about the impact of scheduling recess before lunch. In regard to age structure, food waste per student in high school was lesser than food waste per student in elementary school.

1.0 INTRODUCTION

Sustainable consumption and production or SCP are goals of sustainable development. Its objective is to attain more profitable and efficient production by adding value to a product, with the use of minimal raw materials producing less environmental hazard (Govindan, 2018).

The Department for Environment, Food and Rural Affairs of the UK in 2003 defined SCP or Sustainable Consumption and Production as the progress of economic and social activities that

recognize and address the limits of the ecosystem of the earth, meet the needs and provide quality of life of the present and the future generations to come.

One of the major sustainability issues is food waste. It is a huge and perennial problem in many areas of the world. The World Food Programme (2018) emphasized that there is enough food to feed everyone, but one in nine suffer from hunger and one in three suffer from malnutrition. In the estimate of the United Nation's Food and Agriculture Organization in 2014, it was revealed that one-third of all food production for human consumption is discarded

each year all over the world. Based on World Wildlife Organization, for every three food calories, humans throw away one. The wasted calories should be enough to sustain three billion people. Moreover, wasted food contributes as much as 10% of greenhouse gas emissions, like Methane, globally.

In the same vein, the United Nations Environment Programme (2015) reported that food losses and wastage are alarming situations in terms of problems in consumption and production. To address this, it produced the reducing food loss and waste program together with the World Resources Institute (WRI). This program creates recommendations and develops food waste and loss protocol.

Millions of Filipinos still suffer from hunger and malnutrition, despite the suitability of Philippine farms for food crops. The World Hunger Report 2018 indicated that there are some 14.2 million Filipino people who are undernourished and 13.3 million without food security. Based on the FNRI's 2015 survey, a Filipino household wastes 43 grams of rice daily, meaning, at 23 million Filipino households, the country wasted around 987,952 kg of rice daily (Philippine Statistics Authority, 2015).

EU institutions have been promoting the best practices in food assistance, labeling and consumer education to reduce food waste (European Parliament, 2011). In 2014, the European parliament declared the year as the "European Year against Food Waste." In the EU alone, 196 billion pounds of food is thrown away. This translates into \$238 billion dollars wasted food each year. EU sees that the resource losses can be diminished through changes that are deemed practical like reviewing the requirements for food labeling, encouraging and establishing food donation systems, consumer education through public-private cooperation and partnerships and fostering innovative solutions to address the problem in food waste (GAIN, 2014).

The lack of realization of the magnitude of the food waste issue as mentioned by the International Food Policy Research Institute (IFPRI) is considered as a major barrier to addressing and resolving the issue.

In the study of Kummu *et al.* (2012) about global food supply losses due to wasted food crops, they found out that in the food supply chain (FSC), a quarter is already lost. According to the authors, food supply losses and waste could be cut by half if the losses and wastage are reduced or eliminated in each step of the food supply chain.

World Wildlife Fund sees the problem on food wastage as a huge opportunity to reduce and recycle waste. The organization brings together industries, retail, food services, farms as well as schools to act on reducing food waste.

There are reports in free world historical documents (Charter Belgrade, UNESCO, 1976 Declaration of Tbilisi – UNESCO, 1977) about environmental education as a tool for implementing programs to change and create awareness of the environmental dilemma and create an obligation to act on a personal and collective level to resolve environmental issues and prevent the same issues for generations to come.

Problems in food loss and waste are evident in many regions, areas and sectors in many countries. As previously mentioned, food wastage exists in all stages of the food supply chain. This paper is focused on the consumption stage. Specifically, the subjects are select public schools in a city in Metro Manila. This research sought to identify the amount of food waste among aggregate school waste and determine the relationship between age structure, school breaktime and food waste.

There are studies about food waste auditing in some countries where the government's health and nutritional program is a healthy lunch supply for students. However, food waste has become a predicament since a positive correlation exists between the food supply and food waste in those schools. Meanwhile, there are studies correlating the schedule of recess, age structure and the amount of food waste.

Previous researches warrant additional research to extend theory and expand studies as to whether this could also be the case in the local context.

This research could also contribute by drawing attention to needed resolutions and actions to address the food waste predicament. As reiterated by the United Nations

Environment Program (2015), sustainability in terms of patterns of consumption in the community should be looked into and addressed by encouraging dialogue with them in support of sustainability initiatives. The schools can create and develop strategies and implement programs towards sustainable management of food.

2.0 DEFINING FOOD WASTE

There is still no unanimity on the definition of food waste. However, in the current directive - Directive 2008/98/EC of the European Parliament, food waste is recognized as a particular type of bio-waste which occurs in the supply chain final stages. To understand bio-waste, it is defined as any biodegradable waste in garden and park, waste coming from households, kitchen, restaurants and fast food chains, caterers and retailers like supermarkets and marketplace; and waste from food manufacturing plants.

The Food Agriculture Organization of the United Nations (2014) defined food waste as the squandering or discarding of food that is meant for human consumption - food that is safe and nutritious and is produced in the stages of the food supply chain, that is from the stage of production to end household-consumer level.

3.0 FOOD WASTAGE IN THE FOOD SUPPLY CHAIN

Food wastage occurs in all stages in the food supply chain – in agricultural farming, food processing, the process of distribution, retailing and consumption. The figure below shows the stages of food wastage as illustrated by Govindan (2018).

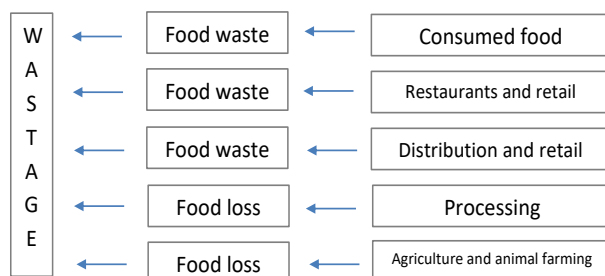


Figure 1: Food wastage in the food supply chain, Govindan (2018).

Food loss occurs in the stages of production to harvesting and processing. However, in the study conducted by Kummu *et al.* (2012) huge or majority of the amount of food waste is generated at distribution, retail, and consumption.

Accordingly, Buzby *et al.* (2011) distinguished food losses in different levels of food production to consumption. In their article, farm-level food losses occur when crops become prone to spoilage and crop-diseases in transport systems and storage. Crops that remain unharvested and become fertilizers and harvested crops sometimes fail the standards of supermarket chains. In the Philippines, fruits and vegetables, which are high value crops are prone to early or quick ripening due to high temperature including humidity. Mechanical damages occur due to manual hauling or fruit picking. It is suggested that the postharvest-related research and technologies should be employed to avoid food losses (Mopera, 2016).

In the processing and retail where losses are also incurred, these are due to natural causes such as shrinkage and discoloration; transportation-related factors, and damages from handling, the wrong system of packaging, infestations, and improper stock rotation or overstocking. For consumer-level losses, increased menu choices generate food waste, as well as retail promotional activities and unexpected fluctuations in food prices, food overpreparation, plate waste and product spillage and breakage and other external cues (Buzby *et al.*, 2011).

Researches in sustainable consumption and production or agriculture have consistently emphasized the food losses and wastes generated in the stages of production to consumption.

4.0 SCHOOL FOOD WASTE

Waste & Resources Action Programme or WRAP in 2007/08 reported the various types and amount of waste generated by schools in England. After data gathering and waste auditing, it was inferred that food waste was a huge component of waste from schools, accounting for almost half of the waste in terms of weight from primary schools and accounting

for a third of waste in terms of weight, from secondary schools in England.

In the same vein, aggregate waste audit was conducted at three schools in Florida by Wilkie, Graunke and Cornejo (2015). The results showed that among the aggregate school waste, food waste contributed the most to the cafeteria waste composition. In the results, the average waste generation rate if we are to look on a per student reference was 102.3 g, having food waste to constitute 51.0% of the aggregate school waste. The total organic wastes which consist of food, milk and paper revealed a staggering amount of 81.5% of the waste generated per student. Looking at these figures, this presents an opportunity to reduce and recycle organic waste in schools.

School can create sustainable initiatives by adopting two approaches to converting school food waste – the system of reusing, reducing and recycling.

5.0 SIGNIFICANCE OF SCHOOL BREAKTIME

In the study of the University of Washington School of Public Health, Nutritional Sciences Program (2015), a portion of the study focused on the effect of adequacy of time for lunch on food waste. It was concluded that the amount of time allocated for lunch is correlated directly to the amount of food waste. Those students with a quicker lunch period produced an average of 43.5% of food waste. On the other hand, the students with a longer lunch break produced lesser - an average of 27% food waste.

Relatively, Conklin, Lambert and Anderson (2002) conducted a study on how long it takes for students to finish lunch. The National Food Service Management Institute (NFSMI) sponsored the study in order to provide reference or basis for the amount of time students spend on school lunch among K-12 students. It specifically sought to measure the average amount of time needed by K-12 students to eat lunch. In the research findings, school children consumed 7 to 10 minutes average to finish lunch. The average eating time mentioned here indicates the act of eating and drinking. (Conklin, Lambert and Anderson, 2002).

A 20-minute breaktime at the table is suggested by the Food and Nutrition professionals (USDA, 2000). This amount of time will allow enough time for eating and socializing for the average person.

Furthermore, the University of Washington School of Public Health, Nutritional Sciences Program assessed school lunch seat-time in Seattle public schools on March 2015. In the study, seven elementary schools were put under investigation to compute the average total lunch time. The result revealed that approximately 20 minutes was consumed. The average time spent for eating was 13 minutes, the rest for interaction. An interview with the school principals was also conducted and among the eight interviewed principals, six of them were amenable to a 20-minute lunch period.

6.0 RESEARCH METHODOLOGY

The study adopted a descriptive-correlational design, topical scope is statistical, and units of analysis were primary and secondary public schools in Makati City, namely: South Cembo Elementary School and Pitogo High School. The researcher chose these schools since they were willing to cooperate with the researcher in providing data relevant and necessary for the study.

In planning the audit, an interview with the school management was conducted to extrapolate data on total school population, population per education stages, time of break and length of breaktime and school policies relative to breaktime. A field researcher/research assistant aided in the data gathering procedure and school waste auditing.

Researchers visited the canteen a day before the waste audit proper to interview the canteen manager with regard to school waste collection and management.

On the day of the waste audit, researchers arrived before the first-scheduled breaktime. The researchers identified where students eat, usually enter the canteen, where they throw their garbage away and finally, where they exit.

In the waste audit proper, a five-day observation and compositional analysis were executed in the process of data gathering and

collection. Food waste materials were collected after every school break.

In the Philippines, the recovery and processing of waste materials are sorted into; (1) biodegradable, (2) non-biodegradable, and (3) recyclable. However, sorting will be categorized as: (1) food waste, (2) paper cups/paper/cartons, (3) pet bottles and plastic spoons, (4) plastic wrappers and (5) others; aluminium, sticks etc. To implement this, food wastes were collected from the canteen, the main area where food waste can be collected, before these food wastes go to the main dumpster.

The following categories were weighed using grams as the unit of measurement; (1) food waste, (2) paper cups/paper/cartons, (3) pet bottle/plastic spoons, (4) plastic wrappers, and (5) others (Aluminium, sticks, etc.).

Statistical method was applied to compute for the frequency and percentage distributions. ANOVA statistical technique was used to measure the relationship between time of break, age structure and the amount of food waste.

In view of the ethical considerations, voluntary participation and informed consent were secured before conducting the study/interview. The researcher informed the department, school and interviewees of the nature, relevance and importance of research.

Permission to conduct the study at Pitogo Elementary and High School was sought from the Department of Education Schools Division, Makati City. An endorsement form was obtained in order to proceed with the study.

7.0 RESULTS AND ANALYSIS

7.1 Type of school waste

Table 1 presents the types of school waste in Pitogo High School and South Cembo Elementary School. The aggregate school wastes comprise of pet bottles and plastic spoons, paper cups, paper sheets, plastic wrappers and plastic foils, aluminum materials, sticks and food waste. All of the types of waste are evident in both schools.

Table 1: Types of school waste in select public schools in Makati City

Type of school waste	Pitogo High School	South Cembo Elementary School
Pet bottles/plastic spoons	✓	✓
Paper cups/papers	✓	✓
Plastic wrappers/foil	✓	✓
Food waste	✓	✓
Others (sticks, aluminium)	✓	✓

7.2 Amount of food waste in Public School

There is a total of eight break periods in Pitogo High School as shown in Table 2. The average food waste generated per day is 2,750 grams. The 1:30 to 1:50 recess schedule contributed 26.35% to total food waste in Pitogo High School.

Table 2: Amount of food waste generated in Pitogo High School for a period of five days

Recess schedule	Year level	Amount of food waste (in grams)					Average food waste	%
		Day 1	Day 2	Day 3	Day 4	Day 5		
8:00 - 8:20	Grades 7 & 10	200	300	200	250	200	230	7.77%
9:00 - 9:20	Grades 7 & 10	100	100	100	150	100	110	3.72%
10:00 - 10:20	Grades 7 & 10	150	400	200	200	150	220	7.43%
11:00 - 11:20	Grades 11 & 12	850	600	700	700	650	700	23.65%
1:30 - 1:50	Grades 8 & 9	950	700	750	750	750	780	26.35%
2:30 - 2:50	Grades 8 & 9	250	200	200	250	200	220	7.43%
3:30 - 3:50	Grades 8 & 9	600	500	500	500	550	530	17.91%
4:30 - 4:50	Grades 8 & 9	200	100	200	200	150	170	5.74%
Total food waste		3300	2900	2850	3000	2750	2960	100.00%

Paper cups and paper materials, pet bottles and plastic spoons, plastic wrappers and foils, Aluminum materials, sticks comprise the aggregate school waste. In the table above, it shows the average school waste per day equivalent to 61,850g. Paper cups and paper sheets contribute 73.2% to the aggregate school waste as shown in Table 3.

Table 4 depicts the total of four break periods in South Cembo Elementary School. The

average food waste generated per day is 1,220 grams. The 8:00 to 8:20 recess schedule contributed 31.15% of the total waste in South Cembo Elementary School. (Table 4)

Table 5 shows the average school waste per day which amounts to 21,000g. Paper cups and paper materials contribute 65.2% to the aggregate school waste.

Table 3: Amount of other types of school waste generated in Pitogo High School for a period of five days

Other type of school waste	Weight (in grams)					Average school waste	%
	Day 1	Day 2	Day 3	Day 4	Day 5		
Paper cups/paper	45,500	47,000	45,000	47,000	42,000	45,300	73.2%
Pet bottles/plastic spoons	14,000	15,000	13,000	14,500	13,500	14,000	22.6%
Plastic wrappers	2,000	2,000	1,750	1,500	2,000	1,850	3.0%
Others	1,000	500	500	1,000	500	700	1.1%
Total waste	62,500	64,500	60,250	64,000	58,000	61,850	100.0%

Table 4: Amount of food waste generated in South Cembo Elementary School for a period of five days

Recess	Year level	Amount of food waste (in grams)					Average food waste	%
		Day 1	Day 2	Day 3	Day 4	Day 5		
8:00 - 8:20	Grades 1 & 6	300	500	300	300	500	380	31.15%
8:20 - 8:40	Grade 3	250	300	300	350	500	340	27.87%
8:40 - 9:00	Grade 5	250	300	250	300	250	270	22.13%
2:00 - 2:20	Grades 2 & 4	200	250	250	200	250	230	18.85%
Total food waste		1000	1350	1100	1150	1500	1220	100.00%

Table 5: Amount of other types of school waste generated in South Cembo Elementary School for a period of five days

School waste	Weight (in grams)					Average school waste	%
	Day 1	Day 2	Day 3	Day 4	Day 5		
Paper cups/paper	15,000	13,000	15,500	13,500	11,500	13,700	65.2%
Pet bottles/plastic spoons	3,000	3,500	3,500	3,250	3,000	3,250	15.5%
Plastic wrappers	2,500	3,000	2,500	2,750	2,250	2,600	12.4%
Others	2,000	1,250	1,500	1,500	1,000	1,450	6.9%
Total waste	22,500	20,750	23,000	21,000	17,750	21,000	100.0%

7.3 Age Structure and Food Waste

Food waste is higher among elementary students compared to high school students. Table 6 shows food waste per student. A high school student generates 0.72 g food waste per day while an elementary student incurs 1.39 g food waste per day.

Table 6: Amount of other types of school waste generated in South Cembo Elementary School for a period of five days

Age Structure	Population	Food waste (in grams)	Food waste/student
High School	4,104	2,960	0.72g
Elementary	875	1,220	1.39g

7.4 Time of Break and Food Waste

Table 7 shows that there is no significant relationship between time of break and amount of food waste as manifested by the *P-value* of 6.25.

Table 7: The Relationship between time of break and the amount of food waste

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	633761.6	1	633761.6	25.41233	6.2544E-05	4.351244
Within Groups	498782.7	20	24939.14			
Total	1132544	21				

8.0 CONCLUSIONS

Food waste is not a major component of the aggregate school waste in select public schools in Makati City in the Philippines as manifested by the less than 5% contribution to total school waste. What constitutes the majority of waste is paper cups/paper or the biodegradable which earned an average of 65% followed by pet bottles or the recyclables, which contributed an average of 18%.

Food wastes are collected for pet food and composting. The schools implement a “reduce, reuse and recycle” system as evident by the schools’ eco-programs like: (1) bringing plastic bottles every Friday for donation and recycling and, (2) composting project.

Pet bottle waste is greater in Pitogo High School than in South Cembo Elementary School since drinking fountains are available in the latter and some grade schoolers bring along with them pet bottles or containers with either milk, juice or water.

As mentioned, food waste is not a major component of the aggregate school waste since school canteen management implements a “measured serving” system. The serving is

tantamount to 150g food served in a small bowl or saucer in order to prevent food waste. This is also popularly known as “takal system” in the Philippines. In the canteen, six to eight viands or food choices are offered to students.

In view of the relationship between time of recess and amount of food waste, statistics show that there is no significant relationship between the variables. The findings deviate from previous studies about the impact of recess before lunch schedule. Previous studies posited that there is lesser food waste when recess is set before lunchtime.

As regards age structure, food waste per student in high school is lesser than food waste per student in elementary school. This can be attributed to kids being picky and playful during breaktime.

9.0 MANAGEMENT IMPLICATIONS

This study draws attention to needed resolutions and actions to address the issue not only on food waste, but other types of school waste as well such as papers and plastics. Policy initiatives on economic instruments can be implemented and evaluated. As indicated in the Environmental

Protection Agency (2016), Pay-as-you-throw (PAYT) has been executed in different countries such as the US, Sweden, Canada, Taiwan, Korea, Thailand, Vietnam and China. In this program, for the amount of ordinary household trash the residents throw away, they are charged a corresponding amount. This encourages reusing, recycling and reducing activities.

This study can bring awareness to school management and administration and help educate students about the amount of food that are wasted in school canteen, the bulk of all types of school waste generated on a daily basis so as to encourage them in helping reduce school waste in general. The school and students can develop strategies and implement programs towards sustainable management of food, proper waste disposal, implementation of “zero waste” and the reduce, reuse and recycle system. This research can help in enculturating school children such that the practice becomes a way of life.

10.0 AREAS FOR FURTHER RESEARCH

Although findings revealed that food waste is not a major component of the aggregate school waste, schools can also focus on the management of plastic wastes – both the recyclables and non-recyclables since they constitute the majority of school waste.

Demographic variables such as gender and type of school institution (whether public or private school) can be investigated further. Number of subjects under investigation can be augmented by involving other districts in the Metro and provincial schools to analyze further whether a significant difference between the amount of food waste and school location occurs.

A qualitative study can also be adopted to understand and identify the antecedents to the accumulation of food waste and other types of waste.

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