

# Surplus Food Management





## Surplus Food Management: A Case Study

An Interactive Qualifying Project Report submitted to the faculty of Worcester Polytechnic Institute and Chulalongkorn University in partial fulfillment of the requirements for the Degree of Bachelor of Science.

**Submitted on:**

11 March 2020

**Sponsoring Agency:**

Scholars of Sustenance

**Submitted By:**

Raveeporn Anantapattanapong

Emily Bodurtha

Alex Maslen

Dev Patel

Pakawat Sirilertpanich

Lily Spicer

Thawin Tangsirivanich

Saranras Thareechat

**Submitted to:**

Professor Esther Boucher-Yip, WPI

Professor Numpon Insin, CU

Professor Brigitte Servatius, WPI

Professor Supawan Tantayanon, CU

**This report represents the work of four WPI and four Chulalongkorn University undergraduate students submitted to the faculty as evidence of completion of a degree requirement. WPI routinely publishes these reports on its website with editorial or peer review. For more information about the project's program at WPI, please see <http://www.wpi.edu/Academics/Projects>.**

## **Abstract**

Scholars of Sustenance (SoS Thai) in Bangkok, Thailand is a food rescue organization. The goal of this project was to improve SoS Thai's relationships with food donors and recipients, while also increasing their public presence by creating marketable data and assessing current practices of managing surplus food. We evaluated the operation's processes, conducted interviews, and analyzed data to create marketable tools for expansion. Our findings and recommendations helped to strengthen SoS Thai's relationships with recipients and potential donors.

## **Acknowledgments**

Our team would like to express our deepest gratitude and special thanks to individuals and organizations that encourage and support this project. They have led to the success of this project, and it would not be possible without their efforts and interests towards our project.

First of all, we would like to thank our sponsor, Scholars of Sustenance (SoS Thai), that always gave us advice, information, and guidance throughout the duration of the project. With their help, our project contains qualitative information that is useful to people who are in need.

Secondly, we would like to thank our advisors, Assistant Professor Dr. Numpon Insin, Professor Dr. Supawan Tantayanon, Professor Esther Boucher-Yip, and Professor Brigitte Servatius. All professors supported us by giving us guidance and support throughout the project. Our professors sacrificed their own time to help us to make our project continuously better throughout the project duration.

Thirdly, we would like to thank Worcester Polytechnic Institute and Chulalongkorn University for providing us with this precious opportunity to work on this project, and their well-organized plan and foundation that made this possible. Also, thank you for a great opportunity to make new friends and cultural exchanges from different universities.

## Authorship

	Primary Author(s)	Primary Editor(s)
<b>Abstract</b>	Alex, Pakawat, Thawin, Lily	Saranras, Raveeporn, Emily
<b>Executive Summary</b>	Emily, Saranras, Pakawat, Raveeporn, Lily	Saranras, Pakawat, Raveeporn
<b>Introduction</b>	Emily	Emily, Alex
<b>Background</b>		
<b>2.1 A Global Surplus of Food</b>	Emily	Alex, Emily
<b>2.1.1 The Importance of Nutrition</b>	Saranras, Emily, Raveeporn, Pakawat	Alex, Emily
<b>2.2 Environmental Impact of Wasted and Lost Food</b>	Dev, Lily, Alex, Emily, Raveeporn	Alex, Emily
<b>2.3 Food Waste Management in Thailand</b>	Emily	Alex, Emily
<b>2.4 Food Rescue Organizations Around the World</b>	Emily	Alex, Emily
<b>2.5 Who is SoS Thai?</b>	Lily	Alex, Emily
<b>2.5.1 Background of Food Donors</b>	Raveeporn	Alex, Emily
<b>2.5.2 Background of Food Recipients</b>	Dev, Alex, Emily, Pakawat, Saranras	Alex, Emily
<b>Methodology</b>		
<b>3.1 Identify SoS Thai's practices of retrieving and delivering surplus food</b>	Dev, Lily	Emily, Alex
<b>3.2 Collect and evaluate feedback from food recipients and food donors</b>	Dev, Lily, Alex, Emily	Lily, Dev, Alex
<b>3.3 Analyze SoS Thai's data to make it marketable</b>	Lily	Dev, Emily, Alex
<b>Results &amp; Analysis</b>		
<b>4.1 Results from shadowing SoS Thai truck drivers</b>	Dev, Emily	Dev, Emily
<b>4.2 Results from food donors</b>	Saranras, Raveeporn, Emily	Dev
<b>4.3 Results from food recipients</b>	Dev, Pakawat, Saranras, Raveeporn, Alex, Thawin	Dev, Alex, Emily
<b>4.4 Results from analyzing data</b>	Lily	Lily, Emily
<b>Conclusions</b>	Dev, Emily	Emily, Dev
<b>References</b>	All	

## **Table of Contents**

<b>Abstract</b>	<b>ii</b>
<b>Acknowledgement</b>	<b>iii</b>
<b>Authorship</b>	<b>iv</b>
<b>Table of Contents</b>	<b>v</b>
<b>List of Figures</b>	<b>vii</b>
<b>List of Tables</b>	<b>viii</b>
<b>Executive Summary</b>	<b>ix</b>
<b>บทสรุปผู้บริหาร</b>	<b>xiv</b>
<b>Introduction</b>	<b>1</b>
<b>Background</b>	<b>2</b>
2.1 A Global Surplus of Food	2
2.1.1 The Importance of Nutrition	2
2.2 Environmental Impact of Lost and Wasted Food	4
2.3 Food Waste Management in Thailand	6
2.4 Food Rescue Organizations Around the World	7
2.5 Who is SoS Thai?	8
2.5.1 SoS Thai Food Donors	9
2.5.2 SoS Thai Food Recipients	11
<b>Methodology</b>	<b>15</b>
3.1 Identify SoS Thai's practices of retrieving and delivering surplus food.	15
3.2 Collect and evaluate feedback from food recipients and food donors.	17
3.2.1 Interview food donors	17
3.2.2 Interview food recipients	17
3.3 Analyze SoS Thai's data to determine marketable tools for expansion.	18
<b>Results &amp; Analysis</b>	<b>19</b>
4.1 Findings from shadowing SoS Thai truck drivers	19
4.2 Findings from food donors	22
4.3 Findings from SoS Thai food recipients	23
4.4 Results from analyzing data	28
<b>Recommendations for SoS Thai</b>	<b>31</b>
5.1 Limitations	34



5.3 Suggestions for a future study	34
5.2 Final Remarks	34
<b>References</b>	<b>36</b>
<b>Appendices</b>	<b>47</b>
<b>Appendix A - Greenhouse gas emission equivalent for landfilling various serving sizes of food</b>	<b>47</b>
<b>Appendix B - Community leader interview questions</b>	<b>48</b>
<b>Appendix C - Food recipient survey</b>	<b>49</b>
<b>Appendix D - Food donor interview questions</b>	<b>50</b>
<b>Appendix E - SoS Thai data analyst interview questions</b>	<b>51</b>
<b>Appendix F - Food collection questions and observations, Truck #1</b>	<b>52</b>
<b>Appendix G - Food collection questions and observations, Truck #2</b>	<b>53</b>
<b>Appendix H - Food collection questions and observations, Truck #3</b>	<b>55</b>
<b>Appendix I - Food collection questions and observations, Truck #4</b>	<b>56</b>
<b>Appendix J - SoS Thai truck route timesheet, Truck #1</b>	<b>57</b>
<b>Appendix K - SoS Thai truck route timesheet, Truck #2</b>	<b>58</b>
<b>Appendix L - SoS Thai truck route timesheet, Truck #3</b>	<b>59</b>
<b>Appendix M - SoS Thai truck route timesheet, Truck #4</b>	<b>60</b>
<b>Appendix N - Meals served per delivery for three recipients</b>	<b>61</b>
<b>Appendix O - SoS operations per day</b>	<b>64</b>
<b>Appendix P - Driver salary and maintenance expenses</b>	<b>65</b>
<b>Appendix Q - Infographics</b>	<b>66</b>

## List of Figures

Figure 1: Food Pyramid	3
Figure 2: Bangkok Marriott Marquis Queen’s Park employees helping load SoS truck	9
Figure 3: Tesco Lotus promotes a campaign to reduce food waste	10
Figure 4: JW Marriott Hotel Bangkok donating surplus food to SOS Thai	10
Figure 5: Children being supported by the Mercy Centre	12
Figure 6: Children living at House of Blessing	12
Figure 7: Volunteer teaching kids English	12
Figure 8: The number of refugees in Thailand according to UNHCR	13
Figure 9: Ambassador of UNHCR with refugees	14
Figure 10: SoS driver delivering food to a community	16
Figure 11: The team interviewing a member of the Bangkok Noi Community	17
Figure 12: Refrigeration control panel	19
Figure 13: Clean crates that SoS drops off at donors	20
Figure 14: Bakery items from Tesco Lotus (Truck #1)	20
Figure 15: Produce from Tesco Lotus (Truck #1)	20
Figure 16: Bakery items from a hotel buffet (Truck #3)	20
Figure 17: Produce from Tops Market (Truck #3)	20
Figure 18: Main kitchen at Bangkok Noi	24
Figure 19: Gardening area in Bangkok Noi	24
Figure 20: Farming areas including animals feeding	25
Figure 21: Ms.Nok(Left) and Ms.Na(right), representative staff of the Mercy farm	25
Figure 22: Ms. Noi, representative of the House of Blessing Foundation	26
Figure 23: Food donated from SoS to House of Blessing	26
Figure 24: Food donated from SoS to Pracha Uthit 79	27
Figure 25: Pakistani Refugees lived nearby gather and collected food from SoS	27



## List of Tables

Table 1: Losses during different steps in FSC	5
Table 2: Food truck driver questions	16
Table 3: Truck route information	19
Table 4: Monetary value of SoS Thai	28

## **Executive Summary**

### **The Problem**

According to Rujivanarom of The Nation, over 815 million people around the world suffer from malnutrition and hunger, while 25% of the population (1.9 billion people) in developed countries are obese. In 2017, the Biodiversity, Sustainable Agriculture, & Food Sovereignty Action Thailand Foundation (BioTech) published a report on the food security situation in Thailand. The foundation's director, Withoon Lienchamroom, found that even though Thailand is a major export country, there is a widening inequality gap of access to food for the country's population. There are over 6.5 million people not getting enough food and 600,000 children suffering from malnutrition which affects physical development, while the obesity rate has doubled in the past decade with up to 5 million people being overweight. Lienchamroom states that the worsening food security situation is due to more frequent disasters and wars occurring around the world. While at the same time in Asia alone, 449 million tons of food was wasted, more than enough to feed those affected by disasters and war all over the continent (Biodiversity, 2019).

According to Srisuwannaket and Liumpetch of The Bangkok Post, food waste makes up 64% of the city's total garbage, with only 2% being properly recycled due to the lack of a waste sorting system. Therefore, the rest often ends up in landfills, the most common waste management strategy around the world, and the one strategy that contributes 8% of the total greenhouse gas emissions (Food and Agriculture Organization of the United Nations, 2019).

Recently, hotels and retail industries have been spearheading food waste reduction by donating their nearly expired food and surplus food to nonprofit organizations for further distribution to charities and needy communities. The most hygienic of these being Scholars of Sustenance (SoS Thai), which began when the organization's founder, Bo Holmgreen, noticed large amounts of surplus food being wasted in tourist hotels, while the communities surrounding the city have little to eat on a regular basis.

### **Our Goal**

The goal of this project was to improve Scholars of Sustenance's relationships with food donors and recipient organizations, while also increasing their public presence by creating marketable data and assessing current practices of managing surplus food. Through our partnership with SoS Thai, the focus of our project was to gain data and information from donors, recipients, and SoS Thai employees; analyze data; and create recommendations and marketing tools to further the expansion of the foundation.

### **Our Plan**

Our first objective was to identify SoS Thai's practices of retrieving and delivering surplus food. We joined the four SoS truck drivers on their food retrieval and delivery routes for a day in order to observe the process and ask questions. We noted inconsistencies, what their process was lacking, and the efficiency of the system.

Our second objective was to collect and evaluate feedback from food donors and food recipients. We interviewed four food recipient organizations (Bangkok Noi Community, Mercy Farm, House of Blessings, and the Healthcare and Life Club) to see what they wanted to see improved with the delivery system. We interviewed one food donor, Tesco Lotus, to determine

the root of the surplus food issue and what attracted them to work with SoS. Our third objective was to analyze SoS Thai's data to determine marketable tools for expansion. We used the data collected by SoS Thai in combination with the recipient interview responses and observations to compute SoS Thai's contribution to society in the form of a monetary value. This monetary value and the factors used to reach this value aided in creating marketable tools for SoS Thai's expansion.

## **Findings & Recommendations**

From our observations, interviews, and data collected we identified nine findings. The first three were noted from shadowing the food truck drivers, the next four came from the interviews with Tesco Lotus and the recipient organizations, and the last two were concluded from data analysis. We found:

1. The lack of communication between SoS and donors led to a waste of time and resources.

Through observation, we noticed a large variance in the amount of food collected from different donors. For example, there were more than ten crates from a Tesco Lotus location (truck #1), a single plastic container of cooked food provided by one location of The Westin Grande Sukhumvit, Bangkok (truck #1), and no food provided by The W Bangkok Sathorn Hotel (truck #3). For the W Bangkok Sathorn Hotel, it was a half an hour drive from the previous donor and a twenty-minute drive to the next donor to receive no food. This was not a good use of time, and, if anything, more harm was done than good by wasting fuel to get to the location.

2. The temperature in the back of the truck fluctuated greatly, increasing the chance of food spoilage and damage to the trucks.

SoS tries to keep the temperature between 2° and 4° Celsius, to ensure the food does not spoil throughout the day. While the doors were closed, the temperature did in fact stay at approximately 3° Celsius. For each of the trucks, though, we observed that the temperature would vary every time the doors were opened up to anywhere from 8° to 20° Celsius. When the drivers would grab the clean crates from the back to take into the donors, they would not close the doors fully. This can cause the food to spoil faster and can cause damage to the trucks.

3. Some products were left wrapped in plastic packaging while others were loose in the crates.

Produce and bakery items received from a Tesco Lotus were enclosed in plastic wrap or in plastic containers, whereas a Tops Market and most hotel buffets provided loose bakery items and produce. We also observed one Tops Market removing plastic packaging before handing off the crates to the driver. One of the drivers, truck #2, would remove plastic packing from the food that still had them, but he was the only driver of the four on the day observed to do so. This driver did so to make it easier for the recipients to sort and to make sure they would not have to deal with any excess trash.

4. Tesco Lotus recognized good food safety and management from SoS Thai.

Tesco admires SoS for their food safety and management and they are one of the few organizations that meets their expectations. Other organizations have sold the food that Tesco has donated to them which goes against what Tesco is trying to do. Tesco wishes that SoS Thai could

do more with their food waste, but due to SoS Thai's limited budget, they can only produce a small amount of fertilizer or compost. Tesco also believes that SoS should focus more on nutrition and the types of food donated when it comes to their recipients. Tesco would also like to know the names of the recipients that their food is going to on a bi-yearly basis.

5. Tesco Lotus confirmed that their overall surplus food decreased the longer they were partnered with SoS Thai.

SoS started working with Tesco in 2017 and it seems they have only become more aware of the amount of surplus food they produce. They went from working with one organization to 80, and their surplus food produced has decreased every year. Mr. Lukkanevej stated that there has been a downward trend in the amount of surplus food the company has produced since working with SoS. For example, in the month of January, one of the months that often produces the highest amount of surplus due to the holiday season, there has been a significant decrease since 2018. In 2018, Tesco reported 39,042.42 kgs of surplus food, 20,009.45 kgs in 2019, and 16,557.39 kgs in 2020.

6. The recipients had varying preferences of international versus Thai food.

Although the recipients were grateful for the food that they received, they still had complaints on the types of food they were getting. The Bangkok Noi Community wants food with more Thai taste and less international food, but for the refugees it was the opposite. When the food is disliked by the recipients, they seem to donate it to neighboring communities. However, we were unable to find out if the food is actually consumed when donated. The other recipients we interviewed also had certain foods that they either threw away or fed the animals such as tomato sauce, duck ribs, or fish heads.

7. There was an inconsistency of food distribution within recipient organizations.

After meeting with the food recipients, similar problems were presented at each location. All of the communities require more food even though SoS Thai receives one ton of food every day. Following that, most of the food consists of vegetables, fruits, and bakery goods, but not enough raw meat to be cooked. Also, while the Bangkok Noi Community and House of Blessing Foundation are successful in portioning the food equally to its people, the refugees struggle and have an inconsistent method. The delivery method of SoS Thai is efficient, but the recipients are still getting foods that are spoiled due to improper treatment of delivery.

8. The recipients are not getting a well-balanced diet from the donated food.

From the interview responses, we would assume that each recipient we interviewed is satisfying the amount of days, meals, and people with a healthy, well-balanced meal. This assumption goes against our research when compared with outside sources on nutrition. From the small portion of data analyzed we found that House of Blessings receives approximately enough food to serve 3 well-rounded meals to 195 people for one day, Bangkok Noi receives approximately enough food to serve 3 well-rounded meals to 254 people for one day, and Pracha Uthit 79 receives approximately enough food to serve 3 well-rounded meals to 239 people for one day. For the amount of people who are estimated to be members of these communities, none of them would be able to sustain the entire community with the daily recommended nutrition. With these calculations, clearly there are some discrepancies between what communities consider a satisfactory meal, and what a nutritional meal actually is.

9. The monetary value of SoS Thai is greater than just the value of the food recovered.

There are several factors that contribute to the worth of SoS Thai. Some factors are more straightforward to assign a baht value to, but what should be highlighted are the contributions of the SoS employees that have chosen to work for this non-profit organization for the benefit of those in need. We have calculated that SoS Thai's daily contribution to society is ฿53,994.22. Communication and logistics between SoS, donors, and recipients is key to making this organization run smoothly. As well as the record keeping which is a crucial aspect of managing the tons of food collected everyday. From this information that SoS Thai manages and records everyday, they are able to learn and grow their organization.

In response to these findings, we have formulated 4 key recommendations for SoS Thai to implement into their operations. We recommend:

1. Use infographics to advertise SoS Thai.

SoS Thai wants to expand to obtain more food and attain a larger influence, so we developed infographics to showcase what their organization is and what they have done. Infographics are often easy to follow and catch people's eyes, so we wanted to use this method to market SoS Thai's data to various stakeholders. To appeal to the different types of audience, there is an infographic geared towards new donors and one geared towards the general public.

From the information we gathered from interviewing Tesco Lotus, we want to show to new donors that SoS Thai is a reliable organization that is outstanding in food safety, management, and can benefit from working together. The donors do not want their name to get tarnished, thus why they appreciate that SoS takes full responsibility for the food they receive. We recommend that SoS provide these infographics to donors the first time they meet or contact them.

In order for SoS Thai to grow, the public needs to hear about the organization and understand who they are. In the infographic, we want to show a brief history of SoS Thai, the total impact they have had, explain in simpler terms how they do it, and how the community can get involved. From talking with Bruce-Po Chao Chen, Project Manager of SoS Thai, we gathered that 90% of the money comes from the founder Bo Holmgreen and the remaining 10% is from investors. The organization needs other sources of money, so by providing a QR code to a donation link, this will give the community a way to provide a helping hand.

2. Provide donors with small promotional materials.

We recommend that SoS Thai provide donors with promotional materials to encourage cooperation by showing partnerships and decreasing food waste. Based on the sponsor's experience and the team observations, the donors do not always follow SoS Thai's minimal instructions such as removing plastic packaging and communicating their amount of food for the day. While SoS Thai is grateful for the donated food, it is important to maintain appropriate procedures and management. A way to maintain a good relationship is by providing donors with plaques or certificates of data that show how much that branch donated for last month, the number of meals they have fed to the needy, and how long they have been working with SoS. This will create a positive image of the donor and inspire them to cultivate the partnership.

Along with that, we suggest putting food waste signs near the buffet line at the hotel donors to decrease food waste. This will remind customers to not fill up their plate all the way and increase the potential surplus of food that can be given to the needy communities, while also showing SoS Thai works with that donor. Another benefit is that there will be less food waste, so the donor has to spend less money to dump the trash. With success, the promotional materials that were made for the donor will help SoS Thai self-advertise themselves as well.

3. Expand the donor base to obtain specific types of food that provide more nutrition.

The recipients are noticing less and less meat and nutritious foods being donated, while they continue to receive large amounts of bakery items that are often unhealthy and go bad very quickly. SoS Thai does not like to complain to the donors because they are just happy to get anything at all, so the solution would be to find donors with a variety of healthy foods. Due to the lack of meat and protein, we recommend that SoS should reach out to butcher shops, specialized markets, and supermarkets that sell fresh meat. These potential donors can supply the missing nutrition that recipients require and provide them with a healthy diet.

4. Educate recipients to utilize the food and food waste properly.

We propose that SoS Thai educates the recipients to allow them the opportunity to utilize the food to its fullest. We recommend that they provide strategies that have worked for some of their recipients to others such as recipes, composting, fertilization, and distribution methods.

Recipes can help create meals that the recipients would not have thought of and not waste any of the food that could have potentially been used. For example, House of Blessings wanted more protein but did not like the fish heads as they contain more bone than meat, however, fish heads can also be used for curry and different types of soup to stretch out the protein potential. Mercy Farm also did not know how to use tomato sauce other than with pasta, but it can be used with different Thai meat recipes, and in tomato nam prik, Thai meatballs, and curry.

Wasting any of the surplus food ruins the purpose it was collected for. It is important to teach the communities a way to deal with spoiled and unwanted food. SoS Thai has already taught Mercy Farm composting, and fertilization so they could grow their own fresh produce. Two out of the four communities we visited did not have a system like this in place, so we highly encourage SoS to organize a plan to teach their composting and fertilization methods if they are willing to learn.

There needs to be a proper way for the recipients to distribute their meals to all of its community members to make sure everyone is getting proper proportions. The Pracha Uthit 79 community did not have a way to make sure each person was getting enough food for their family and individuals were on their own to prepare meals. By showing successful methods of preparing and distributing, such as House of Blessings where Ms.Noï is in charge of the food checking, cooking and proportioning, there can be a way to make sure that all of the people are being treated well.

## บทสรุปผู้บริหาร

### ปัญหา

จากบทความของคุณปรัชญ์ รุจิวนารมย์จากสำนักข่าว The Nation พบว่าประชากรโลกจำนวนมากกว่า 815 ล้านคน ประสบปัญหาด้านการขาดแคลนอาหารและได้รับสารอาหารที่ไม่เพียงพอ แต่ในขณะเดียวกัน 25% ของประชากรในกลุ่มประเทศที่พัฒนาแล้ว กำลังเผชิญกับภาวะน้ำหนักตัวเกินหรือโรคอ้วน ในปี 2017 มูลนิธิซีวียีได้เปิดเผยข้อมูลเกี่ยวกับสถานการณ์ความปลอดภัยด้านอาหารในประเทศไทย โดยผู้จัดตั้งมูลนิธิ นายวิฑูรย์ เลี่ยนจำรูญ กล่าวว่า ถึงแม้ว่าประเทศไทยจะเป็นประเทศที่มีการส่งออกอาหารเป็นหลัก แต่ก็ประสบปัญหาความไม่เท่าเทียมในการกระจายอาหาร โดยประชากรกว่า 6.5 ล้านคน ได้รับอาหารไม่เพียงพอ และเยาวชนกว่า 600,000 คน กำลังขาดแคลนสารอาหาร ซึ่งปัญหาดังกล่าวส่งผลกระทบต่อการพัฒนาประเทศในเชิงกายภาพเป็นอย่างมาก ในทางกลับกันอัตราส่วนของประชากรที่มีน้ำหนักตัวเกินนั้นพุ่งขึ้นเป็น 2 เท่า เป็นจำนวนกว่า 5 ล้านคนในรอบทศวรรษ นายวิฑูรย์ยังกล่าวอีกว่าปัญหาความปลอดภัยด้านอาหารนั้นเพิ่มมากขึ้น อันเนื่องมาจากภัยพิบัติและสงครามที่เกิดขึ้นทั่วโลก อาหารกว่า 449 ล้านตัน ในทวีปเอเชียถูกทิ้งอย่างไรประโยชน์ ซึ่งอาหารจำนวนมากเหล่านี้สามารถนำไปช่วยเหลือผู้ประสบภัยและเหยื่อในสงครามได้ทั่วทั้งทวีป

จากบทความของคุณศรียุวรรณเกศ และคุณเลื่อมเพชร จากสำนักข่าว Bangkok Post กล่าวว่าจำนวนขยะอาหารคิดเป็น 64% จากขยะทั้งหมดในจังหวัดกรุงเทพมหานคร ซึ่งในจำนวนนี้มีขยะอาหารเพียง 2% ที่ถูกนำมารีไซเคิลอย่างถูกวิธี และขยะอาหารส่วนที่เหลือนั้นจะถูกทิ้งที่บริเวณพื้นที่ฝังกลบขยะ ซึ่งคิดเป็น 8% ของปัจจัยที่ทำให้เกิดก๊าซเรือนกระจก

ในปัจจุบัน โรมแรมและร้านค้า ได้ตระหนักถึงปัญหาอาหารส่วนเกิน จนในที่สุดกลายเป็นขยะอาหารมากขึ้น โดยการบริจาคอาหารส่วนเกินหรืออาหารที่ใกล้ถึงวันหมดอายุให้แก่มูลนิธิเพื่อนำไปแจกจ่ายให้กับชุมชนที่ขาดแคลนต่อไป ซึ่งหนึ่งในมูลนิธิที่รักษาความสะอาดและความปลอดภัยของอาหารได้ดีมูลนิธิหนึ่งนั่นก็คือ ‘มูลนิธิรักษอาหาร’ หรือ Scholars of Sustenance (SoS) โดยผู้ก่อตั้งมูลนิธิ คุณโบ โฮล์มกรีน (Bo H. Holmgreen) ได้ตระหนักถึงปัญหาขยะอาหารจำนวนมาก ซึ่งเกิดจากอาหารส่วนเกินจากนักท่องเที่ยวที่เข้ามาพักในโรมแรม ในกรุงเทพมหานคร ในขณะที่ยังมีผู้คนอีกจำนวนมากที่ยังขาดแคลนอาหาร ดังนั้นปัญหาอาหารส่วนเกินและขยะอาหารจึงเป็นปัญหาที่ต้องตระหนักให้มากขึ้น นี่จึงเป็นจุดเริ่มต้นของมูลนิธิรักษอาหาร



## เป้าหมายของคณะผู้วิจัย

การวิจัยนี้ถูกจัดทำขึ้นเพื่อช่วยพัฒนาความสัมพันธ์อันดีระหว่างมูลนิธิรักษอาหารหรือ Scholars of Sustenance (SoS) และผู้มีส่วนเกี่ยวข้องซึ่งประกอบไปด้วยผู้บริจาคอาหาร และผู้รับอาหารบริจาค รวมถึงการทำให้มูลนิธิรักษอาหารเป็นที่รู้จักในวงกว้างผ่านสื่อโฆษณา และการประเมินผลในด้านการจัดการอาหารส่วนเกิน โดยการเก็บข้อมูลจากผู้บริจาค ผู้รับอาหารบริจาค และพนักงานในมูลนิธิรักษอาหาร เพื่อนำข้อมูลมาวิเคราะห์ และเสนอคำแนะนำ พร้อมสร้างสื่อ เพื่อใช้ในการโฆษณาและประชาสัมพันธ์ให้กับมูลนิธิรักษอาหารในอนาคต

## วัตถุประสงค์ของคณะผู้วิจัย

วัตถุประสงค์แรก คือ การระบุแนวทางการขนส่งอาหารส่วนเกิน โดยคณะผู้วิจัยได้สำรวจขั้นตอนการทำงานของรถบรรทุกขนส่งอาหารของมูลนิธิรักษอาหารทั้งหมด 4 คัน และสัมภาษณ์พนักงานขับรถบรรทุกขนส่งอาหารของมูลนิธิรักษอาหาร ร่วมกับการสังเกต และการจดบันทึกปัญหาที่ก่อให้เกิดการขาดประสิทธิภาพของระบบการจัดการ

วัตถุประสงค์ที่สอง คือ การเก็บรวบรวมข้อมูลและประเมินความพึงพอใจของผู้บริจาคอาหารและผู้รับอาหารบริจาค โดยคณะผู้วิจัยได้ลงพื้นที่สัมภาษณ์ 4 องค์กร ที่ได้รับการบริจาคอาหารจากมูลนิธิรักษอาหาร ได้แก่ ชุมชนบางกอกน้อย, มูลนิธิเมอร์ซี่ ฟาร์ม (Mercy Farm), มูลนิธิบ้านพระพร (House of Blessings) และชุมชนพี่น้องชาวปากีสถาน เพื่อสอบถามความคิดเห็นเกี่ยวกับมูลนิธิรักษอาหาร รวมถึงสิ่งที่ต้องการและสิ่งที่อยากให้ทางมูลนิธิปรับปรุงแก้ไข นอกจากนี้คณะผู้วิจัยได้มีโอกาสนำสัมภาษณ์ คุณปฏิกรณ์ ลักคณาเวช ผู้จัดการฝ่ายแคมเปญ (Campaign Manager) ของเทสโก้ โลตัส (Tesco Lotus) ซึ่งถือเป็นผู้บริจาคอาหารรายใหญ่ของมูลนิธิ เพื่อเก็บรวบรวมข้อมูลที่เกี่ยวข้องกับต้นตอปัญหาปริมาณอาหารส่วนเกินที่มีจำนวนมาก และ เหตุผลที่ทำให้เทสโก้ โลตัสตัดสินใจ ร่วมงานกับมูลนิธิรักษอาหาร

วัตถุประสงค์ที่สาม คือ การวิเคราะห์ข้อมูลของมูลนิธิรักษอาหาร เพื่อนำข้อมูลเหล่านั้นมาขยายเป็นเครื่องมือทางการตลาดให้กับทางมูลนิธิ โดยคณะผู้วิจัยได้ใช้ข้อมูลที่รวบรวมโดยมูลนิธิรักษอาหารร่วมกับข้อมูลที่คณะผู้วิจัยได้มาจากการสัมภาษณ์ผู้รับอาหารบริจาคในการวิเคราะห์ข้อมูล รวมถึงการสังเกต เพื่อนำมาช่วยในการคำนวณเงินที่ใช้จ่ายไปในการช่วยเหลือสังคมของมูลนิธิรักษอาหาร ซึ่งมูลค่ารายจ่ายและอีกหลายปัจจัยที่ใช้ในการเข้าถึงมูลค่าทางการเงินเหล่านี้ มีส่วนช่วยในการสร้างเครื่องมือทางการตลาดเพื่อให้มูลนิธิรักษอาหารเป็นที่รู้จักมากยิ่งขึ้น

## ผลการดำเนินงาน

จากการสังเกต การสัมภาษณ์ และการเก็บรวบรวมข้อมูล คณะผู้วิจัยสามารถระบุผลลัพธ์จากการดำเนินงานได้ทั้งสิ้น 9 ข้อ โดยในสามข้อแรกนั้นมาจากการติดตามการทำงานของรถบรรทุกขนส่งอาหารของทางมูลนิธิรักษอาหาร ในหัวข้อถัดมา เป็นส่วนที่ได้จากการสัมภาษณ์ผู้บริจาคอาหาร คือ เทสโก้ โลตัส (Tesco Lotus) และ ผู้รับอาหารบริจาคซึ่งประกอบไปด้วย มูลนิธิบ้านพระพร, มูลนิธิเมอร์ซี่ ฟาร์ม, ชุมชนบางกอกน้อย และ ชุมชนพี่น้องชาวปากีสถาน และในสองข้อสุดท้าย มาจากการวิเคราะห์ข้อมูลที่ได้รับ ดังต่อไปนี้

1) การขาดการติดต่อสื่อสารที่ีระหว่างมูลนิธิรักษอาหารและผู้บริจาคอาหาร ส่งผลให้เสียทรัพยากรเวลาและสิ้นเปลืองน้ำมัน

จากการสำรวจ ผู้วิจัยได้สังเกตเห็น ความมากน้อยของปริมาณอาหารที่ได้รับจากผู้บริจาคในแต่ละสถานที่ ยกตัวอย่างเช่น ในรถบรรทุกอาหารหมายเลข 1 ของมูลนิธิรักษอาหาร มีอาหารจำนวนมากกว่า 10 ลัง ที่ได้รับมาจากเทสโก้ โลตัส และ กล่องพลาสติกเก็บอาหารปรุงสุก มาจาก โรงแรมเดอะเวสทิน แกรนด์ สุขุมวิท กรุงเทพฯ (The Westin Grande Sukhumvit, Bangkok) อย่างไรก็ตามบางสถานที่เช่น โรงแรม ดับเบิ้ลยู สาทร์ กรุงเทพฯ (W Bangkok Sathorn) แม้ว่ารถบรรทุกอาหารหมายเลข 3 ของมูลนิธิรักษอาหารจะมาถึงที่หมายแล้วแต่ทางโรงแรมกลับไม่มีอาหารสำหรับบริจาคให้ทางมูลนิธิรักษอาหารเลย ซึ่งทางมูลนิธิใช้เวลาในการเดินทาง 30 นาที จากผู้บริจาครายก่อนหน้า และต้องใช้เวลาอีก 20 นาทีเพื่อเดินทางไปยังผู้บริจาครายต่อไป ซึ่งการไม่ได้รับอาหารบริจาคในครั้งนี้ทำให้เสียเวลา และ เป็นการสิ้นเปลืองน้ำมันเป็นอย่างมาก

2) อุณหภูมิของเครื่องปรับอากาศท้ายรถบรรทุกอาหารนั้นไม่คงที่ ส่งผลให้เกิดการเน่าเสียของอาหารได้อย่างรวดเร็วขึ้น

มูลนิธิรักษอาหารพยายามที่จะควบคุมอุณหภูมิของเครื่องปรับอากาศท้ายรถให้อยู่ระหว่าง 2 ถึง 4 องศาเซลเซียส เพื่อจะมั่นใจได้ว่าอาหารจะไม่เน่าเสียในตลอดทั้งวันที่มีการขนส่งอาหาร เมื่อประตูท้ายรถบรรทุกอาหารทุกคันถูกปิดลง อุณหภูมิของเครื่องปรับอากาศจะอยู่ที่ประมาณ 3 องศาเซลเซียส แต่เมื่อประตูถูกเปิดในแต่ละครั้ง อุณหภูมิจะเกิดการเปลี่ยนแปลงตั้งแต่ 8 ถึง 20 องศาเซลเซียส เมื่อคนขับรถนำลงอาหารไปรับอาหารจากผู้บริจาค ประตูนั้นไม่ได้ถูกปิดสนิท จึงทำให้อาหารที่รับบริจาคเกิดการเน่าเสียในบางครั้ง และ ยังเป็นสาเหตุที่ทำให้ระบบปรับอากาศในรถบรรทุกเกิดความเสียหายอีกด้วย

### 3) การจัดการกับบรรจุภัณฑ์บรรจุอาหารประเภทถุงพลาสติกของผู้บริโภค

อาหารและสินค้าประเภทขนมปัง ที่ได้รับการบริจาคมมาจากเทสโก้ โลตัส จะถูกบรรจุอยู่ในบรรจุภัณฑ์ประเภทถุงพลาสติก หรือ กล่องพลาสติกบรรจุอาหาร ในขณะที่ ท็อปส์มาร์เก็ต (Tops Market) และ บุปเฟ่ต์โรงแรมไม่มีบรรจุภัณฑ์ประเภทถุงพลาสติกบรรจุขนมปัง นอกจากนี้คณะผู้วิจัยได้สังเกตว่าท็อปส์มาร์เก็ตจะแกะบรรจุภัณฑ์ประเภทพลาสติกที่บรรจุขนมปังออกก่อนที่จะนำมาบริโภคให้ทางมูลนิธิรักษอาหาร ซึ่งจากการสังเกตพนักงานขับรถบรรทุกหมายเลข 2 ซึ่งเป็นคนเดียวที่แกะบรรจุภัณฑ์พลาสติกนี้ออกด้วยตนเองหลังจากรับอาหารมาจากผู้บริจาคอาหาร ซึ่งจะทำให้การขนส่งอาหารต่อไปยังผู้รับอาหารบริจาคมง่ายขึ้น เพราะไม่ต้องจัดการกับปัญหากับพลาสติกส่วนเกินนี้ในภายหลัง

### 4) เทสโก้ โลตัสให้การยอมรับในด้านการจัดการความปลอดภัยของอาหาร และ การจัดการระบบขนส่งที่ดีของมูลนิธิรักษอาหาร

เทสโก้ โลตัสให้การยอมรับในการจัดการความปลอดภัยของอาหาร และ การจัดการที่ดีของมูลนิธิรักษอาหาร ซึ่งเป็นหนึ่งในองค์กรที่เทสโก้ โลตัสให้ความไว้วางใจในเรื่องของความตรงไปตรงมาในการร่วมงานกัน ทางเทสโก้ โลตัสทราบว่ามีบางหน่วยงานที่ขอรับบริจาคอาหารจากเทสโก้ โลตัสได้มีการนำอาหารที่เทสโก้ โลตัสบริจาคให้ไปจำหน่ายต่อ ซึ่งไม่เป็นไปตามข้อตกลงในการบริจาคอาหาร นอกจากนี้ในเรื่องของขยะอาหาร เทสโก้ โลตัสมีความเห็นว่ามูลนิธิรักษอาหารจะสามารถแก้ไขปัญหามลพิษขยะอาหารได้มากขึ้นกว่าเดิม แต่เนื่องจากงบประมาณที่จำกัดของทางมูลนิธิรักษอาหาร พวกเขาสามารถนำขยะอาหารเหล่านั้นไปผลิตปุ๋ยหมักได้เพียงเล็กน้อยเท่านั้น อย่างไรก็ตาม เทสโก้ โลตัสคาดหวังว่าทางมูลนิธิรักษอาหารควรมุ่งเน้นไปที่การนำอาหารส่วนเกินที่มีคุณค่าทางโภชนาการและประเภทของอาหารที่เหมาะสมเมื่อส่งถึงมือของผู้รับ สุดท้ายนี้ทางเทสโก้ โลตัสต้องการทราบถึงรายชื่อของสถานที่ที่รับอาหารบริจาคของทางองค์กร โดยต้องการได้รับการรายงานสองครั้งต่อปี หรือทุก 6 เดือนจากทางมูลนิธิรักษอาหาร

5) เทสโก้โลตัสยืนยันว่าปริมาณอาหารส่วนเกินทั้งหมดลดลงหลังจากที่ได้ร่วมงานกับมูลนิธิรักษอาหาร

มูลนิธิรักษอาหารได้ร่วมงานกับเทสโก้โลตัสเมื่อปี2017 เทสโก้ โลตัสได้ตระหนักถึงปริมาณการผลิตอาหารส่วนเกินมากขึ้น เทสโก้ โลตัสเริ่มจากทำงานร่วมกันกับองค์กรเพียงแค่องค์กรเดียวจนปัจจุบันได้ทำงานร่วมกับองค์กรที่รับการบริหารจัดการอาหารทั้งสิ้น 80 องค์กร และ จากการสัมภาษณ์คุณปฎิกรณ์ ลักคณาเวช ผู้จัดการฝ่ายแคมเปญ (Campaign Manager) ตัวแทนจากเทสโก้ โลตัสกล่าวว่าปริมาณอาหารส่วนเกินที่ทางองค์กรผลิตมีแนวโน้มลดลงในทุกปี ตั้งแต่ทำงานร่วมกับมูลนิธิรักษอาหาร ตัวอย่างเช่น ในเดือนมกราคมซึ่งเป็นเดือนที่ผลิตอาหารส่วนเกินมากที่สุด เนื่องจากว่าเป็นช่วงเทศกาลปีใหม่ แต่ปริมาณอาหารส่วนเกินนั้นลดจำนวนลงในทุกปี ตั้งแต่ ปี 2018 ทางเทสโก้ โลตัสรายงานปริมาณอาหารส่วนเกินทั้งสิ้น 39,042.42 กิโลกรัม ต่อมาในปี 2019 รวมทั้งสิ้น 20,009.45 กิโลกรัม และล่าสุดปี 2020 รวมทั้งสิ้น 16,557.39 กิโลกรัม

6) ผู้รับอาหารบริจาคมีความต้องการอาหารที่หลากหลายทั้งอาหารไทย และ อาหารนานาชาติ

แม้ว่าผู้รับอาหารบริจาคจะรู้สึกขอบคุณในอาหารที่พวกเขาได้รับจากทางมูลนิธิรักษอาหาร แต่อย่างไรก็ตามยังคงมีข้อร้องเรียนเกี่ยวกับประเภทของอาหารที่พวกเขาได้รับเสมอ เช่น ชุมชนบางกอกน้อย ต้องการอาหารไทยมากกว่าอาหารนานาชาติ ในขณะที่ชุมชนพี่น้องชาวปากีสถานต้องการอาหารนานาชาติมากกว่าอาหารไทย ดังนั้นหากพวกเขาไม่ได้อาหารประเภทที่ต้องการพวกเขาจะส่งมอบให้กับชุมชนรอบข้างแทน อย่างไรก็ตาม คณะผู้วิจัยไม่สามารถตรวจสอบได้ว่าอาหารดังกล่าวได้ถูกบริโภคจริงเมื่อถูกส่งมอบให้กับผู้รับจากชุมชนอื่น เพราะจากการสัมภาษณ์ ทำให้ทราบว่ามีอาหารบางชนิดที่จำเป็นต้องทิ้ง หรือ นำไปเลี้ยงสัตว์ ยกตัวอย่างเช่น ซอสมะเขือเทศ, โครก กระดุกเปิด หรือ หัวปลา เป็นต้น

## 7) ความไม่สอดคล้องกันของการกระจายอาหารของผู้รับอาหารบริจาคจากทางมูลนิธิรักษอาหาร

หลังจากที่ได้สัมภาษณ์ผู้รับอาหารบริจาค พบว่ามีปัญหาที่เกิดขึ้นในลักษณะที่คล้ายกันในแต่ละชุมชน คือถึงแม้ว่ามูลนิธิรักษอาหารจะได้รับอาหารเป็นจำนวนมากจากผู้บริจาคแต่ผู้รับอาหารบริจาคยังคงต้องการอาหารในปริมาณที่มากกว่านี้ ทุกครั้งที่ได้รับอาหารส่วนใหญ่นั้นเป็นอาหารประเภทขนมปังและผักมีบ้างตามแต่โอกาส แต่สำหรับอาหารประเภทเนื้อสัตว์นั้นมีปริมาณที่ไม่เพียงพอที่จะนำมาประกอบอาหาร ในส่วนของการกระจายอาหารนั้น ชุมชนบางกอกน้อย และ มูลนิธิบ้านพระพร (House of Blessings) นั้นสามารถแบ่งอาหารได้อย่างทั่วถึงทุกคน แต่อย่างไรก็ตาม ชุมชนพี่น้องชาวปากีสถาน นั้นเกิดปัญหาในการแบ่งอาหารที่ไม่ทั่วถึง และนอกจากนี้แม้ว่าวิธีการขนส่งอาหารของมูลนิธิรักษอาหารนั้นมีประสิทธิภาพ แต่ผู้รับอาหารยังคงได้รับอาหารที่เน่าเสียในบางครั้งเนื่องจากการรักษาคุณภาพอาหารที่ไม่เหมาะสมระหว่างการขนส่ง

## 8) ผู้รับอาหารบริจาคไม่ได้รับสารอาหารในปริมาณที่เหมาะสมจากการรับบริจาคอาหาร

ก่อนการสัมภาษณ์ผู้รับอาหารบริจาค คณะผู้วิจัยตั้งสมมติฐานว่าผู้รับอาหารบริจาคที่จะให้สัมภาษณ์แต่ละคนนั้นมีความพึงพอใจกับจำนวนวันที่ได้รับอาหารบริจาค และประเภทของอาหารในแต่ละมื้อที่ได้รับ รวมถึงคาดหวังว่าผู้รับอาหารบริจาคได้รับอาหารที่ดีต่อสุขภาพและมีปริมาณที่เหมาะสม แต่กลับกลายเป็นว่าสมมติฐานนี้ไม่ถูกต้อง หลังจากการสัมภาษณ์ผู้รับอาหารบริจาค โดยเมื่อเปรียบเทียบกับข้อมูลที่คณะผู้วิจัยได้ค้นคว้าเกี่ยวกับโภชนาการที่เหมาะสมกับแต่ละบุคคล ในแต่ละเพศและช่วงวัย จากการวิเคราะห์ข้อมูลบางส่วน คณะผู้วิจัยพบว่ามูลนิธิบ้านพระพร (House of Blessings) ได้รับอาหารที่เพียงพอ 3 มื้อ สำหรับผู้รับประทานโดยประมาณทั้งสิ้น 195 คน ต่อวัน ในขณะที่ ชุมชนบางกอกน้อย ได้รับอาหารที่เพียงพอ 3 มื้อ สำหรับผู้รับประทานโดยประมาณทั้งหมด 254 คน ต่อวัน และ ชุมชนพี่น้องปากีสถาน (ประชาอุทิศ 79) ได้รับอาหารที่เพียงพอ 3 มื้อ สำหรับผู้รับประทานโดยประมาณทั้งสิ้น 239 คนต่อวัน สำหรับจำนวนคนที่ประมาณการว่าเป็นสมาชิกของแต่ละชุมชนดังกล่าว ไม่มีบุคคลใดในชุมชนที่สามารถเป็นตัวแทนในการให้คำแนะนำด้านโภชนาการที่เหมาะสมในแต่ละวันให้กับสมาชิกในชุมชนได้เลย นอกจากนี้คณะผู้วิจัยได้คำนวณปริมาณอาหารที่ผู้รับอาหารบริจาคได้รับในแต่ละวัน แล้วนำไปเปรียบเทียบกับข้อมูลทางโภชนาการที่เหมาะสมกับแต่ละบุคคลในแต่ละวัน ผลปรากฏชัดเจนว่ามีความแตกต่างระหว่างโภชนาการที่คนในชุมชนสมควรที่จะได้รับ กับ โภชนาการจากอาหารที่ได้รับจริง

#### 9) การดำเนินงานที่มีประสิทธิภาพของมูลนิธิรักษอาหารเพื่อความยั่งยืนขององค์กร

คณะผู้วิจัยพบหลายปัจจัยที่ส่งผลต่อประสิทธิภาพการใช้จ่ายของมูลนิธิรักษอาหาร จากการคำนวณงบประมาณการใช้จ่ายเพื่อสังคมของมูลนิธิรักษอาหารคือ 53,994.22 บาทต่อวัน อย่างไรก็ตาม มีบางปัจจัยที่แสดงให้เห็นอย่างชัดเจนมากกว่าการกำหนดเป็นมูลค่าทางการเงิน ซึ่งจะส่งผลให้มูลนิธิรักษอาหารดำเนินงานอย่างมีประสิทธิภาพและเกิดความยั่งยืนภายในองค์กร นั่นคือการทำงานของมูลนิธิรักษอาหารสมัครใจที่จะร่วมงานกับมูลนิธิซึ่งเป็นองค์กรที่ไม่แสวงหาผลกำไรนี้ เพื่อช่วยเหลือผู้ขาดแคลนอาหารจำนวนมาก นอกจากนี้การติดต่อสื่อสารและระบบการขนส่งที่ดีระหว่างมูลนิธิรักษอาหาร และ ผู้บริจาค และส่งต่อไปยังผู้รับอาหารบริจาคจะเป็นกุญแจสำคัญในการทำให้องค์กรดำเนินการไปอย่างราบรื่น รวมถึงการจดบันทึกข้อมูลซึ่งเป็นสิ่งสำคัญในการจัดการกับอาหารที่ได้รับจากการบริจาคเป็นจำนวนมากในแต่ละวัน จากข้อมูลที่มูลนิธิรักษอาหารได้จัดการและบันทึกทุกวันนี้จะทำให้มูลนิธิสามารถเรียนรู้ พัฒนา และทำให้มูลนิธิเติบโตขึ้นได้

#### ข้อเสนอแนะ

จากผลการดำเนินงาน คณะผู้วิจัยมีข้อเสนอแนะทั้งหมด 4 ข้อที่จะเสนอเป็นแนวทางให้กับมูลนิธิรักษอาหาร ดังต่อไปนี้

ข้อเสนอแนะที่ 1 การใช้อินโฟกราฟิก (infographics) เพื่อการโฆษณาและประชาสัมพันธ์มูลนิธิรักษอาหาร

มูลนิธิรักษอาหารมีความประสงค์จะขยายเครือข่ายการรับบริจาคอาหารส่วนเกินจากผู้ประกอบการที่สนใจจะร่วมบริจาคอาหาร และ เพื่อประชาสัมพันธ์มูลนิธิให้เป็นที่รู้จักในวงกว้างมากยิ่งขึ้น ดังนั้นคณะผู้วิจัยจึงสร้างอินโฟกราฟิก เพื่อโฆษณาและประชาสัมพันธ์มูลนิธิรักษอาหารให้ผู้สนใจที่จะร่วมบริจาคอาหารส่วนเกิน เนื่องจากการใช้อินโฟกราฟิกนำเสนอข้อมูล เป็นที่นิยมอย่างมาก เพราะทำให้ผู้ชมเข้าใจข้อมูลที่จะนำเสนอได้ง่าย และ ดึงดูดความสนใจจากผู้ชม ดังนั้น คณะผู้วิจัยจึงต้องการใช้วิธีนี้ในการทำการตลาดข้อมูลของมูลนิธิรักษอาหารเพื่อนำเสนอแก่ผู้มีส่วนเกี่ยวข้องและเพื่อดึงดูดผู้ชมในแต่ละประเภท ทั้งนี้การสร้างอินโฟกราฟิกจะมุ่งเน้นไปที่การประชาสัมพันธ์ให้ผู้บริจาครายใหม่ และอีกส่วนหนึ่งมุ่งสู่สาธารณชนทั่วไป

จากข้อมูลที่คณะผู้วิจัยรวบรวมจากการสัมภาษณ์ตัวแทนจากเทสโก้ โลตัส ได้ผลลัพธ์ว่า เทสโก้ โลตัสรู้สึกประทับใจมูลนิธิรักษอาหาร ซึ่งเป็นองค์กรที่มีความน่าเชื่อถือ และ มีความโดดเด่นในด้านการรักษาความปลอดภัยของอาหาร และการจัดการด้านการขนส่งที่ดี ซึ่งจะทำให้ผู้บริจาดรายใหม่มั่นใจได้ว่าจะได้รับประโยชน์จากการทำงานร่วมกันกับทางมูลนิธิ นอกจากนี้ผู้บริจาดอาหารไม่ต้องการให้ชื่อเสียงของพวกเขาถูกทำให้เสื่อมเสีย ดังนั้นนี่คือเหตุผลที่ผู้บริจาดอาหารส่วนใหญ่ชื่นชมว่ามูลนิธิรักษอาหารรับผิดชอบอย่างเต็มที่ต่ออาหารที่ได้รับจากผู้บริจาด

เพื่อให้มูลนิธิรักษอาหารเป็นที่รู้จักมากยิ่งขึ้น การประชาสัมพันธ์ให้บุคคลทั่วไปได้รับทราบข้อมูลเบื้องต้นเกี่ยวกับองค์กรจึงเป็นเรื่องที่สำคัญ เพราะฉะนั้นการสร้างอินโฟกราฟิกของคณะผู้วิจัยนั้นต้องแสดงประวัติของมูลนิธิรักษอาหารพอสังเขป และ ผลกระทบโดยภาพรวมของมูลนิธิรักษอาหาร โดยจะอธิบายให้เข้าใจได้ง่ายขึ้นเกี่ยวกับการดำเนินงานของมูลนิธิรักษอาหาร และวิธีการที่ทำให้ผู้คนที่สนใจสามารถมีส่วนร่วมกับทางมูลนิธิ จากการพูดคุยกับคุณบุรุษ-โป้วเจา เฉิน ผู้จัดการฝ่ายโครงการมูลนิธิรักษอาหาร ทำให้คณะผู้วิจัยทราบว่าเงินทุนที่ใช้บริหารงานในองค์กร 90% เป็นทุนส่วนตัวของผู้ก่อตั้งมูลนิธิรักษอาหาร คุณโบ โฮล์มกรีน (Bo. H. Holmgren) และอีก 10% ที่เหลือนั้นมาจากผู้ประกอบการธุรกิจที่เป็นผู้บริจาดอาหารให้ทางมูลนิธิรักษอาหาร และ หน่วยงานที่ต้องการจะบริจาด เพื่อให้ความช่วยเหลือ อย่างไรก็ตามทางมูลนิธิรักษอาหารยังมีความต้องการเงินทุนสนับสนุน ดังนั้นคณะผู้วิจัยจึงสร้างการระบรหัสคิวอาร์ (QR Code) ซึ่งเป็นลิงก์ที่สามารถสแกน (Scan) เพื่อบริจาดเงินทุนช่วยเหลือมูลนิธิได้ทันที เป็นอีกหนึ่งช่องทางที่บุคคลทั่วไปจะสามารถให้ความช่วยเหลือมูลนิธิได้

ข้อเสนอแนะที่ 2 การสนับสนุนกิจกรรมในการลดปริมาณอาหารส่วนเกินและขยะอาหารของผู้บริจาดอาหารโดยมูลนิธิรักษอาหารเพื่อสนับสนุนนโยบายความเป็นมิตรต่อสิ่งแวดล้อมของผู้บริจาดอาหาร

คณะผู้วิจัยเสนอข้อแนะนำให้มูลนิธิรักษอาหารสนับสนุนกิจกรรมการดำเนินงานของผู้บริจาดอาหาร เพื่อเป็นการแสดงความร่วมมือที่ดีระหว่างสองฝ่าย และมีส่วนทำให้ปริมาณอาหารส่วนเกินลดลง อ้างอิงจากประสบการณ์ของพนักงานของมูลนิธิรักษอาหารและการสำรวจของคณะผู้วิจัยพบว่าผู้บริจาดไม่ได้ทำตามข้อตกลงของมูลนิธิอย่างเคร่งครัด เช่น การไม่นำบรรจุภัณฑ์ประเภทพลาสติกห่ออาหารออกก่อนการบริจาด และการขาดการรายงานปริมาณอาหารที่จะบริจาดต่อวัน แม้ทางมูลนิธิรักษอาหารมีความยินดีที่จะได้รับอาหารจากผู้บริจาด แต่การบริหารจัดการที่ดีและถูกต้องก็เป็นสิ่งที่สำคัญ ทางคณะผู้วิจัยจึงเสนอแนวทางที่จะรักษาความร่วมมือของผู้บริจาด โดยการจัดทำประกาศนียบัตร และโล่รางวัลให้กับผู้บริจาดอาหารที่แสดงปริมาณอาหารที่บริจาดต่อเดือนให้กับทาง



มูลนิธิ จำนวนมืออาหารที่องค์กรเหล่านั้นบริจาคให้กับผู้ขาดแคลนอาหาร และระยะเวลาที่องค์กรเหล่านั้นร่วมมือกับทางมูลนิธิรักษอาหาร สิ่งเหล่านี้จะช่วยสนับสนุนนโยบายความเป็นมิตรต่อสิ่งแวดล้อมในองค์กรของผู้บริจาค อีกทั้งยังช่วยส่งเสริมภาพลักษณ์ที่ดีให้แก่ผู้บริจาค เพื่อจูงใจให้เกิดความร่วมมือมากยิ่งขึ้น

นอกจากนี้ ทางคณะผู้วิจัยได้แนะนำให้ติดป้ายย้ำเตือนเรื่องขยะอาหารใกล้กับบริเวณจุดตัดอาหารบุฟเฟต์ในโรงแรมที่บริจาคอาหาร ซึ่งจะทำให้ลูกค้าตระหนักว่าอย่าตัดอาหารมากจนล้นจาน เพื่อที่จะได้ไม่เกิดปัญหาอาหารส่วนเกินในปริมาณที่มากจนเกินไป อีกทั้งยังแสดงถึงการทำงานร่วมกันระหว่างโรงแรมกับมูลนิธิรักษอาหาร และประโยชน์อีกอย่างหนึ่งคือ การลดปริมาณขยะอาหารลง ทำให้ผู้บริจาคลดงบประมาณด้านการจัดการขยะอาหารให้น้อยลงอีกด้วย ซึ่งหากประสบความสำเร็จ ก็จะเป็นการช่วยโฆษณามูลนิธิรักษอาหารไปในตัวอีกด้วย

ข้อเสนอแนะที่ 3 การขยายฐานผู้บริจาคอาหารเพื่อรับอาหารบริจาคที่เจาะจงประเภท เพื่อให้ผู้รับได้รับสารอาหารที่หลากหลายมากยิ่งขึ้น

ผู้รับอาหารบริจาคได้ตั้งข้อสังเกตว่า อาหารที่ได้รับจากการบริจาคประเภทเนื้อสัตว์นั้นไม่เพียงพอต่อความต้องการ ทำให้ผู้รับอาหารบริจาคได้รับสารอาหารที่มีคุณค่าทางโภชนาการลดลง ขณะเดียวกันพวกเขาได้รับอาหารประเภทเบเกอรี่และขนมปังเป็นจำนวนมาก ซึ่งส่งผลเสียต่อสุขภาพ นอกจากนี้ยังน่าเสียใจอีกด้วย ทางมูลนิธิรักษอาหารไม่ได้แจ้งกับทางผู้บริจาคอาหารโดยตรง เพราะทางมูลนิธิยินดีรับอาหารทุกประเภทที่อยู่ในสภาพดีและสามารถรับประทานได้จากผู้บริจาคอาหาร อย่างไรก็ตามทางคณะผู้วิจัยได้เสนอแนวทางการแก้ไขปัญหานี้ โดยการให้ทางมูลนิธิรักษอาหารหาผู้บริจาคอาหารให้มีความหลากหลายมากขึ้นเพื่อบริจาคอาหารที่มีประโยชน์ให้เพียงพอต่อความต้องการของผู้รับ เนื่องจากผู้บริจาคอาหาร ณ ปัจจุบันบริจาคเนื้อสัตว์และโปรตีนเป็นส่วนน้อย ดังนั้นคณะผู้วิจัยได้แนะนำให้ทางมูลนิธิรักษอาหาร เข้าถึงร้านขายเนื้อสด โดยเฉพาะตลาด และซูเปอร์มาร์เก็ตมากยิ่งขึ้น ผู้บริจาคเหล่านี้สามารถจัดหาอาหารประเภทเนื้อสัตว์ ซึ่งผู้รับอาหารบริจาคมีความต้องการเป็นอย่างมาก

ข้อเสนอแนะที่ 4 การให้ความรู้แก่ผู้รับอาหารบริจาคในการใช้ประโยชน์จากอาหารส่วนเกินที่ได้รับและการจัดการกับขยะอาหารอย่างถูกวิธี

คณะผู้วิจัยเสนอแนวทางให้มูลนิธิรักษอาหาร ให้ความรู้แก่ผู้รับอาหารบริจาคเพื่อให้พวกเขาสามารถใช้ประโยชน์จากอาหารได้อย่างเต็มที่ คณะผู้วิจัยได้แนะนำให้มูลนิธิรักษอาหารจัดทำแผนกลยุทธ์ที่ใช้งานได้กับผู้รับอาหารบริจาคบางคนและสามารถถ่ายทอดความรู้เหล่านั้นไปให้กับผู้อื่น เช่น สูตรอาหาร, การทำปุ๋ยหมัก และ การกระจายอาหารของชุมชน

สูตรอาหารที่คิดค้นขึ้นจากวัตถุดิบที่มีอยู่โดยมูลนิธิรักษอาหารสามารถช่วยสร้างมืออาหารที่ผู้รับอาหารบริจาคอาจจะคาดไม่ถึง และ ไม่ทำให้อาหารที่ได้รับเกิดการเน่าเสีย หรือ เสียเปล่า ทางคณะผู้วิจัยพบตัวอย่าง 2 กรณีที่เกิดขึ้นจากการลงพื้นที่ กรณีแรก มูลนิธิบ้านพระพร (House of Blessings) ต้องการสารอาหารประเภทโปรตีน แต่ไม่ต้องการหิวปลา เพราะมีส่วนที่เป็นก้างมากกว่า เนื้อ อย่างไรก็ตามทางมูลนิธิบ้านพระพรสามารถนำหิวปลานั้นไปประยุกต์ใช้สำหรับประกอบอาหารประเภทแกงและซุปรต่างๆ ซึ่งได้อาหารหลากหลายรายการมากขึ้น แต่ในขณะที่กรณีที่สอง มูลนิธิเมอซี ฟาร์ม (Mercy farm) ได้รับขอสมะเชื้อเทศจากการบริจาค แต่สุดท้ายไม่ได้นำไปบริโภค เพราะไม่ทราบวิธีรับประทานขอสมะเชื้อเทศคู่กับอาหารประเภทอื่นนอกเหนือจากเส้นพาสต้า (Pasta) ทั้งที่สามารถประยุกต์ใช้ในการประกอบอาหารไทยได้ เช่น น้ำพริกมะเชื้อเทศ, น้ำจิ้มลูกชิ้น และ แกงมะเชื้อเทศ

อาหารส่วนเกินที่เน่าเสียและอาหารบางประเภทที่ผู้รับอาหารบริจาคไม่ต้องการ เป็นสิ่งสำคัญที่จะใช้สอนให้ผู้คนในชุมชนรู้จักวิธีการจัดการกับอาหารเหล่านั้น ทางมูลนิธิรักษอาหารได้สอนวิธีการทำปุ๋ยหมัก และ การปลูกพืชผัก ให้กับ มูลนิธิเมอซี ฟาร์ม เพื่อให้พวกเขาสามารถปลูกผักและผลไม้สดได้ด้วยตนเอง ชุมชน 2 ใน 4 แห่งที่คณะผู้วิจัยไปลงพื้นที่ ยังไม่มีระบบการจัดการปัญหาขยะอาหารเช่นนี้ ดังนั้นคณะผู้วิจัยจึงแนะนำให้มูลนิธิรักษอาหารจัดแผนการสอนวิธีการหมักและผสมปุ๋ย ให้กับผู้คนในชุมชนที่สนใจ

สำหรับผู้รับอาหารในบริเวณชุมชนเองก็จำเป็นต้องมีวิธีที่เหมาะสมในการกระจายอาหารที่ได้รับจากการบริจาคให้กับสมาชิกทุกคนในชุมชนอย่างทั่วถึง เพื่อให้มั่นใจได้ว่าทุกคนได้รับอาหารในสัดส่วนและปริมาณที่เหมาะสม ตัวอย่างเช่น ชุมชนประชาอุทิศ 79 ไม่มีวิธีการจัดสรรอาหารที่ทำให้มั่นใจได้ว่าแต่ละคนในชุมชนได้รับอาหารเพียงพอสำหรับคนในครอบครัวและตนเองหรือไม่ แต่ในขณะที่มูลนิธิบ้านพระพร ประสบความสำเร็จในการจัดสรรอาหารให้ทุกคนในสัดส่วนที่เหมาะสม โดยการจัดเตรียมและแจกจ่ายอาหารให้ทุกคนในมูลนิธิได้อย่างทั่วถึง ซึ่งได้ทราบข้อมูลจากการ

สัมภาษณ์ตัวแทนของมูลนิธิบ้านพระพร คุณหน้อย เป็นผู้มีหน้าที่รับผิดชอบด้านการตรวจสอบอาหาร ก่อนนำมาให้ผู้คนในมูลนิธิรับประทาน การปรุงอาหาร และ การกำหนดสัดส่วนและปริมาณที่สามารถ ทำให้มั่นใจได้ว่าทุกคนได้รับอาหารที่ดีอย่างทั่วถึง

## **บทสรุป**

โครงการวิจัยนี้มีวัตถุประสงค์เพื่อพัฒนาความสัมพันธ์ที่ดีของมูลนิธิรักษอาหารกับผู้มีส่วนเกี่ยวข้องทั้งหมด ได้แก่ ผู้บริจาคอาหารและผู้รับอาหารบริจาค โดยการสร้างวิธีนำเสนอข้อมูลที่เป็นประโยชน์กับมูลนิธิรักษอาหารให้เป็นที่รู้จักมากยิ่งขึ้น และ การประเมินการดำเนินงานในปัจจุบันของทางมูลนิธิรักษอาหารในการจัดการกับปัญหาอาหารส่วนเกิน และการส่งมอบอาหารส่วนเกินเหล่านั้นให้กับผู้รับบริจาคอาหารในแต่ละชุมชนที่เป็นเครือข่ายกับมูลนิธิรักษอาหาร คณะผู้วิจัยได้ผลลัพธ์ของการดำเนินงาน จากการสังเกต การสัมภาษณ์ การเก็บรวบรวมข้อมูลและนำข้อมูลเหล่านั้นมาวิเคราะห์ พร้อมเสนอแนวทางการปรับปรุง แก้ไขปัญหาที่คณะผู้วิจัยพบเห็นให้แก่มูลนิธิรักษอาหาร สุดท้ายนี้ คณะผู้วิจัยหวังเป็นอย่างยิ่งว่าจะมีส่วนช่วยให้มูลนิธิรักษอาหารบรรลุวัตถุประสงค์ในการใช้ประโยชน์จากอาหารส่วนเกินอย่างคุ้มค่าสูงสุด และทำให้มูลนิธิรักษอาหารเป็นที่รู้จักในวงกว้างมากยิ่งขึ้น อีกทั้งยังสร้างความตระหนักถึงความเสียหายที่เกิดจากปัญหาอาหารส่วนเกินและขยะอาหารในสังคมไทยอีกด้วย

## Introduction

The Food and Agriculture Organization (FAO) of the United Nations describes “food loss” as the decrease in quantity or quality of food resulting from decisions or actions of food suppliers, such as food that is discarded along the food chain from harvest to slaughter up to, but not including, the retail level. The FAO also describes “food waste” as the decrease in quantity or quality of food resulting from retailers, food service providers, and consumers, such as suboptimal produce, foods close to “use-by” or “best-before” dates, and an excess of food unused or leftover from households and eating establishments. Surplus food, the focus of this project, encompasses a little bit of both and can arise at all stages of food production. Throughout this project, the concentration will be on the surplus of food from food suppliers and hotels, thus mostly excess products, products close to expiration or their “best-by” dates, damaged products not fit to sell, and leftover food from hotel food services.

In the 2019 FAO report, it states that there are roughly 1.3 billion tons of food produced every year for human consumption around the world, one-third of which ends up lost or wasted. Ten thousand of these tons come from Bangkok alone, every day. According to Srisuwannaket and Liumpetch of *The Bangkok Post*, food waste makes up 64% of the city’s total garbage, with only 2% being properly recycled due to the lack of a waste sorting system. Therefore, the rest often ends up in landfills, the most common waste management strategy around the world, and the one strategy that contributes 8% of the total greenhouse gas emissions (Food and Agriculture Organization of the United Nations, 2019).

According to the *Pacific Asia Travel Association*, the average Bangkok grocery store throws away up to 200 kgs of edible food a day, with the average 5-star hotel buffet throwing away up to 50 kgs of edible food per each service period, thus these industries being the leading source of surplus food in the city. This amounts to an amount of food that can generously feed 50 and 13 individuals, respectively per day. Recently, hotel and retail industries have been spearheading food waste reduction by donating their past-date and surplus food to nonprofit organizations for further distribution to charities and needy communities. The most hygienic of these being Scholars of Sustenance (SoS Thai), which began when the organization’s founder, Bo Holmgreen, noticed large amounts of surplus food being wasted in tourist hotels, while the communities surrounding the city have little to eat on a regular basis.

SoS Thai wants to improve relationships with food donors and recipient organizations, while also increasing their public presence by creating marketable data and assessing current practices of managing surplus food. Through research, observation, and interviews, we formulated marketable tools for SoS to use for expansion. These tools include two infographics, one to raise the public awareness of the organization and one to gain new donors, and small promotional materials for current donors. The promotional materials would be used to encourage cooperation by showing partnership between donors and SoS and decrease the amount of food waste that occurs from hotel buffets and eating establishments. We also combined our findings from interviews to help SoS Thai improve the system of donating food to recipients to ensure people are getting enough food and that no food is unwanted in certain communities.

## **Background**

### **2.1 A Global Surplus of Food**

According to Rujivanarom of The Nation, over 815 million people around the world suffer from malnutrition and hunger, while 25% of the population (1.9 billion people) in developed countries are obese. As stated in the introduction, 1.3 billion tons or one-third of food produced for human consumption get lost or wasted around the world per year. That means, if all of that wasted and lost food were to be rescued around the world, each and every hungry person would receive 1,447 kgs of food per year. To put this in perspective, the average American consumes a little under 907 kgs of food a year (Aubrey, 2011).

This indicates a major imbalance in the access to food around the world, and in Thailand alone there is close to an even proportion of those starving and those overweight. In 2017, the Biodiversity, Sustainable Agriculture, & Food Sovereignty Action Thailand Foundation (BioTech) published a report on the food security situation in Thailand. The foundation's director, Withoon Lienchamroom, found that even though Thailand is a major export country, there is a widening inequality gap of access to food for the country's population. There are over 6.5 million people not getting enough food and 600,000 children suffering from malnutrition which affects physical development, while the obesity rate has doubled in the past decade with up to 5 million people being overweight. Lienchamroom states that the worsening food security situation is due to more frequent disasters and wars occurring around the world. While at the same time in Asia alone, 449 million tons of food was wasted, more than enough to feed those affected by disasters and war all over the continent (Biodiversity, 2019).

#### **2.1.1 The Importance of Nutrition**

A proper healthy diet must include a variety of foods with proper proportions per day in order for organs to function efficiently. Without proper nutrition, the body is more prone to disease, infection, and fatigue. According to the UN Refugee Agency, malnutrition is a major problem in mass population movements which include the refugees that have traveled to Thailand to avoid persecution in their home countries. The UN has also found that poor diets and vitamin and mineral deficiencies contribute to delayed childhood development which can cause irreparable damage, and for those suffering from chronic illnesses, adequate nutrition is vital to maintaining the immune system.

The United States Department of Agriculture (USDA) outlines the following estimated calorie needs by age and gender. These are shown below (Estimated calorie needs per day by age, sex, and physical activity level, 2020).

- children ages 2 to 8 years: 1,000 to 1,400 calories
- girls ages 9 to 13 years: 1,400 to 1,600 calories
- boys ages 9 to 13 years: 1,600 to 2,000 calories
- active women ages 14 to 30 years: 2,400 calories
- sedentary women ages 14 to 30 years: 1,800 to 2,000 calories
- active men ages 14 to 30 years: 2,800 to 3,200 calories

- sedentary men ages 14 to 30 years: 2,000 to 2,600 calories
- active men and women over 30 years: 2,000 to 3,000 calories
- sedentary men and women over 30 years: 1,600 to 2,400 calories

The food pyramid, shown in Figure 1, illustrates the optimal proportion size of the five major food groups for one day in order to maintain a healthy diet.



**Figure 1:** Food pyramid (Bhangoo, 2015)

According to Ryan Andrews of Precision Nutrition, the average well-off person generally consumes between three and five pounds (1.4 - 2.3 kgs) of food a day. Some extreme examples of four pounds (1.81 kgs) of food provided by Andrews are shown below.

- 1.81 kgs of raw vegetables = 400 calories
- 1.81 kgs of raw fruits = 1000 calories
- 1.81 kgs of cooked whole grains/legumes = 1600 calories
- 1.81 kgs of nuts/seeds = 10,000 calories

Andrews also found that the average person in the United States consumes the following in a day:

- 0.9 kgs of meat, dairy, and eggs
  - 0.68 kgs of fruits and vegetables
  - 0.22 kgs of grains
  - 0.22 kgs of added sugars, fats, and oils
- = 2.04 kgs  
= about 3,700 calories, an average healthy calorie consumption

But, if you switched the foods around a little bit you get:

- 1.13 kgs of fruits and vegetables
  - 0.45 kgs of grains and legumes
  - 0.14 kgs of nuts/seeds
  - 0.14 kgs of meat, dairy, and eggs
  - 0.05 kgs of added sugars, fats, and oils
- = 1.91 kgs  
= about 2,075 calories, low-calorie consumption especially for active individuals

According to SoS Thai, on any random day, they donate around 10,000 kgs of bakery items, 6,000 kgs of beef, pork, and chicken, and around 16,000 kgs of fruits and vegetables. This means the foods that the recipients are consuming look more like the second breakdown of foods consumed.

## **2.2 Environmental Impact of Lost and Wasted Food**

“There’s the waste of the food itself. The waste of the money associated with producing the now wasted food. The waste of labor associated with all of the above. And the social inequity between people who really need food, but cannot get it and those who have too much and just trash it. And for climate change? It’s a huge deal.” This is a quote by Jan Ellen Spiegel in an article from *Yale Climate Connections* where she discusses the impact of surplus food. Based on a study by *Project Drawdown*, which consists of experts focused on climate change solutions, the ranking of food waste is number three on the list of solutions. Not only that, but according to the *World Resources Institute*, if food waste were a country it would be the third-largest emitter of greenhouse gases. The major parts of food waste that end up causing the majority of greenhouse gases are emissions from farms and the supply chain because of the excess of resources used. The FAO estimated that about \$940 million, or 29.8 billion baht, of food is lost throughout the entire food supply chain.

Otterdijk and Meybeck of the FAO and Gustavsson, Cederberg, and Sonesson of the Swedish Institute for Food and Biotechnology conducted a study for the International Congress at Interpack 2011, in Germany on food losses and waste throughout the different stages and types of losses of food, from farm to disposal, in the food supply chain (FSC). As stated in the introduction, surplus food occurs at all stages of food production and this is shown in Table 1. Gustavsson, Cederberg, Sonesson, Otterdijk, and Meybeck also found that in medium and high-income countries, a great amount of food is often wasted even if it is still suitable for human consumption, but significant losses still occur in the early stages of the food supply chain. In lower-income countries food is mainly lost during the early and middle stages and much less food is wasted on the consumer level.



	<b>Vegetable commodities &amp; products</b>	<b>Animal commodities &amp; products</b>
<b>Agricultural production</b>	losses due to mechanical damage and/or spillage during harvesting	losses due to animal death during breeding, loss of fish due to discards during fishing, losses due to decreased production due to animal illness
<b>Post-harvest handling &amp; storage</b>	losses due to spillage and degradation during handling, storage, and transportation	losses due to animal death during transport to slaughter/condemnation at slaughterhouse, losses due to spillage/degradation during icing, packaging, storage, transportation
<b>Processing</b>	losses due to spillage and degradation during industrial/domestic processing, losses due to suboptimal appearance or during cooking process	losses due to trimming spillage, losses due to industrial processing/treatments
<b>Distribution</b>	losses and waste in market system	losses and waste in market system
<b>Consumption</b>	Losses and waste at the household and food service industry level	Losses and waste at the household and food service industry level

**Table 1:** Losses during different steps in FSC (Gustavsson, Cederberg, Sonesson, Otterdijk, & Meybeck, 2011)

These five stages contribute to a food's carbon footprint, which is a way of measuring how much carbon dioxide and other greenhouse gases, such as methane, are emitted into the atmosphere during the process of food production. The emissions within the food system have to be taken into consideration. Vermeulen, Campbell, & Ingram of The Annual Review of Environment and Resources (2012), break these emissions down into three main stages:

- pre-production (fertilizer, animal feed production, pesticide)
- production (direct and indirect emissions from agriculture)
- post-production (storage, packaging, transport, refrigeration, food management, waste disposal)

Vermeulen, Campbell, & Ingram estimate that the global emissions from these three stages are: 345 - 775, 7,318 - 12,683, and 1,534 metric tons of carbon dioxide, respectively. It is important to consider the entire life cycle of food production when assessing food wastage to understand that waste management only encompasses a small fraction, less than one percent, of a single piece of food's carbon footprint.

Joseph Poore of the University of Oxford, and Thomas Nemecek of the Agroecology and Environment Research Division in Zurich, Switzerland assessed the effect of 40 major food products, that represent the majority of what is eaten on a global scale, on climate-warming greenhouse gas emissions in 2019. Poore and Nemecek analyzed data from 40,000 farms and 1,600 processors, packaging types, and retailers to see how different production practices and geographies affect the planet. This information is relayed in an article from *BBC News* in the form of a climate change food calculator in order to show people the impact of their diets on the environment. The reader selects a type of food and how often they eat it. Then the calculator tells them:

- how much that food contributes to your annual greenhouse gas emissions as well as the equivalent in driving distance
- the amount of time you can heat a house for that amount of greenhouse gas emissions
- how many liters of water consumption the food takes up during production

- how much land food production uses
- Appendix A shows all of the different foods and their impacts.

## 2.3 Food Waste Management in Thailand

An article published in the Environmental Monitoring and Assessment, written by Chart Chiemchaisri, Jeanger Juanga Labayen, and Chettiyappan Visvanathan, talks about the changes in municipal waste management in Thailand from before the 1990s until the early 2000s in this case study conducted in 2004. Chiemchaisri, Labayen, and Visvanathan stated that up until the 1990s, a large portion of waste collected from urban areas in Thailand were placed in open dumping sites, but in the past few decades, there has been a gradual improvement toward using sanitary landfills instead. Up until the early 2000s, more than 60% of waste was still being disposed of in open dumping sites. This was due to Thailand's main waste management strategy focusing on bulk collection and mass disposal. Then, there is the fact that there is a monopoly held by waste collection companies, who often do not have any type of sorting system and do not plan to add one, that municipalities will still often choose to give their money to. The Public Cleansing Department (PCD) inside the Bangkok Metropolitan Administration (BMA) is responsible for the collection of solid waste. The BMA operates the only solid waste management system in Thailand, which collects and transports municipal waste from its districts.

In 2008, there were a total of 425 waste disposal sites throughout Thailand, 95 of which are landfills, and 330 were open dumpsites (Chiemchaisri, Labayen, & Visvanathan, 2008). According to Chiemchaisri, Labayen, and Visvanathan, methane from landfills and open dumpsites is produced during the breakdown of organic matter by the action of microorganisms. They also stated that even though there are more dumpsites than landfills, landfills have higher methane generation than dumpsites because dumpsites are more anaerobic due to a barrier on top that provides more favorable conditions for methane production.

In 2017, an article was published in the United Nations Centre for Regional Development written by Tharee Kamuang of the Green Amity Co., Ltd. and Associate Professor Dr. Orawan Siriratiriya who is also a part of the resources management for the Sustainability (3R) Foundation. Kamuang and Siriratiriya stated that between 2008 and 2011, there was a 3% increase in food waste reutilization from local efforts of recycling, composting, and waste to energy projects. According to the Journal of Environmental, in 2011 the National 3Rs Strategy and the 3Rs Act was implemented. This aimed to nationally increase organic waste utilization by 50% by 2026 and to encourage cities to separate food waste. This was the first nation-wide act that addresses the food waste problem in the country.

Kamuang and Siriratiriya stated that the 3Rs strategy encourages activities through cooperation among stakeholders to implement effective waste management. The activities include recycling, community 3Rs activities, resource efficiency, source separation, and re-utilization, meant to provide incentives and public participation. The campaign for 3Rs was pushing these activities nationwide to promote the effectiveness of food waste management in hopes that awareness and participation would increase. Some examples of these activities that appeared throughout Thailand are green labels (environmental certification awards to products or services), the waste bank (buys back waste in terms of a deposit), and the Zero Baht Shop (which provides at-source segregation).

*The Strait Times* (2018) states that the master plan under the 3Rs strategy specifically encourages the private sector to invest in waste disposal plants, with 44 provinces already doing so, but state no requirements for local administrations. Less populated areas with below 50 tons of waste generated daily are advised to locally process waste into fertilizer or to bury garbage in local sanitary landfills. Ecological Alert and Recovery Thailand director, Penchom Saetang, has criticized the promotion of private investment in small waste-to-energy projects across the country. Saetang stated that it is one of the most polluting methods for waste management and power generation because burning garbage emits toxic pollutants, and the leftover ashes, are hazardous and must be disposed of carefully in a secure landfill. The lack of waste segregation comes back into play here for the waste-to-energy plants, where they burn garbage for power without segregating out the less-flammable material, which causes more environmental problems and damages the operation system of the plants.

Some supermarkets around the country donate their surplus food straight to charities or farms to be used as compost to ensure reutilization. According to Srisuwannaket and Liumpetch, these supermarkets also have their own internal systems to reduce food loss and waste, including procuring products directly from farmers and packing produce at the farms to minimize spoiled goods. Hotel, retail, and restaurant industries are spearheading food waste reduction by donating excess food as well. With no national policies, there are no legal protections for food donors and distributors though. Scholars of Sustenance (SoS Thai) is currently the only food waste distributing organization in the country that meets proper hygiene standards, but they are still at high risk of lawsuits, should the food cause any illness forcing full responsibility on them (Srisuwannaket & Liumpetch, 2019). SoS Thai will be elaborated on and explained in more detail further in this chapter.

## **2.4 Food Rescue Organizations Around the World**

OzHarvest is the leading food rescue organization in Australia that currently rescues over 180 tons of food nationally each week from 3,500 food donors consisting of “supermarkets, hotels, airports, wholesalers, farmers, corporate events, catering companies, shopping centers, delis, cafes, restaurants, film and TV shoots, and boardrooms” (OzHarvest, 2020). The organization directly delivers the rescued food to over 1,300 charities, helping those in need throughout the country. It was founded in 2004 by Ronni Kahn AO in Sydney after deciding that the huge volume of edible food that goes to waste in the hospitality industry had to be dealt with in a different way. One of the first donations came from Goodman + Foundation among many others, which helped the founder to deliver 4,000 meals in the first month alone. The organization also has several educational programs “to help enable a positive change for vulnerable people”, and they recently opened the first rescued food supermarket in Australia (OzHarvest, 2020). The OzHarvest Market, located in Sydney that operates on a “take what you need, give if you can” policy. The organization operates under four pillars: rescue, eliminate food waste through redistribution; educate, increase community connectedness and awareness; engage, encourage the community to get involved; and innovate, to find new ways to combat food waste (OzHarvest, 2020).

Second Harvest is an organization located in Canada that is the largest food rescue charity in the area with a dual mission of protecting the environment and giving food to the hungry. According to the Second Harvest official website, they use direct delivery and an online

platform (<https://foodrescue.ca/>) to recover nutritious, unsold food from over 1,200 donors that are redistributed to 1,080 social service organizations throughout Ontario and British Columbia. Their free service nourishes people through school programs, senior centers, shelters, food banks, and regional food hubs. The organization has been in operation for 35 years and has rescued “155 million pounds of healthy food, preventing 192 million pounds of greenhouse gases” that would have been emitted from landfills (Second Harvest, 2019). Second Harvest does not only rescue from markets, restaurants, and distributors, but they rescue food all across the supply chain including farmers and processors.

## **2.5 Who is SoS Thai?**

Scholars of Sustenance Global was established in late 2012 and is funded privately by the founder Bo H. Holmgreen. The food rescue charter was approved in 2014 when the non-profit status was established, and local foundation paperwork was filed in Thailand. By 2015, SoS Thai was established in Bangkok, and in 2016 SoS Indonesia was founded. In July alone, SoS Thai rescued 31.3 tons of food, redistributed it to communities in need, gained 105 food donors, served approximately 129,120 meals per month, and diverted 59.47 tons of carbon dioxide gas emission from landfills (Scholars of Sustenance, 2019).

In our conversation with Bruce Chen, SoS Thai’s liaison, the foundation rescues between one and one and a half tons of food per day from over 20 food donors and donates the food to one or two of their 20 charities and organizations. The operation employs seven refrigerated truck drivers and has four food trucks used to retrieve and deliver food on a daily basis. There can be minor issues with the usage of refrigerated trucks, though. According to L.C. David of ToughNickel, leaving a refrigerator door open for too long will warm up the food and this can cause the compressor inside to overheat and shut off completely until it cools down, which causes the need for repair more often.

Each driver is specially trained by SoS Thai employees to properly inspect the quality of the food several times before moving on to the next stop. The SoS Thai employees are typically back at their office ready to help with any issues that arise during their daily operations. They are also there to manage the data that is collected by the drivers. This data is crucial to helping this organization be sustainable and legitimize their operations. SoS Thai’s recent numbers show a general trend of growth. SoS Thai tracks their progress in terms of ‘price per meal’. With all of the food collected, the number of meals served can be determined. Taking the other expenses SoS Thai has (fuel for the trucks, manpower, bills, etc.) into consideration, a ‘price per meal’ is calculated. According to Bruce Chen, the organization currently has a ‘price per meal’ of about 6 baht.

Aside from giving leftover food to communities in need, SoS Thai has methods in which the surplus food is turned into compost or animal feed. SoS Thai preserves precious natural resources and creates a more environmentally friendly food distribution system that also has economic value. With SoS Thai employees being so few, they rely heavily on the support and participation of the donors. These donors are typically restaurants, hotels, and grocers. Because SoS Thai requires reliable donors to be successful, these participants are a part of the future of sustainable food waste management. SoS Thai is also one of a kind in terms of proper care and management of the food once it is deemed ‘waste’; therefore, the success of this organization is

crucial to the food waste management in Bangkok, which is one driver for the broadening of their scope of work and increasing their sustainability (Scholars of Sustenance, 2019).

### 2.5.1 SoS Thai Food Donors

According to an article by Rachel Lee, published in the Bangkok Marriott Marquis Queen's Park Hotel website, Marriott set a goal to send zero food waste to landfill sites, and have successfully achieved the goal at its main all-day dining restaurant, Goji Kitchen + Bar, by partnering with SoS Thai. Through this initiative, as of 2019, the hotel contributes 37.5 kilograms of food per day from Goji Kitchen + Bar to the SoS network which serves over 3,000 meals daily to poor communities around Bangkok, which will be discussed further in section 2.5.2.



**Figure 2:** Bangkok Marriott Marquis Queen's Park employees helping load SoS truck (Lee, 2019)

On 25 September 2018, Tesco Lotus promoted a campaign about reducing food waste through the screening of the film “WASTED!” by Anthony Borden. According to Tesco Lotus’ website, Tesco Lotus stores currently have a total of 40 branches in Bangkok including 5 distribution centers that regularly donate safe and edible food to SoS Thai. In addition, Tesco Lotus has started to launch the campaign “Tesco’s farm to fork” to reduce food waste together between producers and consumers to sustain the environment in the long term.





**Figure 3:** Tesco Lotus promotes a campaign to reduce food waste (*Translation: Tesco Lotus continues to expand their campaign “Eating Without Waste”*) (Tesco Lotus continues to reduce food waste..., 2018)

According to Banyan Tree’s official website, Banyan Tree has been putting in the effort to connect with the issue of global climate change by conserving resources through efficient operations. They are one of the partnerships with SoS Thai that will be collected and distributed. The edible food is sent to the people that are suffering from hunger. Since 2018, Banyan Tree Bangkok has donated 2,287 kilograms of food which is equal to a greenhouse gas emission saving of 4,345 kilograms, so their food donations already provided over 9,605 meals to those in need.



**Figure 4:** JW Marriott Hotel Bangkok donating surplus food to SOS Thai

As of February 2020, SoS Thai has 105 food donors which include restaurants, hotels, and grocery store branches.

### 2.5.2 SoS Thai Food Recipients

Since 2015, SoS Thai has been donating food to slum communities, orphanages, religious organizations, and refugee camps. In total, they have been working with around 20 different food recipient organizations around Bangkok. It is easy to become a recipient just by simply contacting the organization and they will work with the community to set up a method. All of the recipients can trust the SoS team since they have a standard process to ensure that the food donation is safe (Scholars of Sustenance, 2019). Below are several communities working with SoS Thai.

#### Slum Communities

According to Atchara Sorawaree, the secretary-general of the non-governmental organization *Issarachon Foundation*, the slum community has continued to grow in Bangkok with the number of homeless people in 2019 “surging to 4,392 which is 10% higher” than the previous year. In addition, with the recent transformation project plans by the government in the Klong Toey district, there are about 12,500 low-income families who are being forced to move somewhere else (Bangkok Post, 2019). With the excess food in Bangkok, the SoS team wants to work with these slum communities and help them stay healthy. According to Bruce Chen, SoS works with the Lad Bua Khao Community, Rangsit Pathumthani 43, Onnut 14 Rai Community, and Bangkok Noi Community.

The Bangkok Noi Community consists of approximately 100 people. According to Monruedee Jansuttipan of BK Asia, this is a homeless shelter where the residents will take on any odd job that they can find, for things such as demolition or building. Others also sell scrap or work on the farming project they have set up in the community, which includes growing vegetables and fishing in the pond. The community even received live goats, chickens, and ducks from Thonglor Root Garden that helps them produce some of their own food and sell it at a cheap price.

#### Orphanages

SoS Thai also works with the orphanages located throughout Bangkok such as Mercy Centre, House of Blessing, and Duang Prateep Foundation. There are an estimated 30,000 children who live and work on the streets of Thailand, who are exploited for labor, sex, and criminal enterprises (MacLean, 2014). According to the *Borgen Project*, a nonprofit organization that addresses poverty and hunger, Thailand has made progress in reducing child poverty from 67% in 1986 to 7.2% in 2015, however, there are still an estimated one million children living in vulnerable conditions throughout the country.

Mercy Centre is an organization that works to help the children and communities of the slum. According to the Mercy Centre website, they build and operate schools, improve family health and welfare, combat the AIDS crisis, offer shelter to orphans/street children, and protect street children’s rights. It is part of the Human Development Foundation (HDF) which started in 1991 as a shelter program for a dozen street children at its Mercy Centre. All HDF child protection programs have expanded from the care of these original Mercy street children. They have twenty-three slum kindergartens in Bangkok, provided over 500 sponsorships, and



sheltered 180 kids. They are accomplishing their main principle of helping the poor help themselves (Mercy Centre, 2020).



**Figure 5:** Children being supported by the Mercy Centre (Mercy Centre, 2020)



**Figure 6:** Children living at House of Blessing (House of Blessing, 2020)

House of Blessing provides assistance to youth who are struggling with family problems, drugs or have been convicted as prisoners before. The foundation does not limit to any nationality or religion, so anyone is welcome, but they are required to follow set regulations. They train every person in a way that they can be ready to pursue an honest career in society. The minorities learn to read, write, and live in a place with one big family. The organization's future objectives are to open a new family house as a place for shelter and to be able to promote education even further (House of Blessing, 2020).

The Duang Prateep Foundation (DPF) focuses on education, child abuse, and welfare of the elderly and slum youths. According to the DPF website, they carry out their service through community kindergartens, educational sponsorships, rehabilitation centers, in-home support, traveling puppet troupes, credit unions, and other regular activities at their center. The foundation is heavy on volunteering and teaching kids values and new skills in life. The kindergartens are the heart of the foundation because it originally began as a refuge for young children from the slums who were left alone. For the youths that have been abused, they offer a center for rehabilitation to restore their health in a safer environment. (Duang Prateep Foundation, 2020).



**Figure 7:** Volunteer teaching kids English (Duang Prateep Foundation, 2020)

## Religious Organizations

SoS Thai also works with several religious organizations. Some are churches seeking to help refugees and provide safe places of worship for those who faced persecution in their home countries, such as the Vietnam Church. SoS Thai helps these organizations achieve their goals by delivering donated food for those seeking shelter, or those in need of a meal.

Another organization that SoS Thai partners with is the Good Shepherd Sisters Foundation. It was founded by Sister Louise Horgan, an Irish missionary who lived in Thailand for many years. According to their website, the foundation was first established in 1965 in Din Daeng, Bangkok and the goals of the foundation are to give love, shelter, and pay respect to those who are most deprived and rejected in society, especially women and girls. The foundation provides many programs to comfort women and children such as Mother and Baby home, Teen Residential Care, Day Care Centre, Refugee Program, Adult Education, and Fatima Self-Help Centre. Currently, the Good Shepherd Foundation successfully sent 400 women to school to complete primary education, 700 have achieved the level of M3, and 54 women have graduated from higher studies and have earned a university degree (Good Shepherd Sisters, 2019).

## Refugees

The statistical data of refugees in Thailand is shown in Figure 8. This number includes the Vietnamese and the Pakistani refugees living scattered around refugee shelters in Thailand. According to Asylum Access, the majority come from Pakistan, Palestine, Syria, Sri Lanka, Vietnam, Somalia, and China, and all are fleeing armed conflict and persecution in their home countries. Amnesty International states that there is a lack of migration status in Thailand, thus refugees are subject to arbitrary arrest and detention, resulting in the separation of many families. Amnesty International also calls on the Thai government to implement laws and policies to ensure full rights and protections for refugees with the international human rights law.



**Figure 8:** The number of refugees in Thailand according to UNHCR (UNHCR, 2020)

According to our sponsor, there are shelters throughout Bangkok for refugees, such as the Pracha Uthit 79 Refugee shelter, however, an exact number was not disclosed to us. There are two main organizations in Thailand that help the refugees, the United Nations High Commissioner for Refugees (UNHCR) and Asylum Access Thailand (AAT). The UNHCR (United Nations High Commissioner for Refugees) is a global organization that's dedicated to

protecting rights and building a future for refugees. They want to ensure that everybody has the right to seek asylum and find safe refuge for those who were forced from their homes. UNHCR was first created in 1950 after World War II, aiming to rescue European victims who had lost their shelters.



**Figure 9:** Ambassador of UNHCR with refugees (UNHCR, 2020)

According to their website, AAT was established in 2007, and ever since they have provided counseling and a place of protection for refugees seeking asylum. AAT has partnerships with other organizations to “advocate for changes in Thai law and policy that will create stronger protections for refugees and asylum-seekers throughout the region”. AAT launched a program called Community Paralegal, and the purpose was to “provide access to justice and empowerment to the community of asylum seekers and refugees in Bangkok”.

## **Methodology**

In this chapter, we describe the information we sought, and the process in which information was collected. We began by shadowing SoS Thai truck drivers and interviewing the employees to improve our knowledge of the current processes the organization has in place. We also led a series of interviews with both food recipients and food donors to learn what the recipients desire from this organization and what the donors saw in SoS Thai when deciding to partner with them. We then compiled the information collected and the data provided by our sponsor to determine the best deliverables to give to our sponsor.

The goal of this project was to improve SoS Thai's relationships with food donors and recipient organizations, and increase their public presence by creating marketable data and assessing current practices of managing surplus food. To achieve this goal, the following objectives were developed:

1. Identify SoS Thai's practices of retrieving and delivering surplus food.
2. Collect and evaluate feedback from food donors and food recipients.
3. Analyze SoS Thai's data to develop marketing tools for expansion.

### **3.1 Identify SoS Thai's practices of retrieving and delivering surplus food.**

To help us understand how SoS Thai retrieves and delivers the surplus food, we observed their daily operations. We joined the four SoS truck drivers on their routes for a day to observe the food recovery and delivery process. One goal of these observations was to discover if there were any excessively inefficient parts of SoS Thai's food recovery and delivery process that can be improved upon. The information from this process was gained through observation and interviews with the truck drivers.

During the procedure of retrieving food from donors, we documented observations in an excel spreadsheet. The documentation included observations of how the drivers recorded their information, how the food was maintained in the truck, the quality of food, the quantity of food from different donors, the processes of retrieving food from individual donors, how the donors prepared the food for SoS Thai pickup, and the crate system used. Along with these observations, a set of questions was prepared for the drivers. The same questions were asked on each route that we accompanied SoS Thai with. The information collected was compared and analyzed to check consistency and efficiency of SoS Thai's food recovery process. An example of the questions asked is shown in Table 2, and all the answers for the 4 trucks can be seen in Appendix F-I.

While we accompanied the truck drivers, we also observed the delivery process to the recipients. Observations that we recorded were the unloading process, SoS Thai's interactions with the recipients, similarities and differences between each dropoff location, if all of the food was used, and the time of delivery. This information was effective in letting us know where the food physically ended up and how the recipients work with SoS Thai. The full schedule of each truck can be seen in Appendix J to L.

Date	Truck Route Name	Question	Observation/Data Collected	Other Comments
dd/mm/yy	xx, truck #	How many trucks are typically completing pick-ups per day		
		How often the trucks refuel? Fuel capacity?		
		How long is a typical route (in minutes and kilometers)? How long is the food typically in the truck?		
		What types of food are collected from donors? What foods are not accepted?		
		Are the trucks being filled to capacity?		
		How many food donors are visited per day per truck?		
		How many deliveries are done each day per truck?		
		How far are the delivery stops from the donor locations? From SoS office?		
		What time does the truck leave to deliver the food? And when the truck arrived back at SoS Thai?		
		Are drivers hygienic in the food recovery process? How do they keep the food clean?		
		Are the SoS Thai trucks refrigerated? At what temperature are they set? Is the temperature consistent?		
		What types of containers is the food transported in?		
		How many kilograms of surplus food is produced per donor?		

**Table 2:** Food truck driver questions



**Figure 10:** SoS driver delivering food to a community



## 3.2 Collect and evaluate feedback from food recipients and food donors.

### 3.2.1 Interview food donors

The food donors of SoS Thai consist of hotels, international schools, supermarkets, and restaurants. We were only able to interview one food donor though, Tesco Lotus, a hypermarket chain that regularly donates a large sum of surplus food to SoS with 160 tons of food donated in 2019 alone.

We spoke with a member of the Tesco head office, Mr. Patikorn Lukkanevej, over the phone in order to ask a set of questions inquiring about quantitative and qualitative data, shown in Appendix D. We also went into one of the Tesco locations to further observe the donation process and the inner workings of Tesco. Mr. Lukkanevej showed us around and answered further questions we had. He also showed us how Tesco categorizes the food by colored crates, for example red represents Sunday, pink represents Tuesday, etc. He also showed us their different methods of reducing food waste, such as “first-in-first out”, “would I buy it?”, and “reduce to clear”.

### 3.2.2 Interview food recipients

Four types of SoS food recipient organizations, namely slum communities, orphanages, religious organizations, and refugees were described in section 2.5.2. We chose one organization of each type, and were able to speak with the Bangkok Noi Community, Mercy Farm, House of Blessing Foundation, and Pracha Uthit 79. We interviewed the community leader and individuals living in the communities. The sets of interview questions are located in Appendix B and Appendix C, respectively. The community leader was asked questions regarding their satisfaction with the food, what their distribution methods of the food are, and what could be improved about the food delivery process. The individuals living in the community were asked similar questions as well as if they felt they were receiving enough food. We were also able to observe the communities and their ways of dealing with food waste and waste in general such as composting, fertilization, and recycling.



**Figure 11:** The team interviewing a member of the Bangkok Noi Community

### **3.3 Analyze SoS Thai's data to determine marketable tools for expansion.**

SoS Thai has been collecting data on food types and amounts for each of its donors per donation. Moreover, similar records are kept for each food recipient. These records can be used to compute the cost per meal that SoS provides to recipients for free, and the carbon footprint saved, both of which SoS Thai has done. SoS Thai has also tracked donating habits over time and noticed that the longer donors are partnered with them, the less overall surplus food the donors produce. If, over time, food donations decrease per donor, SoS Thai may view this as a success of their operation. On the other hand, a decrease in donation per donor means that more donors are needed to continue operations to serve the same number of recipients.

We used the data collected by SoS Thai in combination with the recipient interview responses and observations to compute SoS Thai's contribution to society in the form of a monetary value. This monetary value and the factors used to reach this value aided in creating marketable tools for SoS Thai's expansion. These marketable tools include infographics for potential new donors and the general public, and small promotional materials that SoS Thai can provide to their donors to encourage a change in behavior from the consumers. These are described in more detail in the recommendations section.

Through research and observation, we have seen that the organization tracks the amount of food rescued, meals served, food donors gained, and carbon dioxide gas emissions diverted (Scholars of Sustenance, 2019). We also met with the data analyst and asked a set of questions (Appendix E) in order to learn how and why they collect certain data, what they want to do with it, and what they want to achieve. By evaluating all of the accumulated quantitative values, we have come to understand what datasets are important, which ones can cause an impact on others, and what to use to formulate marketing data models.

## Results & Analysis

### 4.1 Findings from shadowing SoS Thai truck drivers

In this section, we describe our observations of the roles that SoS Thai truck drivers play when we rode with them during one work day. SoS Thai uses four refrigerated trucks to pick up and deliver the donated food (Figure 2 depicts what the trucks look like). The temperature in the back refrigerated part of the truck is controlled by a panel located in the front of the truck underneath the radio (Figure 12).



**Figure 12:** Refrigeration control panel

Each truck route is given a specific name: GiGi, Jackie, Michael, and Adam. Before the trucks depart, the drivers spray and clean the back of the truck with a water hose to ensure cleanliness. All of the truck drivers leave between 11 - 11:30 a.m. to go pick up the food from the donors. The following table depicts the specifics of each of the four routes from the day we shadowed the truck drivers. Appendices F-I displays specific observations from each of the four trucks and Table 3 displays an overview of each truck route on our observation day.

Route Name	Area of Route	# of Donors Visited	Distance Traveled (km)	Amount of Time to Complete Route
1. GiGi	Near SoS Office	14	109	5 hrs 18 minutes
2. Jackie	Bang Na Area	12	127	6 hours 3 minutes
3. Michael	Northern Bangkok	11	79	6 hours
4. Adam	Sukhumvit District	16	76	8 hours 30 minutes

**Table 3:** Truck Route Information

As the driver went to each donor, they left behind a clean crate(s) with reusable plastic containers (Figure 13) for the donors to fill the next day, as they collected the crate(s) from the donor for that day. Donors often had refrigerators labeled for SoS and the drivers were able to go straight to where they knew the food would be to ensure they were not at stops for longer than necessary. Many donors recorded the weights of the food by type, and the driver recorded this in a sheet alongside the donor name with timestamps of arrivals and departures for each stop. The



pickup process was quick and often only took 5-10 minutes per donor. Appendices J-M contain the routes with each donor the truck visited and the arrival and departure times at each stop.



**Figure 13:** Clean crates that SoS drops off at donors

The reusable plastic containers were mostly used for the cooked food from hotel buffets, but many bakery items and produce were donated covered in plastic or in plastic containers, shown in Figures 14 and 15. Loose fruits, vegetables, and bakery items were common items received from donors.



**Figure 14:** Bakery items from Tesco Lotus (Truck #1)



**Figure 15:** Produce from Tesco Lotus (Truck #1)



**Figure 16:** Bakery items from a hotel buffet (Truck #3)



**Figure 17:** Produce from Tops Market (Truck #3)

When all of the food was collected, the drivers drove to the recipient they were assigned for that day. The trucks on GiGi and Jackie routes went to the Bangkok Noi Community, while

the other two trucks went to the Pracha Uthit 79 Community. Once the trucks arrived at the destination, the driver opened the back of the truck and let the recipients unload it. None of the trucks were fully filled, but according to the drivers, they receive the greatest quantity of food on Fridays and we observed on a Thursday. Once all of the crates were unloaded, the drivers headed back to the SoS office to finish their shift for the day. The trucks only used around a quarter of the tank (10.5 Liters). A full tank (42 Liters) which costs approximately 1350 Baht, could last them 3-4 days.

***Finding #1: The lack of communication between SoS and donors led to a waste of time and resources.***

Through observation, we noticed a large variance in the amount of food collected from different donors. For example, there were more than 10 crates from a Tesco Lotus location (truck #1), a single plastic container of cooked food provided by one location of The Weston (truck #1), and no food provided by The W Bangkok Sathorn Hotel (truck #3). The Weston had a longer pick-up process because the driver had to check-in, take an elevator up several floors, and walk through the backend of the hotel kitchen to get to the refrigerator labeled for SoS Thai. This donor was not specifically out of the way on the route, as the next donor stop was a Tops Market that was right next door, and the driver just walked through the parking lot to reach the Tops. For the W Bangkok Sathorn Hotel, it was a half an hour drive from the previous donor and a twenty-minute drive to the next donor to receive no food. This was not a good use of time, and, if anything, more harm was done than good by wasting fuel to get to the location.

***Finding #2: The temperature in the back of the truck fluctuated greatly, increasing the chance of food spoilage and damage to the trucks.***

SoS tries to keep the temperature between 2° and 4° Celsius, to ensure the food does not spoil throughout the day. While the doors were closed, the temperature stayed at approximately 3° Celsius. For each of the trucks, though, we observed that the temperature would vary every time the doors were opened up to anywhere from 8° to 20° Celsius. When the drivers would grab the clean crates from the back to take into the donors, they would not close the doors fully. This has the same effect of leaving the refrigerator door open in your home (see background section 2.5) can cause trucks to need more frequent repair.

***Finding #3: There was an inconsistency in the plastic packaging of products, and whether drivers took the packings off or not.***

Figures 14 and 15 show crates received from a Tesco Lotus with produce and bakery items entirely covered in plastic or in plastic containers, whereas Figures 16 and 17 show loose bakery items from a hotel and produce from a Tops Market. Due to the fact the foods from hotels are often from buffets, it makes sense there would be no individual packing on bread. We also observed one Tops Market removing plastic packaging before handing off the crates to the driver. One of the drivers, truck #2, would remove plastic packing from the food that still had them, but he was the only driver of the four on the day observed to do so. This driver did so to make it easier for the recipients to sort and to make sure they would not have to deal with any excess trash.

## 4.2 Findings from food donors

We spoke with Patikorn Lukkanevej of the Tesco Lotus Head Office location to find out more about the surplus food donation process from the donor's point of view to see how they felt about SoS, how they began working with SoS, and how they work to decrease their food carbon footprint. Mr. Lukkanevej informed us that SoS Thai reached out to Tesco inquiring if they would be willing to work with them in 2017. Before SoS contacted them, they only worked with the Mirror Foundation, but since then Tesco has expanded to donating and working with 80 organizations, meaning they have to split the surplus food between many organizations. Tesco works to reduce food waste and surplus food throughout the production process, and Tesco was the first retailer in Asia that published their food waste data. They even have their own sustainable development plan called the "Leader Help Plan" that focuses on waste management. Tesco reduces the amount of surplus food in six main ways:

1. Canceled use of "best before" labels
  - Tesco has also found that many customers do not understand the meaning of "best before" dates and will not purchase foods close to those dates thinking they are unsafe to eat. Last year, Tesco canceled the "best before" labels on products like fruits, vegetables, and meats.
2. FIFO or "first-in-first-out" method
  - Tesco categorizes its products into different colored crates according to the day. For example, if Tesco receives a crate of apples from Monday and a crate of apples from Tuesday, they make sure the apples from Monday are put on the shelf and sold before they put out the apples from Tuesday.
3. WIBI or "would I buy it?"
  - They use this to estimate the price of the product according to its quality. For example, when the product is not selling, they will reduce the price down until it is sold.
4. RTC or "reduce to clear"
  - They cut prices of products that are close to expiration to attract customers to buy said products.
5. Donation
  - When a product cannot be sold through the previous two methods, they will donate the food to SoS and other organizations. Therefore, the food is not always of the best quality when donated, but it is always still edible.
6. Employee Canteens
  - Some branches do not produce enough surplus food on a regular basis to make it worth donating, so food from those branches will be donated to the employee canteens

Tesco reported that their surplus food is a small amount compared to its net sales. For example, if they sell 400 kgs of cabbage, 5 kgs of that will be considered waste, meaning just over 1% of food gets wasted. Tesco also tries to prevent overstock issues; if a branch can only sell 100 kgs of apples, they will only order as much as 110 kgs.

Produce like vegetables and fruits tend to make up their surplus food due to short shelf lives. Bakery items take up the rest because the majority of Thai people do not consume a lot of

bread. There is nothing left to donate when it comes to meat and cooked food because these foods are in high demand. During the holidays, around Christmas, Songkran, and the New Year, the demand for food is higher, though, and there are larger amounts of food waste.

Tesco stores food for SoS in a fridge and categorizes it by the type of food and expiration date to make it easier for SoS. Tesco is also the only food donor to report their surplus food amounts to SoS via Line regularly.

***Finding #4: Tesco Lotus recognized good food safety and management from SoS Thai.***

Tesco admires SoS for its food safety and management and they are one of the few organizations that meet their expectations. Other organizations have sold the food that Tesco has donated to them which goes against what Tesco is trying to do. Tesco wishes that SoS Thai could do more with their food waste, but due to SoS Thai's limited budget, it can only produce a small amount of fertilizer or compost. Tesco also believes that SoS should focus more on nutrition and the types of food donated when it comes to their recipients. Tesco would also like to know the names of the recipients that their food is going to on a bi-yearly basis.

***Finding #5: Tesco Lotus confirmed that their surplus food has decreased the longer they were partnered with SoS Thai.***

SoS started working with Tesco in 2017, it seems they have only become more aware of the amount of surplus food they produce. They went from working with one organization to 80, and their surplus food produced has decreased every year. Mr. Lukkanevej stated that there has been a downward trend in the amount of surplus food the company has produced since working with SoS. For example, in the month of January, one of the months that often produces the highest amount of surplus due to the holiday season, there has been a significant decrease since 2018. In 2018 Tesco reported 39,042.42 kg of surplus food, 20,009.45 in 2019, and 16,557.39 in 2020.

### **4.3 Findings from SoS Thai food recipients**

#### **Bangkok Noi Community**

The Bangkok Noi Community is a homeless shelter that provides the residents with jobs to help transform them into working people. We spoke with Ms. Nang, the person in charge of the communications between the community and SoS Thai, to find out more about the community. She told us that they found out about SoS Thai from another organization called Housing Development Foundation (มูลนิธิพัฒนาที่อยู่อาศัย). She is very grateful for the food rescue project because it helps reduce food costs and saves them money to develop the community into a better place. There are 102 people living in the community, consisting of 50 elders, 45 adults, and 7 children.

Ms. Nang gave us a summary of the delivery process in which SoS truck drivers arrive around 8:00 pm every Thursday with the donated food. The community will unload the truck and bring the crated food to the kitchen area. The food is then re-checked in order to make sure that no one is eating spoiled or expired food. The kitchen team then prepares the food and distributes it equally to the residents in the dining area during mealtime. She said that they try to not waste any of the food that they receive and make sure to fully utilize it in several different ways. For food that is spoiled or expired, such as bread, the community makes use of it through

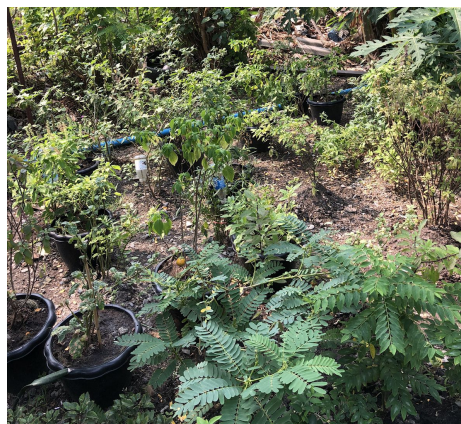


composting, and a fermentation process to grow fruits and vegetables. They also receive composting materials from another organization and get funding from Housing Development Foundation (มูลนิธิพัฒนาที่อยู่อาศัย) to buy any of the required materials. When there are extra vegetables, fruits, or food the community doesn't want to eat, they will further donate the extra food to another slum neighborhood nearby such as Bangkok Noi 1, or 2. The community members are very generous and sometimes give away cooked food to the homeless people living in Hua Lamphong train station as well.

A small sample size of six people was surveyed at the community with the questions shown in Appendix C. Based on the select responses to the survey, we gathered that two of them were vegetarians, 3 only ate pork and chicken for meat, and 1 ate any meat. They are happy with SoS Thai and think they are doing a great job but said certain improvements to the food would be pleasant. All of them want more food ingredients such as soy sauce, and pepper to complement their meals. Furthermore, they would prefer to receive less international food such as western condiments and cooked dishes because it is not always consumed since everyone living there is Thai and ends up being donated to surrounding communities. The responses showed that they want more food of Thai flavor, but other than that the food meets their needs and has definitely helped their well-being by reducing the costs of meals.



**Figure 18:** Main kitchen at Bangkok Noi



**Figure 19:** Gardening area in Bangkok Noi

### Mercy Farm

Mercy Farm is an orphanage in the Saphan Soong district. We had the opportunity to speak with Ms. Nok, who is the representative of the center. Ms. Nok informed us that SoS Thai and the Mercy Farm have been working together since 2017. There are 20 people living in the foundation currently, consisting of 5 workers and 15 children ages 13-18.

Ms. Nok provided a summary of the food delivery they received from SoS truck drivers every Tuesday at 8 pm. The 5 workers will unload the truck and put all of the food in the kitchen area. The center receives 10 crates of baked goods, 3-4 crates of vegetables, and 1 crate of meat every week. Before preparing meals, she checks to see if the food is in good condition because the baked goods they receive sometimes will already have butter on it or too much moisture and will start to mold quickly. The moldy food will be thrown away and if possible, some of the food will be turned into fertilizer or fed to the fishes. Ms. Nok handles all of the cooking and manages to create 3 meals per day for each person. All of the food is used for meals to make sure

everyone is eating enough, but when there are leftover bakery items, she will give the extra food to surrounding communities.

Five people were surveyed at the community (2 workers, and 3 children) with the questions shown in Appendix C. The responses are biased due to the small sample size. None of them had any dietary restrictions, so they were able to eat any type of food. They think SoS Thai is doing a great job and get plenty of food to eat but brought up a couple of suggestions for them. All of them wished for more variety in the food type, such as more meat, as they mostly receive produce and bakery items. Due to this, there is an inconvenience, the center has to purchase meat from an outside market in order to ensure that everyone is getting a healthy meal. Another suggestion was to receive less western food and more traditional Thai food because the members are more familiar with the Thai taste. One worker complained that there was once a donation of tomato sauce, but no pasta of any sort, thus the sauce was useless and was made into fertilizer instead of being consumed. Other than that, the people are thankful to SoS Thai and have no other problems, stating that they have been blessed by the free food they receive.



**Figure 20:** Farming areas including animal feeding



**Figure 21:** Ms.Nok(Left) and Ms.Na (right), the representative staff of the Mercy farm

### House of Blessing Foundation

The House of Blessing Foundation provides assistance and education to the youths raised in the slums. We were able to speak with Ms. Noi, who is the representative at the foundation, and she was able to give an overview of the operation to our team. She stated that SoS Thai had contacted the House of Blessing Foundation directly in 2019. There are around 140 people in the House of Blessing foundation including toddlers, 50-60 children (most of them are orphans), 20-30 teenagers (from juvenile detention center), 25 adults, and 25 elders.

Ms. Noi told us that SoS Thai delivers the food every Monday, Wednesday, and Friday between 4-5 pm. Even though Ms. Noi did not mention the specific amount of received food per dropoff, most of the food items are bakeries, sausage, vegetables, and fruits. She is always adapting and managing all of the food and is able to provide three meals a day for everyone. She rechecks the food because some of the food can be spoiled and unusable for meals. Once the meals are prepared by Ms. Noi, the meals are served in the community's dining area where each person will be given a plate of food. They have a lot of leftover bakery goods, so she gives it to others in need such as donating bakeries to the Hill Tribes people of Northern Thailand kids that visit the church once a week every Sunday.



Five of the children who lived at the foundation were surveyed with the questions shown in Appendix C. The responses are biased due to the small sample size. The children said that they did not have any dietary restrictions, and most of the people at the foundation can eat anything. They are satisfied with the amount of food they get, but all of them complained about not getting enough meat. One of them said that the only meats they receive are duck ribs and fish heads, but it is disliked since it is mostly all bones. They also said that they receive too many bakery goods and would prefer to obtain more varying food. The food lasts the children until the next delivery; however, they start running out of vegetables because they start spoiling. The children showed a lot of appreciation towards SoS Thai's food sharing program, as it helps the foundation by decreasing the cost of food and helps improve their well-being.



**Figure 22:** Ms. Noi, representative of the House of Blessing Foundation



**Figure 23:** Food donated from SoS to House of Blessing

### Pracha Uthit 79

Pracha Uthit 79, or the “Healthcare and life club,” is the place that Pakistani refugees live. We talked with the community leader, Sister Noi, who devotes herself to helping the community. Through her, we found that this community helps nearby refugees, sets them up with a communication group, and provides housing for them. Sister Noi knew about SoS Thai from her brother, who worked with the organization in the Jaransanitwong area. They heavily depend on SoS Thai since they provide the main source of their food because as stated in the background, the refugees are not allowed to work according to Thailand laws. The exact number of people living there is unknown because some refugees keep moving, but there are approximately 100-120 people living in the area,

According to Sister Noi, SoS Thai delivers the donated food every Thursday at 7:00pm with the amount of food varying each week, but normally the food can last up to a week if used efficiently. Sister Noi and a few other community members unload the truck and bring all the food into her home. The food is organized by the community leaders, and then around 8:30pm the community comes in and they take however much they need depending on their family size. It is up to the individual refugees to manage the food and prepare it, and there was not a designated chef or kitchen. When the refugees do not pick up the Thai food or some of the cooked items, they try to donate it to other people. The leader shares their excess food with other communities including Pracha Uthit 69, 75, IDC or the Bangkok Immigration Detention and Thai people in the area.

We gathered 5 survey responses from the refugees with the questions shown in Appendix C. Since the majority of the residents are Muslims, they cannot eat pork. They all asked for more food to get proper meals every day and stay healthy. The main issue they wanted to improve was that they wished to receive less Thai food since they are not familiar with it and do not enjoy it. When asked how long the food lasts them and one woman stated, “the food only lasts me three days because I also have to feed my three children”, while another man said, “one week, if used properly.” Since the Pakistani refugees are keen on cooking by themselves, they wish for more raw materials including vegetables, fruits, meat and more of international food. They enjoy the bakery and bread items and would not mind receiving more of it. They all appreciate SoS Thai’s efforts and admitted that it saves them money especially since it is hard for them to get jobs in Thailand.



**Figure 24:** Food donated from SoS to Pracha Uthit 79



**Figure 25:** Pakistani Refugees lived nearby gather and collected food from SoS

***Finding #6: The recipients had varying preferences of international versus Thai food.***

Although the recipients were grateful for the food that they received, they expressed a preference for certain types of food. The Bangkok Noi Community wants food with more Thai taste and less international food, but for the refugees it was the opposite. When the food is disliked by the people, they seem to donate it to neighboring communities. However, we were unable to find out if the food is actually consumed when donated. The other recipients we interviewed also had certain food that they either threw away or donated such as tomato sauce, duck ribs, or fish heads.

***Finding #7: There was an inconsistency of food distribution within recipient organizations.***

After meeting with the food recipients, similar problems were presented at each location. All of the communities require more food even though SoS Thai receives one ton of food every day. Following that, most of the food consists of vegetables, fruits, and bakery goods, but not enough raw meat to be cooked. As mentioned in the background, a person requires 2-3 servings of meat or alternative sources of protein every day for a well-balanced diet. In addition, SoS has not put much thought into the type of food each recipient type wants because refugees want more of an international taste, but the Thai people want more of the Thai taste. Even though there is an



effort to not waste any food, the redistribution of food to surrounding communities makes it untraceable and raises the potential of it being further wasted. Also, while the Bangkok Noi Community and House of Blessing Foundation are successful in portioning the food equally to its people, the refugees struggle and have an inconsistent method. The delivery method of SoS Thai is efficient, but the recipients are still getting foods that are spoiled due to improper treatment of delivery. Additionally, even though the House of Blessing Foundation houses only 20-40 more people than the other communities, they get triple the number of deliveries in one week. People at the foundation are eating three meals a day, while the others eat only two meals a day. This shows that there is not a balance of food delivery amount between the recipients.

#### 4.4 Results from analyzing data

After observing the pickup and delivery process of the SoS Thai truck drivers, we have determined the factors that contribute to successfully recovering surplus food. These factors include individual contributions and expenses from food donors, food recipients, and SoS operations. To consider these factors means that we have calculated and assigned a baht value to (1) potential people served from the food collected, (2) SoS daily operations, (3) the manpower needed for collection, maintenance, and distribution, (4) and the equipment cost and maintenance. The monetary value of SoS Thai was then calculated using the value of these factors. We define the monetary value of SoS Thai as the total daily or annual contributions of the repurposed food given to the recipients by SoS Thai plus the value of all other factors. As shown in Table 4, we used the data collected from our interviews with the four food recipients in our calculations. We also used data provided by our sponsor to incorporate it into our calculations. This data included an estimation of SoS employees' salaries if their operations were a for-profit organization minus their current, non-profit salaries to display the money that is being saved, the manpower for collection, maintenance, and distribution, and equipment cost and maintenance broken down into their daily values.

	House of Blessings	Bangkok Noi	Pracha Uthit 79
<b>Average Number of Potential People Served (3 meals/day) per SoS Delivery</b>	195	254	239
<b>Value of Food Donation per SoS Delivery</b>	฿19,460.42	฿25,418.63	฿23,875.44
(1) value of potential people served (3 meals) per day	฿45,836.32		
(2) value of SoS operations per day	฿28.06		
(3) value of manpower for collection, maintenance, and distribution per day	฿3,966.67		
(4) value of equipment cost and maintenance per day	฿4,163.17		
daily contribution to society (in baht)	฿53,994.22		
annual contribution to society (in baht)	฿19,707,888.78		

**Table 4: Monetary value of SoS Thai**

Highlighted in green are the factors and their estimated baht value that contribute to SoS Thai's daily operations. The ฿45,836.32 value is the average value multiplied by two of the food donated per SoS delivery of three of the four recipients we visited. This number is multiplied by two because SoS Thai typically visits two recipients each day. The sum of these values expresses the daily and annual worth of SoS Thai. See Appendices N-P for a breakdown of how each factor (highlighted in green) is calculated. This monetary value has aided us in recommending strategies to SoS Thai that will grow their organization and increase sustainability while taking into consideration the needs of the people receiving the food. This value has also been included in our later marketing materials to advertise SoS Thai to the general public and potential donors.

***Finding #8: The recipients are not getting a well-balanced diet from the donated food.***

The food the recipients have been receiving is not suitable in terms of a person's recommended daily requirements for nutrition. According to the food pyramid by Bhangoo in the background section, in one day a person is required 2-3 servings of meat & alternatives for protein. They are getting correct proportions for the other food groups, but when it comes to protein there is not enough. Based on the 21 survey responses from the 4 recipient organizations we interviewed, all of them wished for more meat items to be included in their meals as well.

From the interviews with the food recipients, each reported how many days each SoS Thai food delivery lasted, how many meals each person could be served, and approximately how many people there are:

- House of Blessings: 3 days, 3 meals per day, 140 people
- Bangkok Noi: 7 days, 2 meals per day, 100 people
- Pracha Uthit 79: 5 days, 3 meals per day, 110 people
- Mercy Farm: 7 days, 3 meals per day, 20 people

From the interview responses, we would assume that each recipient we interviewed is satisfying the amount of days, meals, and people with a healthy, well-balanced meal. This assumption goes against our research because, as shown in Appendix N, a proper daily serving of food according to *Precision Nutrition* is 1.91 kgs of food, proportioned by food type, to meet recommended health requirements (Andrews, n.d.).

When compared with the records kept by SoS Thai for the food collected during the month of December, House of Blessings receives approximately enough food to serve 3 well-rounded meals to 195 people for one day, Bangkok Noi receives approximately enough food to serve 3 well-rounded meals to 254 people for one day, and Pracha Uthit 79 receives approximately enough food to serve 3 well-rounded meals to 239 people for one day. For the amount of people who are estimated to be members of these communities, House of Blessings' donation would feed everyone for only one day with some meals remaining, Bangkok Noi's donation would feed everyone for two days with some meals remaining, Pracha Uthit 79's donation would feed everyone for two days with some meals remaining. With these calculations, clearly there are some discrepancies between what communities consider a satisfactory meal, and what a nutritional meal actually is.

***Finding #9: The monetary value of SoS Thai is greater than just the value of the food recovered.***

There are several factors that contribute to the worth of SoS Thai. The truck expenses and the value of the food collected is more straightforward to assign a baht value to, but what is really noteworthy and should be highlighted are the contributions of the SoS employees that have chosen to work for this non-profit organization for the benefit of those in need. As shown in Table 4, we have calculated that SoS Thai's daily contribution to society is ฿53,994.22. Communication and logistics between SoS, donors, and recipients is key to making this organization run smoothly. As well as the record keeping which is a crucial aspect of managing the tons of food collected every day. From this information that SoS Thai manages and records every day, they are able to learn and grow their organization.

In this chapter, we identified improvements for the process of retrieving and delivering food and the needs of the different recipient organizations. We also analyzed the different factors associated with the rescue of surplus food in order to find the net worth of the repurposed food given to recipients in order to understand the impact of those factors on the operation of SoS Thai. In the next chapter we explain our recommendations for SoS Thai.

## **Recommendations for SoS Thai**

In the previous chapter, we analyzed the findings from the data and information we gathered. Based on that information, we came up with several recommendations to improve SoS Thai's processes of retrieving and delivering food and to improve their relationships with the recipients.

### **1. Use an infographic to advertise SoS Thai.**

SoS Thai wants to expand to obtain more food and attain a larger influence, so we created an infographic to showcase what their organization is and what they have done. Infographics are often easy to follow and catch people's eyes, so we wanted to use this method to market SoS Thai's data to various stakeholders. To appeal to the different types of audience, there is an infographic geared towards new donors and one geared towards the general public. The infographics are located in Appendix Q.

From the information we gathered from interviewing Tesco Lotus, we want to show to new donors that SoS Thai is a reliable organization that is outstanding in food safety, management, and that new donors can benefit from working together with SoS. The donors do not want their name to get tarnished, thus why they appreciate that SoS takes full responsibility for the food they receive. The monetary value of SoS Thai will also be incorporated into the infographic to display all that the organization contributes to society. We recommend that SoS provide these infographics to donors the first time they meet or contact them.

In order for SoS to grow, the public needs to hear about the organization and understand who they are. Aside from the people that they work with, not much is known about SoS and this was clear when some of the recipients did not even know their name since only the community leader had worked with them. In the infographic, we want to show a brief history of SoS Thai, the total impact they have had, explain in simpler terms in how they do it, and how the people can get involved. From talking with Bruce Chen of SoS Thai, we gathered that 90% of the money comes from the founder Bo Holmgren and the remaining 10% is from investors. The organization needs more money, so by providing a QR code to a donation link will give the community a way to provide a helping hand. We recommend that SoS Thai use social media to present the infographic and ask donors if they would be willing to put the advertisement in their store. If possible, the infographic can be at the register and the cashiers can ask people if they are interested in donating.

### **2. Provide donors with small promotional materials.**

We recommend that SoS Thai provide donors with promotional materials to encourage cooperation by showing partnerships and decreasing food waste. Based on the sponsor's experience and the team observations, the donors do not always follow SoS Thai's minimal instructions such as removing plastic packaging and communicating their amount of food for the day. While SoS is grateful for the donated food, it is important to maintain appropriate procedures and management. A way to maintain a good relationship is by providing donors with plaques or certificates of data that show how much that branch donated for last month, number of meals they have fed to the needy, and how long they have been working with SoS. This will create a positive image of the donor and inspire them to cultivate the partnership.

Along with that, we suggest putting food waste signs near the buffet line at the hotel donors to decrease food waste. This will remind customers to not fill up their plate all the way and increase the potential surplus of food that can be given to the needy communities, while also showing SoS Thai works with that donor. Another benefit is that there will be less food waste, so the donor has to spend less money to dump the trash. With success, the promotional materials that were made for the donor will help SoS Thai self-advertise themselves as well.

### **3. Expand the donor base to obtain specific types of food that provide more nutrition.**

As stated throughout section 4.3, the recipients are noticing less and less meat and nutritious foods being donated, while they continue to receive large amounts of bakery items that are often unhealthy and go bad very quickly. SoS Thai does not like to complain to the donors because they are just happy to get anything at all, so the solution would be to find donors with a variety of healthy foods. Due to the lack of meat and protein, we recommend that SoS should reach out to butcher shops, specialized markets, and supermarkets that sell fresh meat. These potential donors can supply the missing nutrition that recipients require and provide them with a healthy diet. In section 4.3, we also mention how all of the recipients we spoke to have some form of a kitchen to use, so receiving raw materials is no problem. The following are places SoS can reach out to for bulks of meat & alternatives:

- Accidental Butcher
- Gargantua Butcher Shop
- Prime Beef Butcher Shop
- Best Country Beef Butcher Shop
- KRBB The Boutique Butcher Shop & Deli
- Arno's Butcher Shop
- Meat Market Thailand
- Makro Market
- Foodgloriousfood Butcher Shop
- Betagro Butcher Shop
- Bangkok Halal Food Marketing Co., Ltd.
- Bo. Ian & Sloane's Aharn Farang Co., Ltd. Butcher Shop & Deli
- Villa Market
- Delishop Grocery Store
- The Meatchop Butcher & Spirits Restaurant

### **4. Educate recipients to utilize the food and food waste properly.**

We propose that SoS Thai educates the recipients to allow them to utilize the food to its fullest. We recommend that they provide strategies that have worked for some of their recipients to others such as recipes, composting, fertilization, and distribution methods.

Recipes can help create meals that the recipients would not have thought of and not waste any of the food that could have potentially been used. For example, House of Blessings wanted more protein but did not like the fish heads as they contain more bone than meat, however, fish heads can also be used for curry and different types of soup to stretch out the protein potential. Mercy Farm also did not know how to use tomato sauce other than with pasta, but it can be used with different Thai meat recipes, and in tomato nam prik, thai meatballs, and curry.

Wasting any of the surplus food ruins the purpose it was collected for. It is important to teach the communities a way to deal with spoiled and unwanted food. SoS Thai has already taught Mercy Farm composting and fertilization so they could grow their own fresh produce. Two out of the four communities we visited did not have a system like this in place, so we highly

encourage SoS to organize a plan to teach their composting and fertilization methods if they are willing to learn.

There needs to be a proper way for the recipients to distribute their meals to all of its community members to make sure everyone is getting proper proportions. Referring back to Finding #8, the Pracha Uthit 79 community did not have a way to make sure each person was getting enough food for their family and individuals were on their own to prepare meals. By showing successful methods of preparing and distributing, such as House of Blessings where Ms. Noi is in charge of the food checking, cooking and proportioning, there can be a way to make sure that all of the people are being treated well.

#### **5. Use “Line” the phone application to increase communication between donors and SoS drivers.**

Finding #1 showed there is a serious communication problem between the donors and SoS drivers and has caused a waste of time and effort before. According to Bruce Chen of SoS Thai, they have tried to tell donors to let SoS know if they do not have any food for them, but the donors never follow through with this. To allow the communication to exist, it should be initiated from SoS Thai’s end to increase the likelihood of a response. Since SoS keeps track of the amount of food received from each donor, the organization knows which donors are most likely to have little to no food on any given day, and therefore instead of contacting all 60 donors and branches on a given day, they could reach out to the few that are known to donate little to no food. In Thailand, Line is used by 84% of internet users, making it an ideal platform for marketing, thus most companies use the app to reach their customer base (Thateethai, 2019), thus most markets and hotels use the app in Thailand. As noted in section 4.2, Tesco regularly uses Line to contact SoS about their amount of surplus food, so this is something other donors could strive to do as well. Drivers could use the Line app to communicate with donors a few stops ahead of time to conclude if there is any food to be donated that day.

#### **6. Enforce stricter responsibilities upon the driver to reduce plastic waste, food spoilage, and truck damage.**

Since Findings #2 and #3 showed there are many inconsistencies being caused by human error, there needs to be a stricter responsibility placed upon the driver. Making sure that the rear door of the truck is locked when leaving for 5-10 minutes can greatly affect the temperature and make sure the food is being preserved properly. In the long term, if the refrigeration system gets damaged, a lot of money will be wasted. It is also up to the driver, not only the donor, to take off the plastic packaging from the foods. When the food is being unloaded, the driver has to do nothing, so at the very least he can take off the plastic and recycle it. Since there is an increase in work, the drivers’ salaries would have to be renegotiated to make sure they are getting the correct amount.

#### **7. Implement a food sorting system to satisfy the food preferences of recipients.**

As reported in Finding #7, depending on the type of recipients, they want either more international food or Thai food. We understand that SoS Thai does not have time to sort all of the food to people’s preferences and neither the employees. Therefore, we recommend getting the community involved and incorporating a “Goodwill” model. The model is based on promoting

common good through empowering individuals in the community we serve (Gibbons, 2011). By getting volunteers, this task can be made easy and it will motivate people to get involved within their community. Another benefit of this model is that the organization will grow and be viewed as a positive image. Through this method, new employees can be gained as well if they are showing commitment and interest to the project. If this is successful, the volunteers can be given different tasks in the future and make the entire process quicker through uniting the people. Another benefit would be the possibility of individual donation of food. Logistically, it would be most straightforward to have individuals drop off food directly at SoS Thai's office which could then be stored or added to the other donations for the day; however, as SoS Thai grows, they could set up specific drop off locations around the city to encourage more donations too.

## **5.1 Limitations**

We would have preferred to interview several food donors, such as at least two hotels, one being Banyan Tree who has been making multiple efforts to reduce waste and conserve resources, and another hotel who is not so involved in going green, in order to see what made each want to become involved with SoS. We would have also liked to interview another grocery store, such as Tops Market, to see the differences between a large and a small market. SoS Thai was unable to set up more food donor interviews, as many of their contacts were on holiday for most of the month of February

We were unable to talk to each and every food recipient organization due to time constraints and the sheer number of recipients. Therefore, the conclusions are generalized to the few recipients we spoke with and are not applicable to each and every recipient organization. We only spoke with a few individuals within the slum communities, orphanages, religious organizations, and refugee camps. Only a few people within the slum communities were willing to be interviewed, the orphanages and religious organizations mostly supply food to children, and most refugees do not want to be interviewed due to fear of repercussions from the government. We would have also preferred to interview more individuals.

## **5.3 Suggestions for a future study**

Our sponsor originally gave us three tasks to accomplish: gaining information about and insight into the recipient communities and their needs, researching and experimenting with black soldier flies as an alternative food waste management strategy, and analyzing and turning SoS Thai's surplus food data into marketing tools. Due to time constraints, we were only able to accomplish two of the tasks, the recipient and marketing tasks. A possible project for WPI and Chulalongkorn students to collaborate on with SoS Thai in the future, would be to research and experiment on the black soldier flies. A possible continuation of the tasks accomplished in this project would also be possible. As noted in the previous section, we were only able to contact four recipients and one donor, so further data collection through marketable data and assessment of current surplus food management practices, would be useful.

## **5.2 Final Remarks**

The purpose of this project was to better the surplus food management by improving SoS Thai's relationships with stakeholders, while also increasing their public presence. Surplus food

is a growing problem in Bangkok and SoS Thai has initiated a program to rescue the food. However, the management is not perfect, and the process could be improved to satisfy both the food donors and recipients they are working with. Another growing problem is that the organization needs more food as they acquire more recipients to work with, thus they need to expand and make themselves known. SoS Thai tasked our group to assess their current surplus food management practices and develop marketing materials with data to tackle the issues.

We developed the recommendations through detailed observations, research, and direct interviews. Our deliverables included improvements to the retrieval and delivery process of surplus food, recipient educational programs, marketing materials and strategies, and communication with donors and recipients. Implementing our recommendations is intended to increase partnership with food donors, satisfy the needs of food recipients, and allow SoS Thai to advertise their organization. The deliverables will be in an editable format if they seek to make changes as they continue to grow.



## References

10 Shocking Facts About Child Poverty. (2018). *The Borgen Project*. Retrieved from <https://borgenproject.org/child-poverty-in-thailand/>

This article mentions facts about child poverty in Thailand and how big of a problem it is. It talks about how children are being exploited for trafficking and labor. Many children are also left as orphans and because of that they are forced to live on the streets alone. The article was useful for us to understand that child poverty is still an issue despite it being reduced by 60%. When meeting with the food recipients who provided help to these children, we recognized the situation they were in and what they wanted from SoS Thai to further satisfy their needs.

Andrews, R. (n.d.). What are your 4 pounds made of? How to understand calorie and energy density. *Precision Nutrition*. Retrieved from <https://www.precisionnutrition.com/what-are-your-4-lbs>

This article explains how a person consumes three to five pounds of food each day and breaks it down to what the food consists of. A typical person has around four pounds of food to be satisfied and uses that to calculate the nutrient differences between different types of meals. By reading this, we learned what the recipients need for food and how the food that SoS delivers to them fits to them on the nutrient scale. The donated food does not consist of a lot of meat/protein, so it was useful to know that a veggie heavy meal was still viable even though it is not much for a person that is generally active.

Aubrey, A. (2011). The average american ate (literally) a ton this year. *National Public Radio*. Retrieved from <https://www.npr.org/sections/thesalt/2011/12/31/144478009/the-average-american-ate-literally-a-ton-this-year>

This news article explains how a regular American person eats around one ton of food every year and talks about the percentage of different food that goes into the consumption. For the team, it put into perspective how much the 1.3 billion tons of food wasted can feed a single person if it was actually used. Each person would receive 1.5 tons more food and there would be less hungry people throughout the entire world.

Asylum access: making human rights a reality for refugees. (2020). Retrieved from <https://asylumaccess.org/program/thailand/>

This web page talks about the history of the Asylum Access Thailand since the first day of its establishment. The purpose of the foundation is to provide legal counsel and seek asylum in refugee status. The Asylum Access Thailand is under the United Nations High Commissioner for Refugees Foundation (UNHCR), also AAT cooperates with many refugees related foundations including Core Urban Refugee Network (CURN) and the Asia Pacific Refugee Rights Network (APRRN). AAT Foundation is also one of the food recipients in SoS's food distribution program, therefore the background of the foundation will give us a better understanding in terms of the refugee's living conditions.

Bhangoo, N.S. (2015). Retrieved from <https://nirmalsinghbhangoopac1.wordpress.com/>

This article goes over the building blocks of a healthy diet and what it should consist of. The figure that was provided a clear image of the serving of each food that should be consumed the most to the least. This was very useful for us because when dealing with the food delivered to the food recipients, it is appropriate to know if they food is enough to stay healthy.

Charoensuthipan, P. (2019, October 15). BMA blamed for surge in homelessness. *Bangkok Post*. Retrieved from <https://www.bangkokpost.com/thailand/general/1772194/bma-blamed-for-surge-in-homelessness>

This article describes the homeless crisis situation in Bangkok in the present day. The number of homeless in Bangkok increases each year due to the policies imposed by the government as they force and evict all the poor people communities. Most homeless people still have a job and earn some money, however they cannot afford good food. This means that there are more people suffering with hunger and seeking help.

Chiemchaisri, C., Labayen, J., & Visvanathan, C. (2008). Municipal solid waste management in Thailand and disposal emission inventory. *Environmental Monitoring and Assessment*. doi: 10.1007/s10661-007-9707-1

This article goes over the solid waste management system in Thailand and how the country's Pollution Control Department (PCD) is reacting to it. Most of the solid waste disposal in Thailand is carried out by open dumping and there will be an increase of methane emission if there is no plan. The PCD aims to reduce the solid waste by increasing the collection efficiency, recovery of recyclables, and using sanitary landfills. This helped us understand why there needs to be a better waste management system in Thailand and reduce the surplus food that is adding on to it. It also explains what Thailand is trying to do to make the waste issue better and the efforts they are taking.

David, L.C. (2016). Leave the fridge door open, or open and shut multiple times? *ToughNickel*. Retrieved from <https://toughnickel.com/frugal-living/Leave-the-Fridge-Door-Open-or-Open-and-Shut-Multiple-Times>

This article discusses the harm that can come from leaving refrigerator doors open. The author concluded that keeping the door closed and opening it multiple times in a row is much better for the food inside and for the refrigerator itself. Food will spoil faster with the door open due to the warm air being let in and the fact that the compressor can be overheated causing it to shut off until it cools down sufficiently, which damages and causes the need for repair of the compressor more often. This was useful for us in order to understand the workings of the SoS Thai food trucks and why the donors leaving the doors of the truck open for long periods of time have negative connotations.

Duang Prateep Foundation. (2020). Retrieved from <http://www.dpf.or.th/en/>

This is the website for one of the food recipients of SoS Thai, Duang Prateep Foundation. It gave an overview to the team of what the foundation does and who they help. It is a community organization for the Khlong Toei Slum, and it helps provide education to children, gather volunteers, give sponsorships, and set up events for people of all ages. It is important for us to understand what organizations SoS Thai works with and how SoS Thai has helped them through its surplus food program.

Ensure new refugee regulation meets international standards (2019). *Amnesty International Thailand*. Retrieved from <https://www.amnesty.or.th/en/latest/news/754/>

This article contains an overview of the new refugee regulation that's to be implemented in Thailand. A cabinet under the prime minister was expected to consider a draft regulation by the end of 2019 that provides a framework for screening refugees. This showed that the Thai government is developing laws and policies and ensuring the implementation of practices that comply with the international human rights law. Refugees are one type of recipient that the team will be dealing with, so it was helpful for us to understand how they are being treated in Thailand. With this information, we know that the Thai government is working on making the relationships between them better.

Food and Agriculture Organization of the United Nations. (2019). Retrieved from <http://www.fao.org/>

This is the website of the Food and Agriculture Organization of the United Nations (FAO) that leads efforts all over the world to defeat hunger. Their goal is to achieve food security for all and that people have access to good quality food to maintain a healthy life. FAO has done a lot of research on how much food is wasted and money is lost due to the food dilemma. We were able to use their information to understand what exactly is surplus food/food waste, how much is being lost everyday and why it is being lost. The FAO has been working with this issue for years, so it was important to recognize the problem on the global scale.

Gibbons, Jim. (2011). The Good Business Model at Goodwill. *Harvard Business Review*. Retrieved from <https://hbr.org/2011/10/the-good-business-model-at-goo>

This article explains the Goodwill business model. The model is based on the value of promoting the common good and is committed to three goals that they measure the success of the business on. The three goals are to empower individuals in the communities served, ensure a self-sustaining community enterprise, and to have a positive impact on the environment. This was used as a recommendation to SoS Thai to encourage them to take on some of the principles of this model.

Good Shepherd Sisters. (2019). Retrieved from <https://goodshepherdbangkok.com/>

This is a website for one of the food recipients of SoS Thai, Good Shepherd Sisters. They are an organization that helps those who are deprived and rejected in society, especially women and girls. They do so by helping them rebuild their lives, empowering them, and providing shelter. Since they are a food recipient, it is important for us to understand what they do and how SoS has helped them with their mission.

Gustavsson, J., Cederberg, C., Sonesson, U., Otterdijk, R., & Meybeck, A. (2011). Global food losses and food waste. *Food and Agriculture Organization of the United Nations*. Retrieved from <http://www.fao.org/3/a-i2697e.pdf>

This paper contains an overview of the food losses occurring along the entire food chain based on two studies on global food losses carried out in 2011 by the Swedish Institute for Food and Biotechnology. We are able to find out the losses of food at 5 different stages (agriculture production, post-harvest handling, processing, distribution, and consumption) of the food supply chain. This was important to apprehend because these stages contribute to the food's carbon footprint and when handling with the management of surplus food, the emissions within the food system have to be taken into consideration.

Jansuttipan, M. (2016, December 26). The project helping Bangkok's homeless get back on their feet. *BK Asia*. Retrieved from <https://bk.asia-city.com/city-living/news/homeless-project-Bangkok>

This article contains information about the Bangkok Noi Community, one of the food recipients of SoS Thai. They help the homeless people get back on their feet by providing different types of jobs to do and by paying 700 baht per month, they are allowed a shelter. In addition, they have jobs for others around the community as well such as farming, or taking positions of community leaders. As a recipient, it is important for us to know what they do, who they help and how SoS is helping them achieve their goals.

Kamuang, T. & Siriratpiriya, O. (2017). State of the 3Rs in Asia and the Pacific: The Kingdom of Thailand. *United Nations Centre for Regional Development*. Retrieved from [http://www.uncrd.or.jp/content/documents/5695\[Nov%202017\]%20Thailand.pdf](http://www.uncrd.or.jp/content/documents/5695[Nov%202017]%20Thailand.pdf)

This article contains information about the 3Rs strategy act and implemented in 2011 by Thailand. The goal of this strategy is to nationally increase organic waste utilization by 50% in 2026. It encourages activities through cooperation among stakeholders to make waste management effective. Due to this act, there has been an increase in awareness and participation by the public. This is a useful piece of information for us because it shows that Thai government is trying to change their ways of waste management and are successfully taking steps. Our project deals with food management and knowing what methods have already been implemented will help us know what to improve in addition to what is already there.

House of Blessing. (2020). Retrieved from <https://hobtmw.wordpress.com/>

This website is for House of Blessings, one the food recipients of SoS Thai. They help out inmates and children by promoting education and providing training in order forward teaching of how to live as a good person in society. As a recipient, it is important for us to know what they do, who they help and how SoS is helping them achieve their goals.

Lee, R. (2019. November 1). Bangkok Marriott Marquis Queen's Park pushes the sustainability envelope. *TTG Asia*. Retrieved from <https://www.ttgasia.com/2019/11/01/bangkok-marriott-marquis-queens-park-pushes-the-sustainability-envelope/>

This article contains information between the relation of the Bangkok Marriott Marquis Queen's Park Hotel and SoS Thai. The hotel is one of the food donors of SoS Thai. It talks about their goal of sending zero food waste to landfills and working on a better food management system. The hotel makes sure to reuse all of its surplus and food and also compost what cannot isn't usable. They've already seen positive outcomes at their Goji Kitchen +Bar, but also talk about the challenges they face of increased expenses. This article is very important for us because it shows the efforts of a donor and their side of the surplus food problem. It is nice to see the efforts they make, and what they are looking for in an organization like SoS, since they want to expand.

MacLean, D. (2014). Hidden In Plain Sight: Bangkok's 'Invisible Children' Exploited For Profit. *Coconuts Bangkok*. Retrieved from <https://coconuts.co/bangkok/features/hidden-plain-sight-bangkok's-invisible-children-exploited-profit/>

This article talks about the life of the hidden children wandering the city of Bangkok. These children are the orphans of the slum who are left to face society on their own without any guidance. MacLean goes on to explain how children are forced out of their family due to poverty and pushed on to the streets to work. The children are exploited for labor, sex, and the criminal enterprise because they have no other choice. This helped us grasp the situation in which the children live in and what their current situation is, since they will be part of our recipients.

Mercy Centre. (2020). Retrieved from <https://www.mercycentre.org/>

This is the website for Mercy Centre, one of the food recipients of SoS Thai. It is a centre for street kids, five orphanages, hospice and can be considered as home treated for AIDS/HIV patients. A community meeting place, and a serene haven in the slums with small gardens and playgrounds. This center tries to help homeless children to have a better life and get more opportunities towards society. As a recipient, it is important for us to know what they do, who they help and how SoS is helping them achieve their goals.

OzHarvest. (2020). Retrieved from <https://www.ozharvest.org/what-we-do/>

OzHarvest is an organization well known for food rescue in Australia by collecting quality excess food from commercial outlets and delivering it directly to more than 1300 charities supporting people in need across the country. Their working process is the same as the SoS Thai organization. OzHarvest contains four pillars that work on rescue, educate, engage and innovate.

PATA x Thai-SoS - the food waste agenda in Thailand. (2018). *Pacific Asia Travel Association*. Retrieved from <https://sustain.pata.org/pata-x-thai-sos-the-food-waste-agenda-in-thailand/>

This article discusses food surplus food management with the help of Scholar of Sustenance(SoS) which is known as the pioneer of food rescue operations in Thailand. PATA launched a workshop to concern their staff about the number of waste produced in Thailand. In this workshop Mr. Bruce Chen has been invited as a guest speaker from the SoS organization. For example, an average Bangkok grocery store can throw up to 200 kgs of edible food per day. By this it can raise the issue surrounding food waste. In this workshop Mr. Bruce Chen has been invited as a guest speaker from SoS organization in Thailand

Rodgers, G. (2019). How much money is needed for a trip to Thailand. *Trip Savvy*. Retrieved from <https://www.tripsavvy.com/how-much-money-for-thailand-1458578>

This article goes through the general expenses one will face while traveling in Thailand. It includes potential expenses such as: food, water, laundry service, accommodations, transportation, flights, shopping, ATM fees, etc. This was used in the data analysis section in order to understand how much the recipients of SoS Thai would be paying for food and meals if they did not receive the donated food.

Rujivanarom, P. (2018, March 9). Food security report points to increasing malnourishment and obesity in Thailand. *The Nation*. Retrieved from <https://www.nationthailand.com/national/30340610>

This article delves into the food security and gap of access of food in Thailand. It gives statistics on the numbers of hungry or malnourished verses the well off and overweight throughout the country. It also lists reasons for why there is such a food security situation throughout Asia and as well as how much food is wasted on the continent, enough to generously feed all those starving. This was used to gain an understanding on why surplus food is such an issue in developing countries and why it is so important that SoS Thai is doing what they are doing.

Scholars of Sustenance. (2019). Retrieved from <https://www.scholarsofsustenance.org/>

This is the official website for Scholars of Sustenance (SoS), and it explains how SoS began. The founder and CEO, Bo H. Holmgreen, started this organization because, throughout his time traveling around the world, he noticed how much food was wasted in a day in many cities. He wanted that to change and, as time went on, he was able to successfully build a system that recovered large amounts of excess food from groups that are notorious for overproducing food such as catered events, restaurants, and grocery stores. Holmgreen provides his own story as well as a brief history of this organization which is very helpful information to receive from the man running the organization. This source can be trusted, as it is the official website of our sponsor. The information and statistics from this website will be cited throughout the entire paper.

Second Harvest. (2019). Retrieved from <https://secondharvest.ca/what-we-do/>

This is the official website of Second Harvest, Canada's largest food rescue charity aimed to protect the environment and feed the hungry. The website goes into depth about their mission and operations. This was used to understand how other food rescue organizations operate around the world.

Slum's poor lose again. (2019). *Bangkok Post*. Retrieved from <https://www.bangkokpost.com/opinion/opinion/1727831/slums-poor-lose-again>

This article talks about transforming the largest slum into a commercial district in order to complete a new "Bangkok Landmark ". 12,500 low income families that lived in Khlong Toei slum will be forced to move out and rent tiny rooms in new condominium buildings or move elsewhere. Half of the transforming landmark will be a shopping complex, business centers, shops, and other commercial spaces.

Spiegel, J. (2019). Food waste starts long before food gets to your plate. *Yale Climate Connections*. Retrieved from <https://www.yaleclimateconnections.org/2019/05/food-waste-has-crucial-climate-impacts/>

This article delves into the problem of food waste and how waste begins at the very beginning of the food supply chain, not with consumers. Greenhouse gas emissions start with the farm and continue throughout the supply chain up until food waste management. The article discusses the causes and effects of the different emissions. This was useful for us to understand the true environmental impact of lost and wasted food and how so much goes into getting food into retailers and food service suppliers and eventually to consumers, that it is irresponsible to let any of it go to waste.

Srisuwannaket, T. & Liumpetch, C. (2019). Tackling Thailand's food-waste crisis. *Bangkok Post*. Retrieved from <https://www.bangkokpost.com>

This article is about the food waste crisis. One-third of all food produced globally is thrown away. Billions of people suffered from the food crisis. Food Waste generates 8% of the greenhouse gases, causing global warming. Reducing food waste is one of the goals of UNDP that set the goal to reduce food waste by 50% by the year 2030. Many countries tried to reduce food waste by selecting the safe expired food from hotels and supermarkets to donate instead of throwing away. In the status quo, Thailand is far behind other countries. Thailand's 64% of total garbage is food waste, and only a tiny amount is recycled. In Bangkok, only 2% of food waste is recycled. The rest goes to landfills. Hotels in Thailand tried to reduce food waste by donating past date food to those in need. Therefore, Thailand needs a food waste database, starting with the hotel industry, then promoting it into a national issue. Supporting websites, organizations, network, and consultancy agency. Thai government should set hygiene standards and regulations such as on food transportation.

Stylianou, N., Guibourg, C., & Briggs, H. (2019). Climate change food calculator: What's your diet's carbon footprint. *BBC News*. Retrieved from <https://www.bbc.com/news/science-environment-46459714>

This article is about diet's carbon footprint. Meat and dairy products are the main factors that cause environmental impact, according to the studies. Plant based diet can help to fight climate change, according to the UN's IPCC.

Sustainability project - food waste. (2019). *Marriott Marquis Bangkok Queen's Park*. Retrieved from <https://bangkokmarriottmarquisqueenspark.com/dining/sustainability-project-food-waste/>

This is the official website of Marriott Marquis Bangkok Queen's Park Hotel set the goal to put their action on sustainability by reducing the hotel's wastage by 27.4 tons of food and promoting sustainable consumption of food, and reducing global climate change caused by food waste.



Marriott also has a future plan to reduce food waste in all of its restaurants and food outlets, striving to be the 1st hotel to be awarded the PLEDGE certificate.

Thailand becoming garbage bin of world: Expert on waste management. (2018). *The Straits Times*. Retrieved from <https://www.straitstimes.com>

This article discusses the waste problem in Thailand. It goes into some of the current waste management practices and government policies, and how many waste-to-energy plants are being encouraged. This is one of the most polluting methods of waste management, but many things stand in the way of preventing proper methods of being put in place. This helped us to understand waste management in Thailand.

Thateethai. (2019). The LINE phenomenon in Thailand - by the numbers. *Lexiconthai*. Retrieved from <https://lexiconthai.com/blog/the-line-phenomenon-in-thailand-by-the-numbers>

This article explains the widespread use of the Line phone app in Thailand. It was developed in 2011 and became the most popular mobile app in Thailand by 2019. It began as a messenger service by grew into a digital commerce service as well. The app has added business friendly features in order for companies to reach their consumer base. We used this article to gain more understanding of the app and to see if it could be applicable for SoS Thai to use to communicate with their food donors.

The importance of nutrition in an emergency. (2019). *The UN Refugee Agency*. Retrieved from <https://www.unrefugees.org.au/about-us/news/nutrition-in-an-emergency/>

This article talks about the importance of nutrition in an emergency. It talks about why nutrition matters due to the rights to receive the right amount of nutrition, prevention of diseases, and maintaining the immune system. UNHCR works are improving nutrition through funding, and partnership with the World Food Programme (WFP) and others.

Tesco Lotus continues to reduce food waste, expanding the project “Eating out without waste”. (2018). *Tesco Lotus*. Retrieved from <https://www.tescolotus.com/news/view/446>

This article is about how Tesco Lotus decrease the amount of surplus food throughout its project. Some of their actions are such as opening a documentary called “WASTED!” to persuade Thai people to decrease food waste they made daily, donating surplus food to charities and partially in order to make fertilizer and animal feeds. Also, Tesco Lotus started a model to measure the amount of surplus food in the business, and convince other companies to reveal their data on food waste clearly to the public.

The importance of nutrition is an emergency. (2019). *UNHCR*. Retrieved from <https://www.unrefugees.org.au/about-us/news/nutrition-in-an-emergency/>

This article talks about how nutrition is especially important for refugees and those in drastic situations. Mass population movements result in high rates of malnutrition, sickness, and death. Poor quality diets and vitamin and mineral deficiencies are the cause and especially harmful to children and those who live with chronic diseases. This was used to gain an understanding on why the refugee communities that SoS Thai donates to are in special need of a more nutritious diet.

Sustainability. (2019). *Banyan Tree*. Retrieved from <https://www.banyantree.com/en/thailand/bangkok/sustainability>

This article is about how Banyan Tree deals with sustainability internally. Concerning the human and physical environment. Banyan Tree had gained many awards for environmental and social responsibility. Such as EarthCheck Gold Certification, Green Office Award. Banyan. Also, Banyan Tree is a partner with the Scholars of Sustenance Foundation, Thailand (SoS) in order to collect and distribute surplus food for the benefit of people in need. Banyan Tree also set tree-planting events to make green communities for making environmental responsibility. Banyan Tree also creates seedling programs to nurture young people. Providing them with life skills and education, and preparing them for life and work.

Stylianou, N., Guibourg, C., & Briggs, H. (2019, August 9). Climate change food calculator: what's your diet's carbon footprint. *BBC News*. Retrieved from <https://www.bbc.com/news/science-environment-46459714>

This article was written to show the climate impact of a person's diet and to determine which foods are more environmentally friendly. Food production alone is responsible for a quarter of all greenhouse gas emissions and the source encourages and recommends changes to one's diet to make a difference in personal environmental footprints. They found that meat and dairy products contribute the most greenhouse gases, and they even compared the climate footprint in different parts of the world. In order for readers to determine the climate impact of their diet, the authors created a food calculator where the reader can choose different foods and how often they eat them. The calculator then shows how much the consumption of that food over a year contributes to a person's annual greenhouse gas emissions. They also show the equivalent of those greenhouse gas emissions in terms of kilometers driven, the amount of time a home can be heated using those greenhouse gas emissions, and the amount of water consumption the food uses. This is a strong and credible source because they cite their references and explain how they made the food calculator. BBC News is also a world-renowned trustworthy news source. This information will most likely be located in the background and literature review of the final paper but will be referenced in the methodology as well.

UNHCR. (2020). Retrieved from <https://www.unhcr.org/history-of-unhcr.html>

This website contains the history of the United Nations High Commissioner for Refugees (UNHCR), what they do and their current projects. This organization has been working with refugees since 1950, trying to protect and assist these people that are struggling. The UNHCR started work in Europe, and as time went on was able to spread to the rest of the world. The organization grew in size now having more than 16,000 personnel and work in 134 countries. The budget grew from \$300,000 the first year to over \$6 billion in 2016. They are very proud of their accomplishments and are happy to say that they have helped over 50 million refugees restart their lives. We believe that this organization will help significantly in communicating with the refugees for this project.

Vermeulen, S., Campbell, B., & Ingram, J. (2012). Climate change and food systems. *The Annual Review of Environment and Resources*, 37, 195-222. doi: 10.1146/annurev-environ-020411-130608

This article discusses the greenhouse gases that come from each stage of the food life cycle. The emissions are broken down into three stages: pre-production, production, and post-production. The article also states the emissions from each of the stages which shows that most of the emissions in a single foods life cycle come from the production stage and very little comes from waste management. This was useful for us to understand the true environmental impact of lost and wasted food and how so much goes into getting food into retailers and food service suppliers and eventually to consumers, that it is irresponsible to let any of it go to waste.

Quinley, C. (2019, September 11). Life in the shadows: Thailand's urban refugees. *The New Humanitarian*. Retrieved from <https://www.thenewhumanitarian.org/news/2019/09/11/Thailand-refugee-policies-asylum-seekers-immigration-detention>

This article talks about the life of Thailand's urban refugees. Refugee is one of the most sensitive topics since it is considered to be illegal in Thailand. According to the article, refugees from Pakistan immigrate to Thailand, hoping to find safe accommodation in Thailand's capital, Bangkok. Under Asylum seeker they have little protection and few rights in their adopted homeland. Furthermore, Thailand still has immigration crackdown and detention which talks about the difficulty of the refugees migrating to Thailand. Refugees have to live and hide themselves in places that the government cannot reach them. With less opportunity of getting a job and bad living condition SoS will help them to assist their needs in foods to reduce some expenses.

## Appendices

### Appendix A - Greenhouse gas emission equivalent for landfilling various serving sizes of food

● Produce ● Protein ● Starch

Food	Serving Size	kgs of ghg / serving	Equivalent in Driving Distance (km)	Equivalent in Liters of Water	Land Use (m <sup>2</sup> )
Avocados	0.5	0.2	0.83	45	-
Tomatoes	1	0.16	0.7	29.5	-
Berries/grapes	1 handful	0.12	0.5	33.5	-
Bananas	1	0.07	0.28	9.13	-
Apples	1	0.03	0.14	14.37	-
Citrus fruits	1	0.03	0.13	-	-
Beef	75 g (1 typical fast food burger)	7.73	31.7	-	22.17
Lamb	75 g (2 lamb chops)	4.33	17.8	-	40.36
Farmed prawns	5 king prawns	3.44	14.14	450.5	-
Farmed fish	140 g (1 cod fillet)	1.87	7.68	506.88	-
Pork	75 g ( 3 bacon rashers)	1.8	7.38	262.3	2.5
Chicken	75 g (1 small breast)	1.36	5.6	91.22	1.68
Cheese	30 g (2 crackers worth)	0.96	3.96	226.58	3.5
Eggs	2	0.55	2.28	68.8	-
Tofu	100 g	0.16	0.65	7.5	-
Beans	150g (1/3 of can)	0.1	0.41	24.3	-
Peas	80 g	0.016	0.07	-	-
Nuts	1 handful	0.013	0.06	133.3	-
Rice	3 tbsp uncooked	0.33	1.36	168.16	-
Pasta	75 g uncooked	0.12	0.5	57.5	-
Oatmeal	3 tbsp uncooked	0.1	0.43	20.56	-
Bread	1 slice	0.06	0.25	24.6	-
Potatoes	2 small	0.04	0.19	-	-

## **Appendix B - Community leader interview questions**

The questions below are directed towards the community leaders of each group that receives food from SoS Thai. We asked the community leaders because one person can speak for all instead of trying to ask every person in the community what they need and possibly cause problems. We will survey a few of the residents but when it comes to the bigger picture of the problem the community leader will have more information.

1. How do you know about SOS and Food rescue operations?
2. Does food sharing program help improve your well-being?
3. What do you think about the SOS operation?
4. How many people receive food from SOS on a daily basis?
5. How many days does it take to use all of the SOS foods?
6. How many kids and elders are in this community?
7. Does the community have any concern regarding donated foods?
8. Do other surrounding communities have any issues with food distributing activity?
9. What is the ideal amount of surplus that can feed the majority and priority group of recipients?
10. What does the community do when they receive a large portion of food?
11. Does the community have specific kinds of food that are unwanted or do not wish to be received? If so, do you want the workshop on how to reprocess those foods?
12. What do you expect more from SOS in the future?

## Appendix C - Food recipient survey

We will survey refugees in order to gather information and then interpret them into data. We will focus on the food they are currently receiving and what foods they would like to receive and why. We will seek advice from organizations on how to best communicate with the refugees who agree to take this survey.

### Food Recipient Survey

<p>1. Location</p> <p>_____</p>	<p>6. Do you feel you are getting enough to eat?</p> <p><i>Mark only one oval.</i></p> <p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<p>What concerns do you have about the donated foods?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>2. Age Group</p> <p><i>Mark only one oval.</i></p> <p><input type="radio"/> Child</p> <p><input type="radio"/> Teens</p> <p><input type="radio"/> Young Adults</p> <p><input type="radio"/> Adults</p> <p><input type="radio"/> Elders</p>	<p>7. What foods do you need more of?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>Would you be interested in learning about how to reprocess unwanted foods the community receives?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>3. Do you eat meat?</p> <p><i>Mark only one oval.</i></p> <p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<p>8. What foods would you like to receive less of?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>What would you like to see be improved with this system?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>4. Is there any specific type of meat that you do not eat?</p> <p>_____</p>	<p>9. How long does it take to go through the food donated from SoS Thai?</p> <p>_____</p>	<p>Is there anything else you would like us to know?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>5. If you do not eat meat why?</p> <p><i>Check all that apply.</i></p> <p><input type="checkbox"/> Vegetarian</p> <p><input type="checkbox"/> Vegan</p> <p><input type="checkbox"/> Religious reasons</p>	<p>10. Does this food sharing system improve your well-being?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>

## **Appendix D - Food donor interview questions**

The questions below are for the food donors consisting of Tesco Lotus and Bangkok Marriott Marquis Queen's Park hotel. The purpose of these questions is to understand their environmentally friendly policies about food waste management in their organizations and why they would donate the surplus food or edible food to SoS Thai. We also hope to gain information whether the food donors are interested in improving their processes to become more sustainable and to what extent.

1. How many tons of food waste per day is produced by (Tesco Lotus/ Bangkok Marriott Marquis Queen's Park hotel)?
2. How much food is sold per day?
3. What type of food is almost always wasted? How much?
4. Do you believe your customers know the difference between the 'best before' date and the 'expired' date? If not, how do you think customers could learn the difference?
5. Why does (Tesco Lotus/ Bangkok Marriott Marquis Queen's Park hotel) produce so much surplus food?
6. How does (Tesco Lotus/ Bangkok Marriott Marquis Queen's Park hotel) deal with the food waste problem?
7. How do you preserve edible and surplus food before donating to SoS Thai?
8. Any recommendations or opinions from the employees to improve and know the causes of wasted or surplus food problems in the organization?
9. What is your environmental and Corporate Social Responsibility policy about food waste and surplus food of the organization now and in the future plan?
10. Is there any correlation between reducing the surplus food the company donates the longer they work with SoS Thai?
11. What made the company want to work with SoS Thai?
12. What has been a positive outcome by working with SoS Thai?

## **Appendix E - SoS Thai data analyst interview questions**

The questions below are directed towards the data analyst employee of SoS Thai. From these questions, we hope to understand how the data collection process works, who it is geared towards, and what they ultimately want to do with the data. The goal is to gain a clear understanding of why SoS Thai wants to market their data more and what they want to improve about it.

1. What is the importance of your role in SoS Thai?
2. How is the data tracked and updated?
3. How is the data organized?
4. Who do you provide the data to?
5. In your own words, what do you think the data collection lacks as of now?
6. Why do you think it's important to improve data marketing?
7. Do you have any recommendations on what we should focus on?
8. Are we allowed to use all of the data SoS has collected?



## Appendix F - Food collection questions and observations, Truck #1

Date	Truck Route Name	Question	Observation/Data Collected	Other Comments
30/01/2020	GiGi, Truck #1	How many trucks are typically completing pick-ups per day	4	
		How often the trucks refuel? Fuel capacity?	The truck went through a little over a quarter a tank of gas, it looked as though they refuel every couple of days	
		How long is a typical route (in minutes and kilometers)? How long is the food typically in the truck?	From SoS to the last food donor: 37 km, 5 hrs 18 mins	
		What types of food are collected from donors? What foods are not accepted?	Produce, bakery items, cooked food, The donors seem to only give edible food	
		Are the trucks being filled to capacity?	On a busy day (Fridays) the trucks stop at more donors, thus get more crates, on this day the truck was not filled to capacity	
		How many food donors are visited per day per truck?	about 14	
		How many deliveries are done each day per truck?	1 delivery per truck	
		How far are the delivery stops from the donor locations? From SoS office?	See road trip data	
		What time does the truck leave to deliver the food? And when the truck arrived back at SoS Thai?	Departed shortly after 11, arrived back around 6	
		Are drivers hygienic in the food recovery process? How do they keep the food clean?	The back of the truck is refrigerated and monitored with a thermometer in the front of the truck	
		Are the SoS Thai trucks refrigerated? At what temperature are they set? Is the temperature consistent?	The truck, with closed doors, was often around 3 degrees Celsius, but with the doors open at donor stops it often rose up to around 8 degrees Celsius	
		What types of containers is the food transported in?	Crates, cooked food is placed in clear plastic containers	
		How many kilograms of surplus food is produced per donor?	varies from over 10 crates from Tesco, to one plastic container from the Weston	

## Appendix G - Food collection questions and observations, Truck #2

Date	Truck Route Name	Question	Observation/Data Collected	Other Comments
30/01/2020	Jackie, Truck #2	How many trucks are typically completing pick-ups per day	4	
		How often the trucks refuel? Fuel capacity?	This truck most likely will refuel every three days. At the beginning of this route, the drive spent 1000Baht on 31.456 liters to fill the tank 3/4 of the way.	Only ¼ of a tank was used during this trip
		How long is a typical route (in minutes and kilometers)? How long is the food typically in the truck?	From SoS to SoS it took about 6 hours. The total kilometers driven was about 110km.	
		What types of food are collected from donors? What foods are not accepted?	A combination of fruits, vegetables, cooked chicken and pork, and bakery items.	
		Are the trucks being filled to capacity?	No, there was not enough food to fill the whole truck.	
		How many food donors are visited per day per truck?	This truck made 12 stops.	The majority of stops were Tesco Lotus and Tops Market. Two other hotels were visited.
		How many deliveries are done each day per truck?	This truck stopped at one place.	Suwit Wanoo Homeless Center; Bangkok Noi Community
		How far are the delivery stops from the donor locations? From SoS office?	It varies. The first stop in Bang Na was 20min away from SoS Thai. Each location was about 8min from each other. The last donor to the food recipient was an hour away with traffic	
		What time does the truck leave to deliver the food? And when the truck arrived back at SoS Thai?	11:30am-5:33pm	

		Are drivers hygienic in the food recovery process? How do they keep the food clean?	They drop off clean bins when then pick up the full bins.	The driver touches loose food with our hands. The recipients should wash the food before consuming.
		Are the SoS Thai trucks refrigerated? At what temperature are they set? Is the temperature consistent?	The trucks are refrigerated but the temperature ranged from 20-9 degrees celsius	
		What types of containers is the food transported in?		
		How many kilograms of surplus food is produced per donor?		

## Appendix H - Food collection questions and observations, Truck #3

Date	Truck Route Name	Question	Observation/Data Collected	Other Comments
30/01/2020	Michael, Truck #3	How many trucks are typically completing pick-ups per day	4	Each route has a different name
		How often the trucks refuel? Fuel capacity?	It depends on when the truck is low on gas. The driver will typically get gas every couple of days.	
		How long is a typical route (in minutes and kilometers)? How long is the food typically in the truck?	5-10 minutes in each place.	
		What types of food are collected from donors? What foods are not accepted?	Most of the foods are bakery items, vegetables, and fruits.	
		Are the trucks being filled to capacity?	No, the truck not fill in capacity	
		How many food donors are visited per day per truck?	11 donors	
		How many deliveries are done each day per truck?	1 recipient	To Prachauthit 79 community
		How far are the delivery stops from the donor locations? From SoS office?	From SoS HQ to the first donor was about 20 min to the Pinkhoa area and Nonthaburi.	
		What time does the truck leave to deliver the food? And when the truck arrived back at SoS Thai?	11:30 am - 6:30 pm	
		Are drivers hygienic in the food recovery process? How do they keep the food clean?	They spray and clean the truck after each use daily.	
		Are the SoS Thai trucks refrigerated? At what temperature are they set? Is the temperature consistent?	The temperature ranged between 3-10 degree celsius.	
		What types of containers is the food transported in?	Cooked meat in Tupperware, and bakery items, vegetables, and fruits in plastic crates provided by SoS.	
		How many kilograms of surplus food is produced per donor?	3-4 crates of the bakeries and 1-2 crates of vegetables and fruits.	

## Appendix I - Food collection questions and observations, Truck #4

Date	Truck Route Name	Question	Observation/Data Collected	Other Comments
30/01/2020	Adam, Truck #4	How many trucks are typically completing pick-ups per day	4 trucks	
		How often the trucks refuel? Fuel capacity?	1 time per day. Capacity depends on truck brands.	
		How long is a typical route (in minutes and kilometers)? How long is the food typically in the truck?	Estimated 150-200km, 10-12 hours.	In the urban route
		What types of food are collected from donors? What foods are not accepted?	Eatable food surpluses are accepted. Cooked foods are not accepted.	
		Are the trucks being filled to capacity?	Filled just enough fuel to use per day.	
		How many food donors are visited per day per truck?	16-18 places per truck.	
		How many deliveries are done each day per truck?	1 delivery.	to Prachauthit 79.
		How far are the delivery stops from the donor locations? From SoS office?	18 km from the office.	from office to Narai hotel
		What time does the truck leave to deliver the food? And when the truck arrived at SoS Thai?	The truck left at 11:30 am and returned at 8:00 pm.	
		Are drivers hygienic in the food recovery process? How do they keep the food clean?	Drivers are hygienic. They keep the food clean by cleaning the refrigerator inside the truck by washing with water, spray, and scrub.	
		Are the SoS Thai trucks refrigerated? At what temperature are they set? Is the temperature consistent?	They are refrigerated. They set the temperature between -5 to 10 degrees celsius. The temperature is consistent.	
		What types of containers is the food transported in?	Food is transported in crates and Tupperware	
		How many kilograms of surplus food is produced per donor?	Around 5-6 kilograms.	It depends on the type of food. Vegetables made up only 1-2 kilograms.

## Appendix J - SoS Thai truck route timesheet, Truck #1

This table includes the donors visited, the time visited, the distance between each donor, and the recipient the food was dropped off at for truck #1 that took route GiGi.

<b>Departure time:</b> 11:09 AM		
<b>Food Donor</b>	<b>Arrival Time</b>	<b>Departure Time</b>
Chatrium Hotel Riverside	11:35 AM	11:37 AM
Shrewsbury International School	11:42 AM	11:48 AM
Chatrium Residence Sathorn	12:03 PM	12:07 PM
Tesco Lotus	12:31 PM	12:44 PM
Bangkok Sukhumvit Thonglor	1:11 PM	1:18 PM
Grand Hyatt Erawan	1:26 PM	1:30 PM
The Westin Grande Sukhumvit, Bangkok	1:36 PM	
Tops Market		1:56 PM
Conrad	2:20 PM	2:32 PM
Chidlom	2:40 PM	2:55 PM
Siam Kempinski	3:14 PM	3:24 PM
Convention Center at Central World	3:26 PM	3:32 PM
World Trade Center	3:52 PM	4:02 PM
The Sukosol Bangkok	4:11 PM	4:27 PM
<b>Recipient:</b> Suwit Watnoo Homeless Center (Bangkok Noi Community)		
1 hour drive from last donor, 15 minutes away from SoS HQ		
<b>Return time:</b> 6:00 PM		

## Appendix K - SoS Thai truck route timesheet, Truck #2

This table includes the donors visited, the time visited, and the recipient the food was dropped off at for truck #2 that took route Jackie.

<b>Departure time:</b> 11:30 AM		
<b>Food Donor</b>	<b>Arrival Time</b>	<b>Departure Time</b>
Tesco Lotus	11:50 AM	11:54 AM
Tops Market	12:05 PM	12:30 PM
Tesco Lotus	12:50 PM	12:53 PM
Tops Market	1:00 PM	1:10 PM
Tops Market	1:15 PM	1:28 PM
Tops Market	2:04 PM	2:09 PM
Tops Market	2:22 PM	2:36 PM
IKEA	2:42 PM	2:45 PM
Tops Market	2:50 PM	2:57 PM
Tops Market	3:05 PM	3:08 PM
So\ Hotel	3:35 PM	3:39 PM
Banyann Tree Hotel	3:41 PM	3:50 PM
<b>Recipient:</b> Suwit Watnoo Homeless Center (Bangkok Noi Community)		
54 minute drive from last donor, 11 minutes away from SoS HQ		
<b>Return Time:</b> 5:33 PM		

## Appendix L - SoS Thai truck route timesheet, Truck #3

This table includes the donors visited, the time visited, and the recipient the food was dropped off at for truck #3 that took route Michael.

<b>Departure time:</b> 11:30 AM		
<b>Food Donor</b>	<b>Arrival Time</b>	<b>Departure Time</b>
Tops Market at Central Pinklao	11:30 AM	11:41 AM
Tops Market at Seacon Bangkai	12:04 PM	12:15 PM
Tesco Lotus at Bangyai	12:45 PM	1:05 PM
IKEA at Bangyai	1:28 PM	1:29 PM
Tops Market at Central Plaza Westgate	1:33 PM	2:10 PM
Centara Grand Hotel at Central Plaza Ladprao Bangkok	2:36 PM	2:46 PM
Tops Markets at Central Ladprao Bangkok	2:50 PM	2:59 PM
W Bangkok Sathorn Hotel	3:30 PM	3:37 PM
Millennium Hilton Bangkok	3:58 PM	4:07 PM
AVANI Riverside Bangkok Hotel	4:22 PM	4:28 PM
Anantara Riverside Bangkok Resort	4:29 PM	4:31 PM
<b>Recipient:</b> Pracha Uthit79 community arrived at 5.05 pm finished 5.45 pm		
34 minutes drive from last donors and 45 minutes away from SoS HQ		
<b>Return time:</b> 6:30 PM		



## Appendix M - SoS Thai truck route timesheet, Truck #4

This table includes the donors visited, the time visited, and the recipient the food was dropped off at for truck #4 that took route Adam.

<b>Departure time:</b> 11:20 AM		
<b>Food Donor</b>	<b>Arrival Time</b>	<b>Departure Time</b>
Royal Orchid Sheraton	11:40 AM	11:50 AM
Chatrium Riverside	12:10 PM	12:25 PM
Shrewsbury International	12:30 PM	12:40 PM
The Commons	1:04 PM	1:16 PM
Tops Marketplace Thonglor	1:40 PM	1:53 PM
Marriott Hotel Sukhumvit	2:32 PM	2:45 PM
Tops Century	3:01 PM	3:19 PM
Tops Sukhumvit 50	3:27 PM	3:41 PM
Marriott Marquis	3:55 PM	4:08 PM
Novotel 20	4:19 PM	4:42 PM
Erawan	4:58 PM	5:20 PM
Renaissance	5:25 PM	5:40 PM
Waldorf Astoria	5:50 PM	6:03 PM
Anantara Siam	6:10 PM	6:25 PM
St.Regis	6:36 PM	6:50 PM
<b>Recipient:</b> Pracha Uthit 79 community	7:16 PM	8:13 PM
<b>Return Time:</b> 8:55 PM		

## Appendix N - Meals served per delivery for three recipients

House of Blessings					
Number of kg per Delivery by Category					
Bakery	127.85	kg			
Cooked Foods	54.49	kg			
Fruit	84.43	kg			
Vegetables	173.79	kg			
<i>Average Food Donated Per Delivery</i>	440.55	kg			
Recommended kg per DayBreakdown from Source (low-cal, active)			Breakdown Estimation in SoS Categories		
Fruits and Veggies	1.13	kg	Bakery	0.50	kg
Grains and Legumes	0.45	kg	Cooked Foods	0.28	kg
Nuts/seeds	0.14	kg	Fruit and Veggies	1.13	kg
Meat, Dairy, Eggs	0.14	kg			
Added Sugars/fats/oils	0.05	kg			
<i>Total</i>	1.91	kg	<i>Total</i>	1.91	kg
Number of People That Can be Fed per Food Category					
Bakery	256	daily servings			
Cooked Foods	195	daily servings	constraint		
Fruit and Veggies	229	daily servings			
Remaining kgs After Max Full Meals Served					
Bakery	30.54	kg			
Cooked Foods	0.00	kg			
Fruit and Veggies	38.32	kg			

Bangkok Noi					
<b>Number of kg per Delivery by Category</b>					
Bakery	162.31	kg			
Cooked Foods	101.80	kg			
Fruit	141.50	kg			
Vegetables	145.73	kg			
<i>Average Food Donated Per Delivery</i>	551.34	kg			
<b>Recommended kg per Meal Breakdown from Source (low-cal, active)</b>			<b>Breakdown Estimation in SoS Categories</b>		
Fruits and Veggies	1.13	kg	Bakery	0.50	kg
Grains and Legumes	0.45	kg	Cooked Foods	0.28	kg
Nuts/seeds	0.14	kg	Fruit and Veggies	1.13	kg
Meat, Dairy, Eggs	0.14	kg			
Added Sugars/fats/oils	0.05	kg			
<i>Total</i>	1.91	kg	<i>Total</i>	1.91	kg
<b>Number of People That Can be Fed per Food Category</b>					
Bakery	325	daily servings			
Cooked Foods	364	daily servings			
Fruit and Veggies	254	daily servings	constraint		
<b>Remaining kgs After Max Full Meals Served</b>					
Bakery	35.22	kg			
Cooked Foods	30.63	kg			
Fruit and Veggies	0.00	kg			

Pracha Uthit 79					
<b>Number of kg per Delivery by Category</b>					
Bakery	200.17	kg			
Cooked Foods	147.09	kg			
Fruit	137.18	kg			
Vegetables	132.62	kg			
<i>Average Food Donated Per Delivery</i>	617.05	kg			
<b>Recommended kg per Meal Breakdown from Source (low-cal, active)</b>			<b>Breakdown Estimation in SoS Categories</b>		
Fruits and Veggies	1.13	kg	Bakery	0.50	kg
Grains and Legumes	0.45	kg	Cooked Foods	0.28	kg
Nuts/seeds	0.14	kg	Fruit and Veggies	1.13	kg
Meat, Dairy, Eggs	0.14	kg			
Added Sugars/fats/oils	0.05	kg			
<i>Total</i>	1.91	kg	<i>Total</i>	1.91	kg
<b>Number of People That Can be Fed per Food Category</b>					
Bakery	400	daily servings			
Cooked Foods	525	daily servings			
Fruit and Veggies	239	daily servings	constraint		
<b>Remaining kgs After Max Full Meals Served</b>					
Bakery	80.79	kg			
Cooked Foods	80.24	kg			
Fruit and Veggies	0.00	kg			

## Appendix O - SoS operations per day

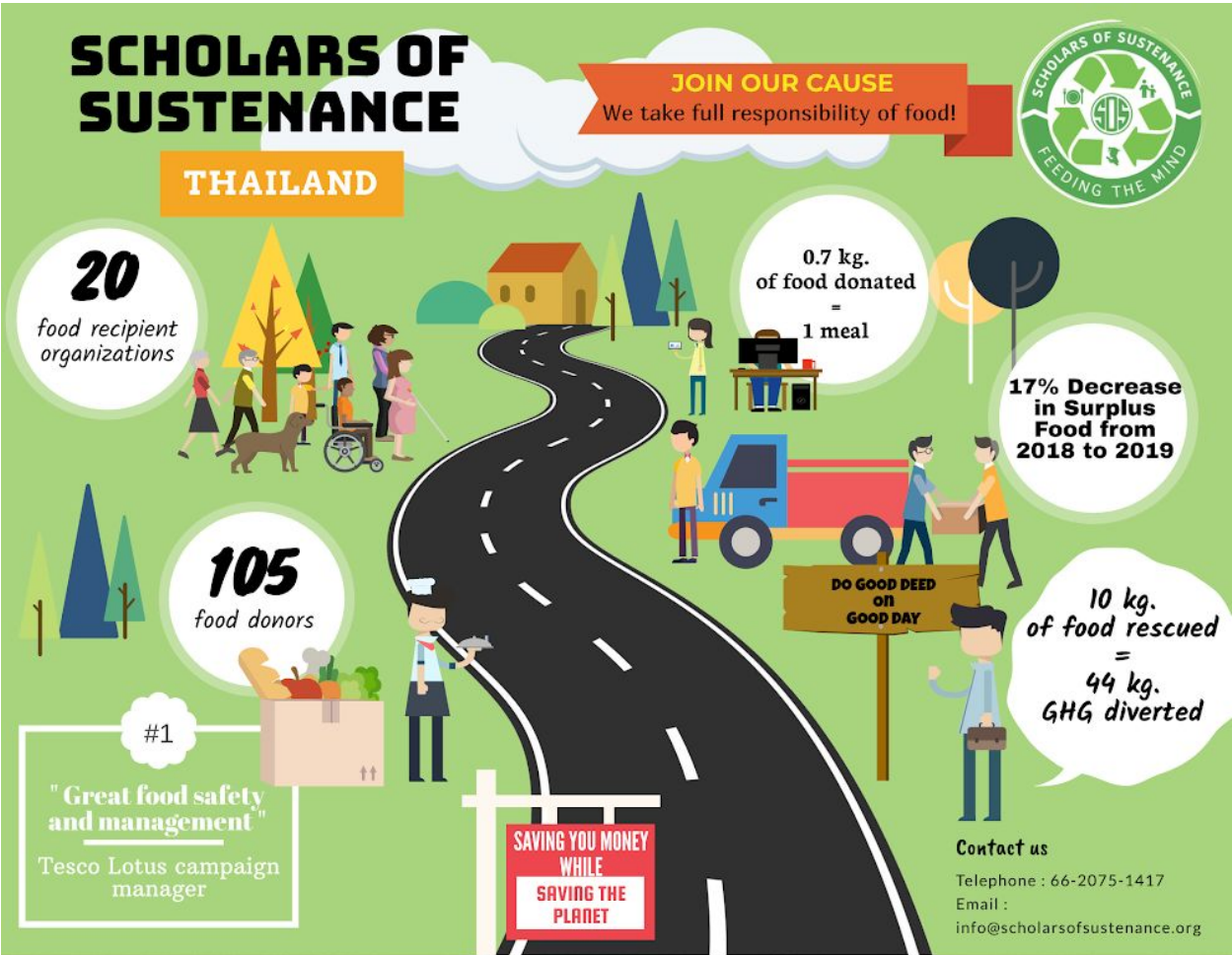
Position	For-profit Salary	Cost per Day
Program Manager	\$11,381	฿31.18
Operational Manager	\$11,381	฿31.18
Office Manager	\$6,699	฿18.35
Marketing Manager	\$13,275	฿36.37
Logistic Supervisor	\$11,381	฿31.18
Food Safety Specialist	\$8,162	฿22.36
Communities Coordinator	\$6,668	฿18.27
	(2) Total Contribution Value:	฿188.89

## Appendix P - Driver salary and maintenance expenses

Truck	Operation Start	Operation End	Km. Driven/day	Maintenance Cost	Tollway/day	Fuel/ day
Adam	11:00	19:00	76	฿133.33	฿200.00	฿750.00
GiGi	11:00	18:30	109	฿133.33	฿116.67	฿583.33
Michael	11:00	19:00	79	฿133.33	฿200.00	฿700.00
Jackie	11:00	18:00	127	฿166.67	฿339.83	฿706.67
				฿566.67	฿856.50	฿2,740.00
<b>Number of Drivers</b>	<b>Driver Daily Salaries</b>					
7	฿566.67					
(3) Drivers' salary	฿3,966.67					
(4) Maintenance	฿4,163.17					

Appendix Q - Infographics

a. New donor infographic



b. Public awareness infographic

