

# STATE OF FOOD DONATION EFFORTS IN FLORIDA

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## EXECUTIVE SUMMARY

The Florida Department of Environmental Protection (FDEP) commissioned the Department of Environmental Engineering Sciences at the University of Florida (UF) to summarize and quantify food donations transferred throughout the state, catalog current tools for recording and transferring food donations, and determine the extent of the environmental benefits of food recovery. Food waste comprises 6.6% by mass of the waste stream in Florida and its contribution to worldwide greenhouse gas emissions is a global concern (FDEP, 2019; FAO, 2013). One option for food recovery, or the reuse of food items, is to donate. Food donations are defined as food products fit for human consumption, including perishable and non-perishable items, that do not enter the traditional waste stream and instead are sent to service organizations with the intent to feed food insecure people.

Typically for manufactured goods, source reduction occurs through the reduction of the generation or consumption of the material. Consumers and manufacturers may apply source reduction activities by reusing or reducing consumption of a material at the beginning or end-of-life stages. Our definition of source reduced food, or food donations, is food waste that is fit for human consumption and donated instead of treated by traditional disposal methods. The team uses source reduced, donation, and recovery synonymously. This definition does not include purchased food items, nor items procured through food drives or the USDA until further information on the source reduction level is known.

We researched and communicated with government agencies, county recycling coordinators, generators, and food service to collect data from food recovery operations on food donation quantities transferred throughout Florida in 2018. In this report, we summarize the food donation flow, which consists of four stakeholders: government, generators, service organizations, and recipients. The Florida Department of Agriculture and Consumer Services runs the Food Recovery Program which promotes donating food. Examples of generators include retail, farms, and restaurants. Service organizations, such as food banks and community distributors, are those that distribute the food donations to recipients, food insecure people. Most food donations are handled by the Feeding Florida network and Farmshare food banks.

We estimated a minimum of 148,645 tons of food donated in the state of Florida in 2018. The Waste Reduction Model (WARM) was used to estimate the greenhouse gas (GHG) emission savings, landfill space, and energy savings of donating the food instead of landfilling it. We found 673,847 MTCO<sub>2</sub>E, 178,164 yd<sup>3</sup> of landfill space, and 2,405,651 mmBTU are saved. The farther down the food chain that waste occurs, the more severe the environmental impact because the value of each preceding step is added (FAO, 2013). In addition to the environmental benefits, we summarized tools currently used in the food recovery field.

During our research of the Florida food donation flow, we have identified several issues of reporting of food donations, including a lack of public information, a lack of documentation, and inconsistent weighing metrics. We suggested to FDEP a simple spreadsheet for generators and service organizations as an optional tool to better track their food donations. This spreadsheet can be submitted to FDEP annually.

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## **ABBREVIATIONS AND ACRONYMS**

C&D	Construction and demolition
CO <sub>2</sub>	Carbon dioxide
CSFP	Commodity Supplemental Food Program
EPA	United State Environmental Protection Agency
ERS	Economic Research Service
FAO	Food and Agriculture Organization
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FORCE	Florida Organics Recycling Center for Excellence
GHG	Greenhouse gas
LAFA	Loss Adjusted Food Availability
MSW	Municipal solid waste
SMM	Sustainable materials management
SNAP	Supplemental Nutrition Assistance Program
TEFAP	The Emergency Food Assistance Program
UF	The University of Florida
US	United States of America
USDA	United States Department of Agriculture
WARM	Waste Reduction Model
WTE	Waste-to-Energy

## **UNITS OF MEASURE**

MMBTU	Million British thermal units
MTCO <sub>2</sub> E	Million tons of carbon dioxide equivalence
yd <sup>3</sup>	Cubic yards

# 1. INTRODUCTION

## 1.1 Project Scope

The Florida Department of Environmental Protection (FDEP) commissioned the Department of Environmental Engineering Sciences at the University of Florida (UF) to produce a deliverable presenting the current state of food donations in Florida. We define food donations as food which is no longer wanted by the generator and instead of being treated by common disposal methods, is donated. Food recovery refers to the act of preventing food waste, and thus food donation is a form of food recovery. The inspiration for this research is based on the statewide goal of obtaining a 75% recycling rate by 2020, as established in June 2008 by the Florida Senate with House Bill 7135. Because the state's recycling rate in 2018 was 49%, indicating that the 2020 goal likely would not be met, FDEP has been tasked with finding ways to increase the recycling rate. One opportunity for improvement lies in the sector of food waste. The United States Environmental Protection Agency (EPA) estimates that food waste is the leading material currently sent to landfills and waste incinerators (FDEP, 2019).

The most common food waste management methods in Florida are landfill or incineration disposal. Of 3,106,305 tons of food waste collected in 2018, 95% was landfilled or incinerated. Recycling food waste is an alternative management method, which accounted for 5% of the total amount of food waste collected and can offer great environmental benefits (FDEP, 2019). One recycling option is to donate food, which presents a way to divert food products that would have originally been discarded into a source of nutrition for food insecure people.

A current challenge facing food donation is a lack of statewide coordination and precision in tracking and reporting quantities currently being donated. Reporting of food waste recycling is currently not required and thus leaves many unknowns in how much food waste Florida generates, disposes, and recycles. FDEP recognizes the need to first assess the quantity currently reported and then progress forward in documenting efforts. A better understanding of the quantity of food recycled in Florida will be useful to state and local government for improving recycling efforts.

We focused on food donations, a form of food waste recycling, within this report. Through research via literature reviews and conversations with participants within the food recovery field, the team learned and summarized the current handling and documenting of food donations. Resulting from this effort is a better understanding of where improvements can be made in the documentation of food donations.

## 1.2 Project Goals and Tasks

The project goals were to collect information of interest to FDEP regarding food donations in Florida and quantify the associated environmental benefits. We approached the goals with four objectives. The first was to collect information of interest to FDEP regarding food donations in Florida, which was accomplished by conversing with food handling organizations and county recycling coordinators as well as researching literature and annual reports of food banks. The second objective was to estimate the amount of food donations in Florida, which was done by compiling quantitative data from organizations and literature and creating a set of equations. We

also assessed the current food donation mass reported to FDEP. The third objective was to quantify the associated environmental benefits, such as landfill space, greenhouse gas( GHG) emissions, and energy savings, of food donation as compared to landfilling. We used a landfill space saving factor as well as GHG and energy saving factors from the Waste Reduction Model (WARM). The final objective was to discuss current tools used in the food recovery field as well as develop a food donation tracking tool for FDEP. The tasks for this objective included discussing with food donation stakeholders and research the websites of these tools.

### *1.3 Report Organization*

This report is organized into eight chapters. Chapter 1 (this section) provides a summary of the project objectives and tasks. Chapter 2 presents background information on food waste within the US and Florida waste stream, alternative methods for handling food waste, our definition of food donations, the FDEP's current involvement in resource recovery, and information on how food recovery plays a role in the recycling goals set by state legislature. Chapter 3 provides a summary of Florida's food donation process. Chapter 4 covers the data collection and estimation methodology as well as the data and estimation results. Chapter 5 presents the estimated environmental benefits of food recovery. Chapter 6 presents lessons learned throughout the research process. Chapter 7 provides the current tracking tools used in food recovery, a tool created by UF, and recommendations for FDEP. Chapter 8 concludes the report.

## 2. BACKGROUND

### *2.1 Food Waste Contribution to Municipal Solid Waste Stream*

The Food and Agriculture Organization (FAO) of the United Nations and the EPA define food loss as food material discarded or spoiled in the agricultural sector during different stages such as harvesting and transportation. Food waste is defined as food discarded from retail, food service, industry, and consumer sectors (FAO, 2020; EPA, 2020; HLPE, 2014). In this report, food loss and food waste are used interchangeably, similar to a 2016 paper by Dou et al. The United States generated 267.8 million tons of municipal solid waste (MSW) in 2017, with food comprising 40.7 million tons, or 15.2%. Of this, 38.2 million tons of food were landfilled or combusted for energy recovery, leaving just 6% recycled (EPA, 2017).

Estimates for food lost within the industrial, retail, and consumer sector are based on data provided by the US Department of Agriculture Economic Research Service's (ERS) Loss Adjusted Food Availability (LAFA) database. Food waste in the agricultural sector results from purposefully not harvesting crops due to excess planting or the produce may not meet retailer's aesthetic standards. Nationally, 9-18 million metric tons (MMT) of fruit and vegetables are estimated to be lost on farms per year. The food waste generated from the industrial sector is due to products failing quality standards and is estimated to be more than 80 MMT per year (Dou et al., 2016).

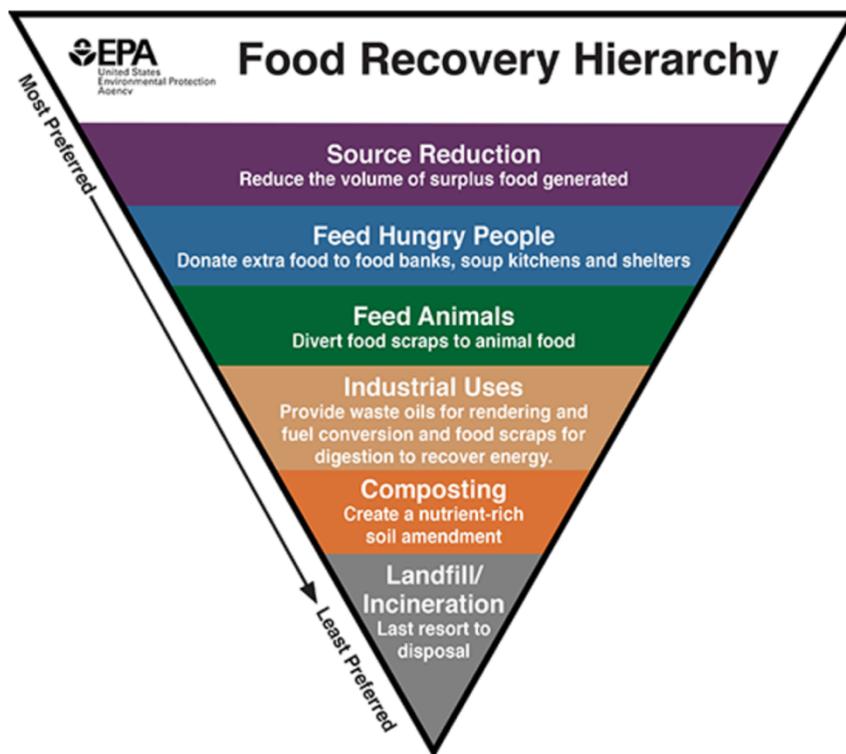
Food loss in the retail sector may occur when stores, such as supermarkets, purchase more food than the consumer demand can support, and when products remain unsold as they approach expiration dates. Sources cite retail operations produce 1.7-19.5 MMT of food waste annually (Dou et al., 2016; Buzby et al., 2014). Lastly, consumer habits have resulted in 41 MMT of food waste per year (Dou et al., 2020). Consumer habits can include buying excess food, not sealing food properly, or not understanding "sell by" and "expires by" labels (Quested et al., 2013). According to Dou et al. (2016), of the total 150 MMT food wasted, 70 MMT is edible food that can be donated.

### *2.2 Alternative Methods of Handling Food Waste*

The EPA created the phrase "wasted food" to describe food material that was not utilized for the purpose in which it was produced and instead treated by traditional or alternative measures (EPA, 2015a). Examples of alternative handling include donating to needy families, feeding animals, or composting, shown in Figure 1. The EPA Food Recovery Hierarchy defines the source reduction of food as the prevention of generating surplus food, such as not buying excess food (EPA, 2015b). The source reduction of food via reducing consumption at the consumer level or ensuring that manufactures and retailers sell all purchased items is not always practical. Source reduction can also be applied to the end-of-life management, such as when a product is reused or recovered, and the item is will no longer be treated by incineration or landfilling. As source reduction can apply to end-of-life management, the term can be used synonymously with the alternative measures, such as food donations.

The United States Department of Agriculture (USDA) and EPA have partnered together to participate in the United Nation's (UN) Sustainable Development Goal by establishing the U.S 2030 Food Loss and Waste Reduction Goal. Reducing food waste by 50% requires the collaboration of national, state, local governments as well as

businesses and non-profits to promote and implement strategies (FORCE, 2019). For example, the Florida Department of Agriculture and Consumer Services (FDACS), a branch of the USDA, partners with various food waste generators to collect surplus foods and direct the items to food insecure populations. This is further defined in Section 3.1 (FDACS, 2020).



**Figure 1.** EPA food recovery hierarchy (EPA, 2015b).

### 2.3 Food Donation Definition and Policy

Food donation is defined in this report as food which is longer desired by the generator but is still fit for human consumption and is prevented from end-of-life disposal. The food is recovered by being directed to service organizations with the intent to feed food insecure people. As food donations are items that are no longer at risk of being treated by traditional methods of disposal, and are reused, also known as recovered, we use the terms food donations, food recovery, and source reduced interchangeably.

Various laws have been enacted to promote food donations. The Bill Emerson Good Samaritan Food Donation Act is a piece of federal legislation which releases donors from liability in their donated food, excluding gross negligence. This law, established in 1996, serves to encourage generators of food waste to donate their edible food without being worried about possible legal consequences (ReFED, 2020). The Food Recovery Act, introduced to Congress in early 2020, is another piece of legislation focused on food donations and collaborative efforts between government and organizations.

Donating food aligns with the US EPA's idea of Sustainable Materials Management (SMM), which began in 2002. The principles of SMM are based on producing and using

materials as efficiently all while reducing resources, waste, and cost. SMM applies to all stages of a material or products lifespan, from extraction through refinement, manufacturing, assembly, distribution, use, and end-of-life management, and promotes actions and policy that maximize environmental benefits. Donating is an example of SMM as the reuse of the product has social environmental and social benefits, all while extending the life of the product (Townsend et al., 2020). The environmental benefits are presented in Chapter 5.

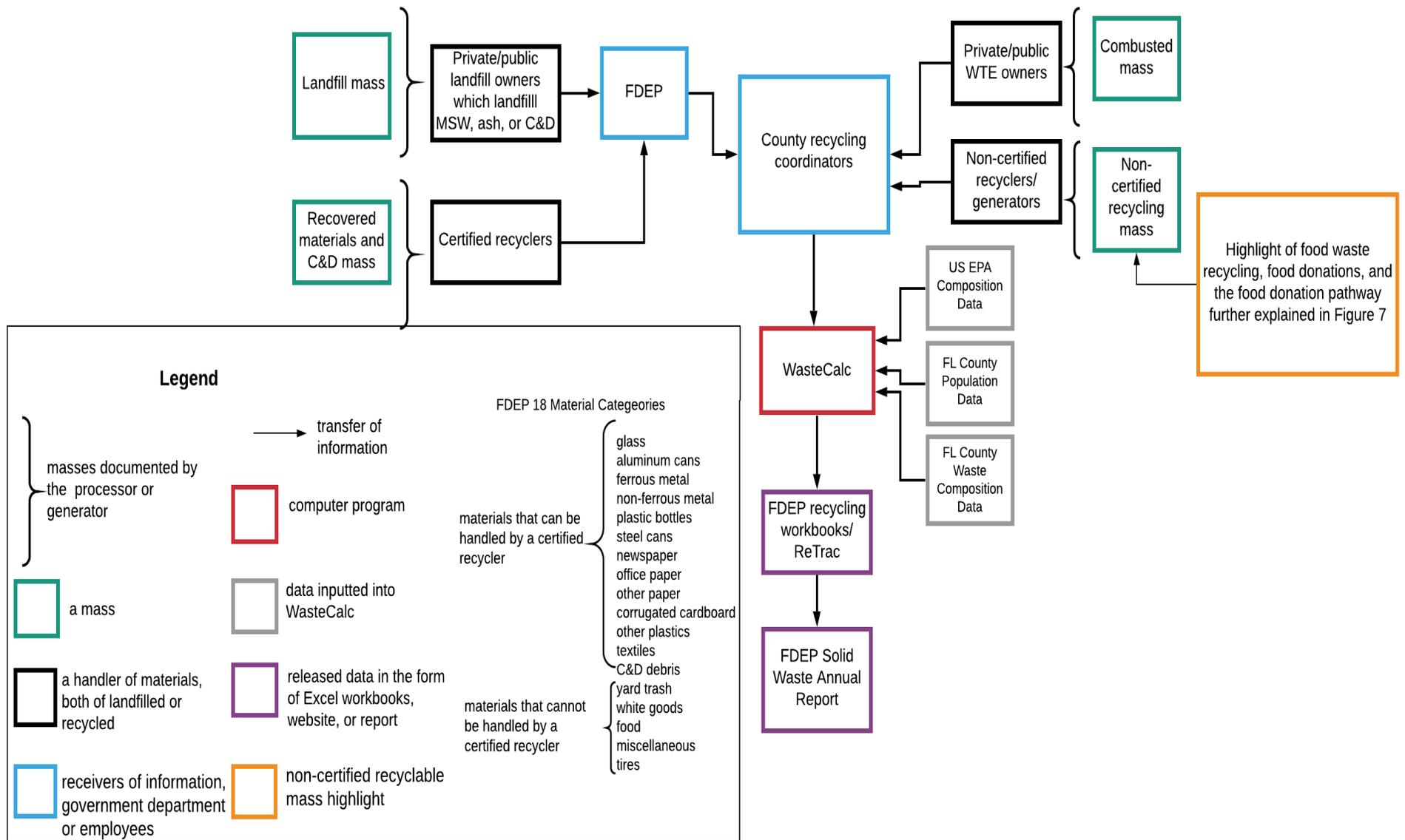
## *2.4 Current Solid Waste Tracking Protocols in Florida by FDEP*

FDEP developed a system for collecting and reporting amounts of solid waste and recycled materials handled within Florida for each year. A schematic portraying the system is shown in Figure 2. FDEP tracks the mass flow of 18 material categories including newspaper, glass, aluminum cans, plastic bottles, steel cans, corrugated cardboard, office paper, yard trash, other plastics, ferrous metals, white goods, non-ferrous metals, other paper, textiles, construction and demolition (C&D) debris, food, tires, and miscellaneous.

FDEP requires the tracking of certified recycled or recovered materials handled by certified recyclers. A recovered material is limited to ferrous metal, non-ferrous, steel cans, aluminum cans, newspaper, office paper, other paper, corrugated cardboard, glass, plastic bottles, other plastics, textile, or rubber materials (not including tires), and if 600 tons or more of the material are recycled. Recycled C&D is not a recovered material but must be reported to FDEP if the material is processed by a certified processor (FL Dept. of State, 2013).

Non-certified recycled materials are not required to be reported to FDEP, and instead county recycling coordinators are required to contact different generators and processors of these materials to obtain this information. Non-certified tons can be any of the 18 FDEP material categories and regardless of mass. Generators include but are not limited to supermarkets, concrete manufacturers, restaurants, schools, and landscaping companies. Community distributors such as food pantries, soup kitchens, or homeless shelters that distribute food items to food insecure people. Some corporations, such as Walmart and Save-A-Lot, submit an annual recycling report to FDEP that includes certifiable and non-certifiable materials, which may include food donations under the food waste category.

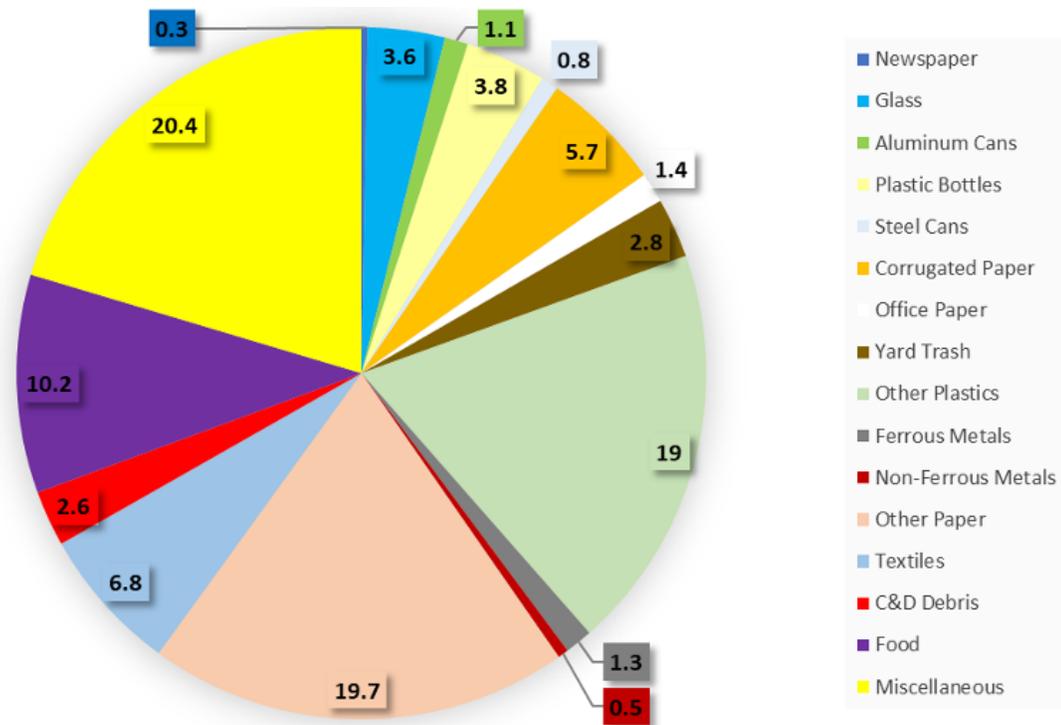
County recycling coordinators use a program called WasteCalc, which is a program created for FDEP for counties to calculate total collected tons for each material. WasteCalc uses both US EPA and Florida county waste composition data as well as Florida county population information. Coordinators release the WasteCalc output and information collected from FDEP and other sources in two forms. In one form, a coordinator condenses their waste management mass flows associated with their county into a county recycling workbook which they submit to FDEP annually, known as “FDEP recycling workbooks.” This workbook includes certified and non-certified recycling entries of the 18 FDEP material categories. In the other form, the recycling coordinators input this information on Re-Trac, a solid waste database. Data presented in the FDEP recycling workbooks and Re-Trac are published in the FDEP Solid Waste Annual Report.



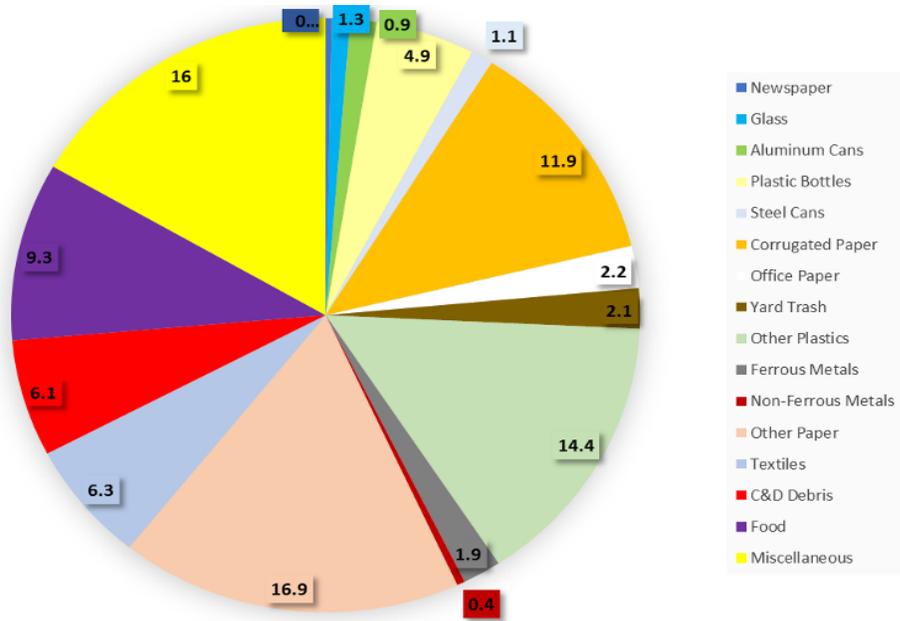
**Figure 2.** Flowchart of landfill and recycled materials in Florida.

According to the FDEP 2018 Solid Waste Annual Report, Florida collected 41.7 million tons of MSW, 3.1 million tons, or 6.6% of which was food waste. Of this food waste, 151,291 tons were recycled, a 5% recycling rate (FDEP, 2019). The mass of food donated is integrated within the food waste recycled tons. As mentioned previously, waste composition studies are beneficial in understanding the material composition of the waste stream. UF researchers conducted waste composition studies in 2019, and are included below to showcase the presence of food waste within Florida waste streams. Two of which are shown in Figures 3-5. Figure 3 exhibits that the food waste present in Orange County is 10.2% of the waste stream, whereas as seen in Figure 4 and 5 the food waste comprises of 9.3% and 17.2%, respectively within the Aucilla Area Solid Waste Administration service region and within Palm Beach County waste streams. Counties can use this data to better target food waste, increase reporting and ultimately reach recycling goals, as explained in Section 2.5.

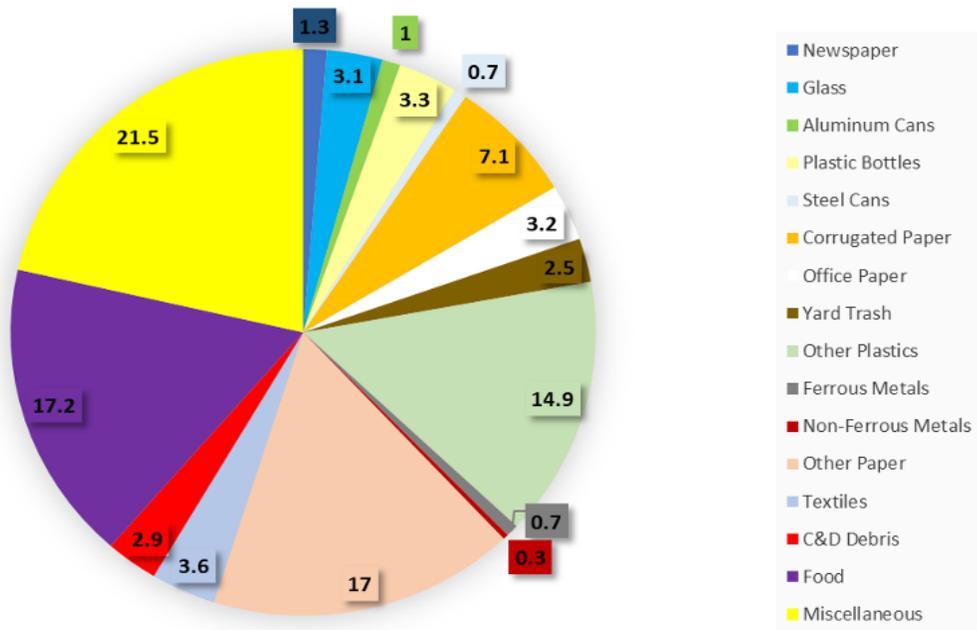
Beyond the FDEP recycling workbooks, Florida does not have any sponsored tracking programs to measure food donations. There are tracking tools, such as applications or websites that have been developed by organizations, but there is no established cohesive reporting form used by all participants within the realm of food recovery efforts.



**Figure 3.** Material breakdown of Orange County's landfilled waste stream as percentages.



**Figure 4.** Material breakdown of Aucilla Area Solid Waste Administration service region's landfilled waste stream as percentages.



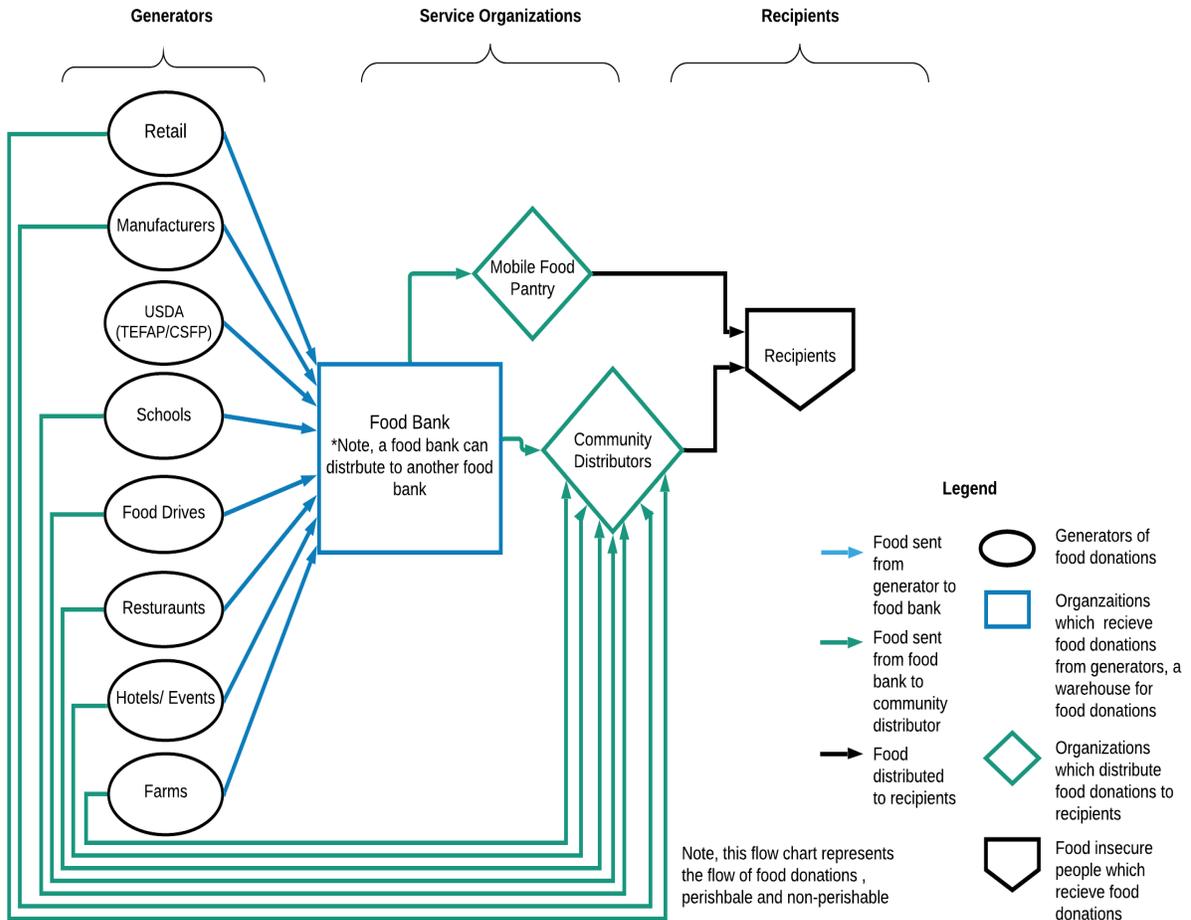
**Figure 5.** Material breakdown of Palm Beach County's landfilled waste stream as percentages.

## *2.5 Food Waste Recovery and the Florida 75% Recycling Rate Goal*

In 2008, the Florida Legislature passed a bill enacting an aspirational 75% mass-based recycling rate by 2020, which directed FDEP to develop a plan to meet this goal. The more recent, Florida and the 2020 75% Recycling Goal, Volume 1 Report (FDEP, 2017) published by FDEP echoes similar concerns to the 2010 75% Recycling Goal Report to the Legislature (FDEP, 2010) recognizing the importance of recovering food waste by providing local governments with opportunities to increase their recycling rates. Some businesses and organizations around Florida actively contribute to food donations, but these entities are not required to report information about these activities. FDEP hosts the Florida Organics Recycling Center for Excellence (FORCE) website, which is an educational tool to promote organics recycling. This website offers information such as the various types of organics, different recycling markets, and guidance for schools on how to sustainably handle food waste (FORCE, 2020).

### 3. THE FOOD DONATION FLOW

An overview of the food donation system is summarized in this section. To gather this information, we consulted literature, FDEP recycling workbooks, food bank annual reports, and engaged in conversations with businesses, non-profit organizations, and government entities. Three primary participants were identified: generators, service organizations, and recipients. Also portrayed in Figure 6, the information elucidated the pathway food takes when it enters at the point of generators and travels through the donation system to recipients.



**Figure 6.** Pathway of food donations.

Figure 6 summarizes the flow of food donations from generators to recipients. Generators produce food donations because the food items are no longer marketable or were produced in surplus. The generator is then a donor, because they donate to a food bank or directly to a community distributor. The food bank has three options to disperse the item; distribute to recipients via the food bank's own mobile food pantry, to a community distributor, or to another food bank. This second food bank can then distribute to affiliated community distributors, or not shown, distribute its own mobile food pantry. Once the food item is received by a community distributor, the food item is given to recipients.

### 3.1 Government

FDACS operates the Food Recovery Program. This program coordinates and promotes efforts on behalf of private entities, farms, federal hunger relief programs, and service organizations to direct unmarketable or excess food to Floridians experiencing food insecurity. The principles of this program are largely based in Florida Statute 595.420. This statute advocates for the recovery of food on behalf of all government, profit, and non-profit entities as well as allows for FDACS to compensate food recovery organizations (Florida Statutes, 2014).

FDACS largely focuses on donations from the agricultural industry. Efforts on behalf of FDACS and partner non-profit organizations include assisting in tax-deduction paperwork, procuring produce and meat through gleaning, collecting harvested or prepared items, and transporting these items to service organizations (FDACS, 2020a). Feeding Florida and Farmshare are large service organizations involved with FDACS' Food Recovery Program. With each monthly request for payment from legislative funds, these large service organizations produce receipts for the source and destination of their procured donations.

As indicated by the receipts, their donations are finally distributed to community distributors and food banks. Feeding Florida is a partner state association of Feeding America and consists of a network of twelve food banks in Florida. Farmshare has four food bank locations within Florida that each service a wide range of counties. Each payload's destination depends on emergency need or demand as needed from community distributors. Each food bank has a service area, spanning from as little as one to up to eleven Florida counties.

### 3.2 Generators

Generators are entities that produce food donations because the food items are no longer marketable, nearing the expiration date, or are in surplus. Generators include retail, manufacturers, restaurants, hotels, schools, farms, and USDA distributions. The generators, and how their food items become eligible for donation are discussed below and a summary table is included in Table A4 of the Appendix. Other generation sources include food drives.

**Retail** produces food items close to expiration date or sell by date may be donated. Included are perishable items such as produce that does not sell due to excess supply or does not meet consumer expectations, bakery items that cannot be sold anymore, or non-perishable items that are bent or mislabeled. The estimated national participation of grocery stores and their corresponding donation contribution is that 88% stores donate dry goods, 31% donate already cooked foods, inclusive of meat dishes, and 51% stores donate produce. This breakdown is assumed to be non-exclusive (Phillips et al., 2013).

**Manufacturers** produce food items that are not to be sold because of incorrect labeling, bent, or do not meet product expectations. Due to the emergence of secondary grocers, such as dollar stores or stores that sell bent items at discounted items, there is a lower quantity of these items entering the food donation system but nonetheless, these items are still considered food donations when they enter hunger relief organizations. More so, food banks may now purchase food from Feeding America's Choice program, through a bidding process to supplement their food supply. Items include a selection of products (generally from manufacturers such as Kellogg and Post) that the generator did

not want to sell. There is a lack of data on the source reduced and non-source reduced breakdown of items bid on in the Choice program.

**Restaurants** produce food that was prepared, not sold, and can no longer be available for purchase. Examples include bread and pastries a bakery has at the end of the day and cannot be sold the next day. These items need to be distributed quickly or else they will spoil.

**Hotels** and events produce food items that were prepared for a conference or event but were not distributed to the public. As these already cooked items generally cannot be distributed for another event and can spoil quickly, these items are quickly donated.

**Schools** produce uneaten items, such as apples, milk, or fruit cups. Some schools have restrictions to donating these items and require the items to be landfilled, but other schools can and have organized for these items to be donated. Some schools have sharing tables where the unwanted food is set on a communal location and the food items can be taken by whoever wants them.

**Farms** generate products that can become donations. Food items are either gleaned to become donations or will be donated once the produce is harvested. Gleaning is the act of collecting produce that was not harvested either because excess was grown, or the farmer knew the items did not meet the aesthetic standards (misshapen, too small or large) of a retailer.

**Food drives** generate food donations as community members contribute to food items. These items are usually non-perishable and are either sourced from their homes or bought from retailers with the intent of donating the items. Although food drives collect food items to deliver to service organizations, we do not currently have enough information on the origin of food drive items to include these items in food donation estimations. Community members often contribute to food drives and we made an educated assumption that most of these food items were not intended for the waste stream and thus not source reduced.

**The USDA** receives federally appropriated money to run and support hunger relief programs. The money is allocated for different programs or to buy from specific food markets. Examples of programs include The Emergency Food Assistance Program (TEFAP) and the Commodity Supplemental Food Program (CSFP). Funds under Section 32 of the 1935 Agricultural Adjustment Act are designated for buying food from surplus conditions. Surplus conditions can occur when market conditions do not match the quantity of food grown. If not purchased, surplus foods can potentially be left to decompose in the ground or treated with traditional disposal methods (Monke, 2016). The Section 32 money is a separate set of funds than the TEFAP and CSFP money. The TEFAP and CSFP funds can be spent to procure food through normal trade or on surplus food. These three different sets of funds can be spent on contract, and thus the same source of food.

The USDA will release a contract and growers or manufacturers will bid on the contract. Whoever wins the bid will then be paid with money from one or numerous funds. Nine food banks, located in 9 different regions in Florida, are approved to distribute USDA food; seven are Feeding Florida food banks and two are Farmshare Inc. The approved food bank can only distribute USDA foods to community distributors that meet specific

requirements. The flow of USDA foods is separate from non-USDA foods (FDACS, 2020b).

Information on the origin of USDA food is lacking. Whether food items purchased by the USDA were source reduced or items that still could be sold in normal conditions are generally not documented or not easily accessible. We do not have enough information on USDA foods and the breakdown between source reduced and non-source reduced conditions to confidently include this generator in estimations of source reduced food donations in Florida.

### *3.3 Service Organizations*

This section includes a summary of food banks and community distributors.

#### *3.3.1 Food Banks*

Food banks are non-profit organizations that receive food items from generators or other food banks and give these items to community distributors or, less frequently, directly to the public. Food banks consist of warehouses that intake food items, both perishable and non-perishable, and then inspect and weigh them. Often the food bank will report the weight of the tax-deductible food back to the donor. The warehouse workers then organize and package loads of food items to send to community distribution organizations or mobile pantries.

Within Florida, the Feeding Florida organization has partnered with already established food banks to create a network of food banks under the umbrella organization. The Feeding Florida food bank network cumulatively receives and handles the largest quantity of food donations. Feeding Florida contracts with twelve food banks within the state, each with a service area of counties. The twelve food banks and their locations are found in Table 1. Each food bank has a list of community distributors which are further discussed in Section 3.3.2. Community distributors connected to Feeding Florida are called partner agencies. Each Feeding Florida food bank has between 21 and 550 partner agencies. Additional food banks outside of the Feeding Florida network operate in Florida as well and are listed in Table 2. Of these, Farmshare is the largest with four facilities.

**Table 1. Feeding Florida network food banks.**

<b>Food Bank</b>	<b>Counties Served</b>	<b>Warehouse Locations</b>	<b>Number of Partner Agencies</b>
Feeding the Gulf Coast <sup>a</sup>	Bay, Escambia, Holmes, Okaloosa, Santa Rosa, Walton, Washington	Milton, FL	428
Second Harvest of the Big Bend <sup>b</sup>	Calhoun, Franklin, Gadsden, Gulf, Jackson, Jefferson, Leon, Liberty, Madison, Taylor, Wakulla	Tallahassee, FL	135
Florida Gateway Food Bank <sup>c</sup>	Columbia, Hamilton, Suwannee, Union	Lake City, FL	21
Feeding Northeast Florida <sup>d</sup>	Baker, Bradford, Clay, Duval, Flagler, Nassau, Putnam, St. Johns	Jacksonville, FL	250
First Step Food Bank <sup>e</sup>	Marion	Ocala, FL	45
Second Harvest of Central Florida <sup>f</sup>	Brevard, Lake, Orange, Osceola, Seminole, Volusia	Orlando, FL	550
Treasure Coast Food Bank <sup>g</sup>	Indian River, Martin, Okeechobee, St. Lucie	Stuart, FL Ft. Pierce, FL	300
Feeding South Florida <sup>h</sup>	Broward, Miami-Dade, Monroe, Palm Beach	Pembroke Park, FL Boyton Beach, FL	400
Harry Chapin Food Bank <sup>i</sup>	Charlotte, Collier, Glades, Hendry, Lee	Ft. Myers, FL Naples, FL	150
Ending Hunger All Faiths Food Bank <sup>j</sup>	DeSoto, Sarasota	Sarasota, FL	203
Feeding Tampa Bay <sup>k</sup>	Citrus, Hardee, Hernando, Highlands, Hillsborough, Manatee, Pasco, Pinellas, Polk, Sumter	Tampa, FL	489
Bread of the Mighty Food Bank <sup>l</sup>	Alachua, Dixie, Gilchrist, Lafayette, Levy	Gainesville, FL	190

a= (Feeding the Gulf Coast, 2018), b= (Second Harvest of the Big Bend,2020 ), c= (Florida Gateway Food Bank,2020), d= (Feeding Northeast Florida,2020 ), e= (First Step Food Bank, 2015), f= (Second Harvest of Central Florida, 2020), g= (Treasure Coast Food Bank,2020 ), h=(Feeding South Florida,2017 ), i= (Harry Chapin Food Bank,2020) , j= (Ending Hunger All Faiths Food Bank,2018 ), k= (Feeding Tampa Bay, 2020), l= (Bread of the Mighty Food Bank,2020 )



**Figure 7.** Feeding Florida food bank network (Feeding Florida, 2020).

**Table 2.** Food banks not in Feeding Florida network.

Organization	Counties Serviced	Warehouse Location	Number of Partner Agencies
Heartland Food Bank <sup>m</sup>	Highlands County	Sebring, FL,	Unknown
Midwest Food Bank <sup>n</sup>	Lee County	Ft. Myers, FL	Unknown
Palm Beach County Food Bank <sup>o</sup>	Palm Beach County	Lantana, FL	120
Farm Share <sup>p</sup>	67 Counties	Quincy, FL Palmetto, FL Homestead, FL Jacksonville, FL	>2,000

m= (Heartland Food Bank, 2020), n= (Midwest Food Bank, 2020), o= (Palm Beach County Food Bank, 2020), p= (Farmshare, 2020)

There are multiple routes for a food bank to procure food items. Generators often donate food directly to the food bank. Additionally, food banks sometimes purchase food items directly from manufacturers to supplement their supply though this is usually a small quantity relative to their other sources for food items. Although purchased, source reduced items can still be procured in addition to non-source reduced items, all to supplement the foodbank's supply. An example is when food banks purchase food using Feeding America's Choice program, through a bidding process. Items include a selection of products, generally from manufacturers such as Kellogg and Post. Four out of twelve Feeding Florida food banks in addition to two non-Feeding Florida food banks have released total distribution quantities and generator breakdowns for procured food items. Note that the Midwestern Food Bank and Heartland Food Bank generator categories are not ones published in annual reports but were provided post conversations. The generator, or donor, categories are not consistent among all food banks. Procured and distributed quantities are assumed to be equal as they have minimal discrepancies due to food bank efficiency. Table 3 presents the total pounds distributed and the weight procured from the donor category as a percentage and a weight. All donor categories listed in the annual reports are included, exhibiting inconsistencies among food banks. As annual report data does not cover consistent years and in-depth breakdowns of donor category were not provided, the information was not assessed to avoid misinterpretation.

**Table 3.** Food bank annual report donor breakdowns.

Food Bank	Feeding the Gulf Coast <sup>a</sup>		Second Harvest of the Big Bend <sup>b</sup>		Second Harvest of Central Florida <sup>f</sup>		Feeding Tampa Bay <sup>k</sup>		Heartland Food Bank		Midwestern Food Bank	
Annual Report Year	2018		2017-2018		2017-2018		2018		2019		2018	
Total Distributed (tons)	13,374 (Note: This breakdown represents all 3 locations, two of which are not in Florida)		4,250		34,800		31,194		1,005		3,891	
<i>Donor Categories</i>	%	Mass (tons)	%	Mass (tons)	%	Mass (tons)	%	Mass (tons)	%	Mass (tons)	%	Mass (tons)
<i>Retail</i>	44	5,885	21	890	45.72	15,911	52.85	165	45.74	460		
<i>USDA</i>	22	2,942					20.8	65				
<i>CSFP</i>			1	43	11.26	438						
<i>TEFAP</i>			35	1,488								
<i>Food Drives</i>			1	43			0.81	3	3.23	32	0.91	35
<i>Local</i>			1	43								
<i>Feeding America</i>	13	1,739	4	170								
<i>Feeding Florida</i>			7	298								
<i>Purchased</i>	8	1,070	3	128	6.65	2,314	2.98	9	3.61	36		
<i>Farms</i>			2	85							0.51	20
<i>Manufacturers &amp; Wholesalers</i>					19.28	6,709						
<i>Manufacturers</i>							5.12	16			98.04	3,815
<i>Food Bank Transfers</i>			3	128					47.42	477		
<i>Distribution Centers</i>			9	383								
<i>Disaster Relief</i>			13	553								
<i>Produce</i>					14.58	5,074	8.5	27				

**Table 3.** Food bank annual report donor breakdowns, continued.

Food Bank	Feeding the Gulf Coast		Second Harvest of the Big Bend		Second Harvest of Central Florida		Feeding Tampa Bay		Heartland Food Bank		Midwestern Food Bank	
	%	Mass (tons)	%	Mass (tons)	%	Mass (tons)	%	Mass (tons)	%	Mass (tons)	%	Mass (tons)
<i>Donor Categories</i>												
<i>Miscellaneous</i>							5.26	16				
<i>Salvage</i>							3.67	11				
<i>Prepared Food</i>	13	1,739			1.26	438						
<i>Mix of Donations, Food Drives, and Food Bank Transfers</i>											0.53	21
<i>Store Donations (Grocers, restaurants, etc.)</i>												
<i>Other</i>							5.26	16				

a= (Feeding the Gulf Coast, 2018), b= (Second Harvest of the Big Bend,2017), f= (Second Harvest of Central Florida,2017 ), k= (Feeding Tampa Bay,2018 )

3.3.2 Community Distributors

Community distributors receive food items either from food banks or directly from generators (i.e., restaurants, hotels, farmers, or bakery items) and then distribute these items to recipients. Community distributors often work with food banks to ensure a consistent supply of food and to acquire other benefits, such as advertisement, inspection, inventory, and training support. In the Feeding Florida network, community distributors are referred to as partner agencies. Community distributors either receive donations for free from food banks or pay the food bank on a cents per pound basis. Although the majority of Florida’s food donations travel through food banks, particularly within the Feeding Florida network, and down to community distributors, the community distributors also obtain smaller quantities of food donations directly from generators. Whether agricultural generators donate to a food bank or community distributor often depends on where the farm is located as well as refrigeration capabilities.

Examples of community distributors are soup kitchens, food pantries (in a church, school, or as a stand-alone organization), and homeless shelters. A soup kitchen prepares meals, usually hot, on-site. A food pantry provides food items, which can be either perishable or non-perishable, depending on the facility’s refrigeration capabilities. Food pantries can either be supplemental or emergency. Supplemental food banks are available to community members on a regular basis. Emergency food banks provide food a maximum number of times per year. These types of food banks provide the recipient with enough food items to last a prescribed amount of meals for a certain amount of days (Second Harvest Food Bank of Middle Tennessee, 2015). There are multiple methods for how a food pantry can distribute food items, presented in Table 4.

**Table 4.** Methods of distributing food items in a service organization.

Method	Description
Prepared Boxed Meals	The food items are organized into meal packages. Prepared boxed meals may contain items unwanted by recipients, potentially becoming food waste. The Pack as You Go method allows recipients to add food items to a prepared meal box. The Standard Box Plus “Odds and Ends Table” method includes a pre-prepared box where items may be exchanged by recipients.
Client’s Choice	Recipients can choose their food items, within allotted quantities. This method may lead to less wasted food as recipients can choose their desired foods.
Balanced Menu Package	Meals are suggested based on nutrition guidelines.
Open Distribution	The choice and quantity of food items are not controlled.

3.4 Recipients

Recipients are food insecure community members that receive food donations. The recipients do not have to pay for the food. Often, food pantries require identification or proof of residency within the county that the community distributor services. Utility bills or proof of income are also often required. Some recipients utilize federal food programs, such as the Supplemental Nutrition Assistance Program (SNAP), TEFAP, or CSFP for people above the age of 60. Residents must be below certain poverty thresholds to receive food under these programs.

## **4. DATA COLLECTION, ESTIMATION METHODOLOGY AND RESULTS**

### *4.1 General Approach*

In Section 4.2, we describe our data collection methodology. Section 4.3 provides a breakdown of the responses from different stakeholders in food recovery. In Section 4.4, we describe the two methodologies formulated for estimating total source-reduced food donation mass in Florida and in Section 4.5, we use one of these methodologies to estimate this value for the year 2018. Section 4.6 uses an estimate provided by a Feeding Florida representative to calculate another representation of the total source-reduced food donation mass. Section 4.7 describes FDEP-reported food donation values, and we compare these to the Feeding Florida distribution values on a per county basis. We then close the chapter by summarizing and comparing the different estimated and reported values.

### *4.2 Contacted Stakeholders*

In order to better understand food donation in Florida, we contacted stakeholders of food donations. First contacted was FDEP to learn about state-sponsored food recovery efforts. We obtained all 67 FDEP recycling workbooks in order to assess the quantity of food donations already reported to the state. All county entries strictly regarding food donations were combined into one joint Excel file. Next, we reached out to all 67 Florida county recycling coordinators or other government employees knowledgeable about food recovery in the county. Clarification questions were sometimes needed, such as whether an entry in the workbook referred to a quantity of food donations that originated from county residents or was distributed to county residents.

We then contacted generators, often at the local and corporate level, to discuss food recovery operations. We also researched service organizations, such as food banks and community distributors, which are discussed in Section 3.1.2. Food bank annual reports present information on operations, donors, and food distribution quantities. We compiled total distributed pounds and percentage breakdown of donor categories, such as retail, manufacturers, farms, and USDA, when available. After organizing all available information, we contacted food banks as well as community distributors to converse about general operations. Because of the sheer quantity of community distributors (over 2000), we focused on a handful of counties where community distributors were called to learn of their efforts. Next, we contacted FDACS to access public records of Feeding Florida and Farmshare to collect any pertinent data on the organizations' donation quantities.

Some participants outside of major generators or food donation handling organizations were contacted for additional insight. One example is a representative of Food Recovery Network of the Southeast and Caribbean which is an organization that educates generators of food donation opportunities. A university professor that works with students on food recovery efforts in the community surrounding the university was also contacted. Their insights were used to create the food donation flow summary.

### 4.3 Stakeholder Responses

#### 4.3.1 County Government Data

See Table A1 in the Appendix for the 2018 FDEP recycling workbook food donation quantities. See Table A2 in the Appendix for responses from individual counties regarding county-sponsored food recovery efforts.

#### 4.3.2 Generator Responses

See Table A3 in the appendix for generator responses and information on their food recovery programs. This is not an exhaustive list of food donation generators, but the ones we contacted or researched.

#### 4.3.3 Service Organization Responses

##### 4.3.3.1 Food Bank Responses

See Table 5 for responses obtained from individual food banks. As can be seen in the table, 8 out of 16 food banks did not respond to conversation requests.

**Table 5.** Food bank responses.

<b>Food Bank</b>	<b>Responses</b>
Feeding Second Harvest of Central Florida	Not able to help at the time
Heartland Food Bank	Provided 2019 and 2020 data breakdown based on weights of food item categories monthly.
Feeding Tampa Bay	Conversed on general operations
All Faiths Ending Hunger Food Bank	The initial introduction of the project was made but no further communication
Midwest Food Bank	Provided 2019 data
Harry Chapin Food Bank	Conversed on general operations
Feeding South Florida	Not able to help at the time
Palm Beach County Food Bank	Provided 2018-2019 data
Bread of the Mighty Food Bank, Farmshare, Feeding the Gulf Coast, Feeding Northeast Florida, First Step Food Bank, Florida Gateway Food Bank, Second Harvest of the Big Bend, Treasure Coast Food Bank	No response

##### 4.3.3.2 Community Distributor Responses

See Table 6 for community distributor responses. These data points were not used in estimations because of inconsistent metrics.

**Table 6.** Service organization responses.

County	# of Service Organizations Contacted	Responses
Orange County	29	Three food pantries responded. One church pantry gets 90% from church goers. One church pantry receives 20% from community, 1000 pounds from Second Harvest monthly. Another community distributor runs over 68 food pantries and food programs. They equal one meal to a pound. They run three food pantries, which procure food mostly through the community, such as food drives. One of those locations distributes around 2,700 meals per month. The organization procures food for about 68 school food programs, mostly from Second Harvest of Central Florida. Food for the two soup kitchens is procured from other service organization, grocery alliances, and contacts from the community. Each soup kitchen feeds around 350-400 people a day. The representative said they have a capacity issue, not a demand issue.
Broward	27	Many pantries stated that they did not keep inventories. Most counties that replied stated that all their food came from Feeding South Florida.
Martin	1	The community distributor feeds 5500 families a month and procures donations from Publix, Fresh Market, and food drives.
Hillsborough	5	A community distributor receives inventory two times a week. The organization feeds 500 families/week and 160 homeless/month. Food is procured through Feeding Tampa Bay, Save-a-Lot, and has a personal relationship with a store manager who helps them get donations.
Lee	5	A community distributor feeds 300,000 people a year. They procure food from Midwest once a month and Harry Chapin once a week.
Manatee	2	An organization feeds 200-250 families a week.
Alachua	4	Smaller pantries retrieve only enough donations for their patrons from Bread of the Mighty. Larger outreach programs maintain relationships with grocery stores, Bread of the Mighty, and uphold conditions to receive Farmshare deliveries.
Martin/Palm Beach	One organization runs 8 community distributors	Five food pantries and one soup kitchen in Palm Beach County and one in Martin County; documents food donations in dollar amount of \$1.68/pound. The dollar equivalence of food the locations handle varies; for example, ~\$350, ~\$12,000, \$45,000, up to ~\$174,000. Food pantries mainly procure from food drives and the soup kitchen procures from restaurants, vendors, negligible from food drives. Neither food pantry nor soup kitchen receives donations from USDA or is purchased. The organization also organizes gleaning, in which most of the produce goes to the local food bank.

#### 4.4 UF Team Food Donation Mass Estimation

##### 4.4.1 Method 1 Estimation

The team established two potential methodologies to estimate the mass of source-reduced donated food items in Florida in 2018. The first methodology, Method 1, is to sum the food donation quantities produced by generators, which include retail, manufacturers, restaurants, hotels, schools, and farms. USDA and food drives are also considered generators but should be excluded until there is more information about how

much of their food donations are source reduced. Method 1 was not pursued because of a lack of available data due to privacy concerns by the food donation generators and distributors, an issue described in Section 6.2.

#### 4.4.2 Method 2 Estimation

The second methodology, Method 2, estimates the total source-reduced food donation mass by adding up the food donations made to both food banks and community distributors, TDSR, the two entities that ultimately distribute food to the recipients. Method 2 is shown in Equation 1.

$$TDSR = FBSR_{tot} + CDSR \quad \text{Eq. 1}$$

Where

$TDSR$  = Total source reduced food donation mass

$FBSR_{tot}$  = Mass of source reduced food donations from generator to food banks

$CDSR$  = Mass of source reduced donations from generator to community distributor

The first step in Method 2 is to solve for  $FBSR_{tot}$ , the mass of source reduced food donations from generator to food banks. This is done by summing the mass of source reduced food donations from a generator to a specific food bank ( $FBSR_i$ ) for all 16 food banks in Florida. Calculating  $FBSR_i$  is shown in Equation 3. For each food bank, one must start with the total tons of food donations distributed and subtract out the masses procured via purchasing, the USDA, and food drives. We do not include USDA and food drives because we lack information about their level of source reduction. Note that the Feeding Florida report does not have food drive donations separated out into a different category, so we do not subtract out food drive masses for the Feeding Florida food banks, but food drive contributions tend to be small. The reader can see in Table 4 that four food banks listed food drives as a source of donations, but all four values are under 3.3% of the total food donations. The Midwestern Food Bank, Heartland Food Bank, and Palm Beach County Food Bank do provide food drive information.

$$FBSR_{tot} = \sum_{i=1}^{16} (FBSR_i) \quad \text{Eq. 2}$$

Where:

$FBSR_{tot}$  = Mass of source reduced food donations from generator to food banks

$$FBSR_i = FB_i - P_i - USDAQ_i - FD_i$$

= Mass of source reduced food donations from generator to a specific food bank. **Eq. 3**

$FB$  = Total tons of food donations distributed by food banks annually

$P$  = Mass procured via purchasing

$USDAQ$  = Mass procured via USDA

$FD$  = Mass procured via food drives

The food banks included in the calculation of FBSR are the twelve Feeding Florida network food banks in addition to Farmshare, Midwestern Food Bank, Heartland Food Bank, and Palm Beach County Food Bank. For this assessment, we use values from the Feeding Florida organization’s annual report, not the individual food bank annual reports. The Feeding Florida, Farmshare, and Palm Beach County Food Bank distribution reports span a fiscal year from July 1, 2018-June 30, 2019. The Midwestern Food Bank and Heartland Food Bank reports begin January 1, 2018 and go through December 31, 2018. The food banks’ total distributed, purchased, and USDA quantities are provided in Table 7.

Next, the team calculated CDSR, the quantity of source reduced food donations that went directly from generator to community distributor, shown in Equation 4. Because food banks can either give their donations directly to the recipients or first to community distributors which then give the food to the recipients, care must be taken with the values in order to avoid double-counting. Therefore, we needed to estimate the contributions to community distributors that are from entities other than food banks, i.e., the generators. As previously mentioned, specific generator information on quantities has mostly been withheld from the researchers. A January 2018-December 2019 distribution summary from the Society of St. Andrews was used to provide a value for agricultural generators’ contributions directly sent to community distributors. The Society of St. Andrews is not itself an agricultural generator but is an organization that collects gleaned and post-harvested produce from agricultural generators and then donates the items directly to food banks and community distributors. Society of St. Andrews procured 397 tons from farms and distributed that mass directly to community distributors. More information is needed from other types of generators in order to more accurately describe the parameter of contributions to community distributors.

$$CDSR = SS \tag{Eq. 4}$$

Where

*CDSR*

= *Quantity of source reduced donations from generator to community distributor*

*SS = Society of St. Andrews, 2018 data*

Restaurants and food service businesses are likely to donate directly to community distributors because the food is already prepared and can spoil quickly. We were unable to find enough information to make an accurate estimate of restaurants’ food donations but evidence suggests that the amount could be significant. A press release from Darden Restaurants, Inc. explains that its Harvest Program donates surplus food from around 1,700 locations throughout the country (Darden Restaurants, 2020). One Olive Garden® located in Winter Park, Florida, donated .6 tons of food in fiscal year 2019. More research found that a New York restaurant donated 0.08 tons of food in one month of 2018 (Salazar, 2018). Okazaki et al. (2008) found that 33% of restaurants in Hawaii recycle their food, but we decided not to use this number because it is unclear what percentage of this recycled food is due to food donations as opposed to composting or livestock fodder. Still though, even if a small fraction of the 41,366 restaurants and food service

businesses found in Florida donated their food to community distributors, this would represent a sizable amount of food donations (FRLA, 2019).

The researchers used multiple assumptions when formulating Method 2. One assumption is that data covering differing annual time spans are comparable. Although there are certainly fluctuations in food donation quantities on a month-to-month basis, data from food service organizations show that food donation quantities have remained of similar magnitudes in recent years. Another assumption is that quantities inbound to the service organization are equal to quantities outbound; in other words, that procured quantities equal distributed quantities. This assumption can be made because service organizations generally have low food spoilage rates. Food recovery organizations want to maximize distribution quantities and, thus, try to avoid spending the resources needed to transport and handle foods that are already spoiled or are at risk of spoiling. Reputations of organizations are also important, and these organizations work to procure and distribute good quality foods.

#### 4.5 Method 2 Food Donation Estimation Results

Table 7 shows food donation quantities handled by 16 food banks in the state of Florida. The second column displays the total tons of food donations distributed by food banks annually ( $FB_i$ ). The third, fourth, and fifth column show the amounts procured by purchasing ( $P_i$ ) via the USDA ( $USDAQ_i$ ), and by food drives ( $FD_i$ ), respectively. These three columns collectively are not considered source-reduced and were subtracted from column 2 to obtain the results in column 6 ( $FBSR_i$ ).

**Table 7.** Food donation quantities handled by 16 food banks in Florida.

<b>Food Banks</b>	<b><math>FB_i</math> (tons)</b>	<b><math>P_i</math> (tons)</b>	<b><math>USDAQ_i</math> (tons)</b>	<b><math>FD_i</math> (tons)</b>	<b><math>FBSR_i</math> (tons)</b>
Feeding Florida					
<i>Second Harvest of the Big Bend</i>	5,588	188	1,946	Unknown	3,454
<i>Second Harvest of Central FL</i>	29,853	2,422	6,624	Unknown	20,807
<i>Bread of the Mighty</i>	6,679	17	193	Unknown	6,469
<i>Feeding Northeast FL</i>	16,030	255	0	Unknown	15,775
<i>Feeding South FL</i>	30,817	97	10,241	Unknown	20,479
<i>Treasure Coast</i>	5,723	324	1,711	Unknown	3,688
<i>First Step</i>	1,451	12	365	Unknown	1,074
<i>FL Gateway</i>	1,223	0	321	Unknown	902
<i>Feeding Tampa Bay</i>	32,713	1,010	6,760	Unknown	24,943
<i>Feeding the Gulf Coast</i>	7,843	68	1,553	Unknown	6,221
<i>Harry Chapin</i>	10,920	609	2,899	Unknown	7,412
<i>All Faiths</i>	5,348	775	889	Unknown	3,684
Palm Beach County	2,600	200	0	120	2,280
Midwestern	3,891	0	0	35	3,856
Heartland*	1,005	513**	0	32	460
Farmshare	38,322	Unknown	11,579	Unknown	26,743
<b>SUM</b>	<b>200,006</b>	<b>6,491</b>	<b>45,080</b>	<b>188</b>	<b>148,248</b>

Notes:

Unknown = 0

\*Heartland data is assumed to represent 2018-2020, unclear timespan when data were provided.

\*\*Tons Heartland received from Feeding Tampa Bay were included in the purchased category as that quantity is assumed to be accounted for in Feeding Tampa Bay's distribution quantity.

Using the values from Table 8, the team filled in Equations 1,2, and 4, as shown below.

Equation 2 filled in.

$$\begin{aligned}
 FBSR_{tot} &= (3,454) + (20,807) + (6,469) + (15,775) + (20,479) + (3,688) + (1,074) \\
 &\quad + (902) + (24,943) + (6,221) + (7,412) + (3,684) + (2,280) + (3,856) \\
 &\quad + (460) + (26,743) \\
 FBSR_{tot} &= 148,248 \text{ tons}
 \end{aligned}$$

Equation 4 filled in.

$$CDSR = 397 \text{ tons}$$

Equation 1 filled in.

$$\begin{aligned}
 TDSR &= 148,248 \text{ tons} + 397 \text{ tons} \\
 TDSR &= 148,645 \text{ tons}
 \end{aligned}$$

Our estimated food donation mass for 2018 in Florida is 148,645 tons. This number is likely to be an underestimate as many generators' contributions to community distributors were not accounted for due to a lack of available information.

#### 4.6 Feeding Florida's Estimate of Total Food Donations in Florida

We then compared the estimate calculated in Equation 2 to an estimate provided by a Feeding Florida representative. Via a phone conversation, the representative estimated that 20% of food donations within the state of Florida does not pass through the Feeding Florida network food banks. By using the known value of tons of source-reduced food items distributed by the Feeding Florida network (denoted by variable  $FBSR_{FF}$ ), we calculated the tons of food donations generated in Florida (denoted by variable  $TDSR_{FFR}$ ). Equation 5 is a proportion, showing that 80% of generators' donations go through Feeding Florida food banks and 20% go through other food banks or directly to community distributors.

$$\frac{FBSR_{FF}}{TDSR_{FFR}} = \frac{80}{100} \tag{Eq. 5}$$

where

$$FBSR_{FF} =$$

*Tons of source reduced food items distributed by Feeding Florida network*

$$FBSR_{FF} = \sum_{n=1}^{12} (FB - P - USDAQ - FD), \text{ applied to the 12 Feeding Florida food banks}$$

The total source reduced quantity distributed by Feeding Florida was compared to the total quantity reported in the 2018 FDEP recycling workbooks. As shown below, the resulting quantity of source reduced food items distributed by Feeding Florida is 114,909 tons.

$$FBSR_{FF} = (3,454) + (20,807) + (6,469) + (15,775) + (20,479) + (3,688) + (1,074) \\ + (902) + (24,943) + (6,221) + (7,412) + (3,684)$$

$FBSR_{FF}$   
 = 114,909 tons of source reduced food items distributed by Feeding Florida network

$$\frac{114,909}{TDSR_{FFR}} = \frac{80}{100}$$

The total value for  $TDSR_{FFR}$ , or the total quantity of source reduced food donations in Florida, equals 143,636 tons.  $FBSR_{FF}$ , the source reduced quantity Feeding Florida food banks receive directly from generators, is 114,909 tons. When  $FBSR_{FF}$  is subtracted from TSDR, 28,727 tons are left. Farmshare, Midwestern, Palm Beach County, and Heartland Food Banks recorded handling roughly 33,339 tons, which is already 4,611 tons above this estimate's allocation for the rest of the food banks in Florida. There is also no room in this estimation for food donations that go directly from generators to community distributors.

#### 4.7 Comparison of Feeding Florida Values to Current FDEP Reported Food Donation Values

We compared the distribution quantities per county of Feeding Florida to quantities reported in FDEP recycling workbooks to assess gaps in reporting, by taking the difference and a ratio. The FDEP recycling workbook values reflect the 2018 calendar year and Feeding Florida values reflect the 2018-2019 fiscal year. The Feeding Florida values are what was distributed to residents of the respective county and not what was generated in that county. The FDEP quantities are supposed to reflect food items generated in that respective county. County recycling coordinator responses were varied on whether their entries in the FDEP recycling workbook reflected quantities generated or distributed in their county. We assumed the FDEP values to reflect generated masses. Feeding Florida values were used in this comparison because the set of data is the most detailed of all the service organizations. Included in FDEP recycling workbooks are values reported by generator and service organizations. A breakdown of generators and service organizations is provided in Table A1 in the Appendix.

We assumed locality of the food donation origin and distribution location based off Feeding Florida's rule that a Feeding Florida food bank can only procure and distribute donations within the food bank's service area. This assumption excludes USDA and purchased food items that are within the food bank's service area. Discussion of this assumption can be found in Section 4.8.

Food donation values reported in the 2018 FDEP recycling workbooks compared to Feeding Florida source reduced donations are presented in Table 9. Feeding Florida distributed a total of 114,909 tons of source-reduced food items. FDEP recycling workbooks reported a total of 78,910 pounds of food donations. A bar graph comparing the two entities on a per county basis is provided in Figure 8.

For each county, the difference between and a ratio of Feeding Florida to FDEP was calculated. The comparison assumes that food donations inbound to a food bank or community distributor came from a reasonably close generator. Logically, a supermarket

or restaurant would minimize distance when donating food; the service organizations themselves may also wish to avoid excessive time picking up donations. This assumption does not necessarily hold true for agricultural generators, as not every county generates agricultural output. The assumption of locality is similar to the Feeding Florida rule that donations procured and distributed by each food bank can only occur within the food bank's service area.

The assumption has limitations as a county does not necessarily generate and receive the same quantity of donations. Generally, the distributed quantities by Feeding Florida within counties were larger than the values reported in the FDEP recycling workbooks, indicating that there is a significant quantity of recovered food in Florida counties which is unaccounted for within FDEP recycling workbooks. In some cases, the FDEP recycling workbook quantities were larger than the reported donations distributed by Feeding Florida. For some counties, the FDEP number was higher than Feeding Florida's, such as in Orange County which was larger by a factor of three. This is an example of a comparison error. The FDEP number reported 28,408 tons, at a minimum, that are generated in Orange County but Feeding Florida had 9,472 tons distributed to Orange County. The discrepancy suggests that food generated in Orange County was distributed to Orange County residents and other counties, most likely within the Second Harvest of Central Florida food bank service area.

To establish fairer comparisons would require more procurement information, such as the county of origin of donations. Double counting donations is another concern in the reported values. Take Walmart donations as an example. Walmart donations go to Feeding Florida food banks (Feeding Florida, 2020) and then are distributed to partner agencies. Walmart, the food bank, and partner agencies all have the potential to report the same food items. This issue is further discussed in Section 6.3. Additionally, same time spans of the data would improve the comparison.

**Table 8.** Feeding Florida compared to FDEP reported values.

Food Bank	County	Feeding Florida (tons)	FDEP (tons)	Difference (tons)	FF/FDEP
Feeding Northeast Florida		15,775	1,623	14,152	9.7
	Baker	159	82	77	1.9
	Bradford	173	67	107	2.6
	Clay	512	139	373	3.7
	Duval	4,723	1,121	3,601	4.2
	Flagler	805	8	797	96.8
	Nassau	8,325	33	8,293	255.6
	Putnam	331	79	252	4.2
	St. Johns	746	94	652	7.9
Second Harvest of Central Florida		20,807	31,766	(10,959)	0.7
	Brevard	3,219	985	2,234	3.3
	Lake	2,265	612	1,654	3.7
	Orange	9,472	28,408	(18,936)	0.3
	Osceola	1,555	747	808	2.1
	Seminole	2,080	386	1,694	5.4
	Volusia	2,215	628	1,588	3.5
Harry Chapin Food Bank		7,412	18,274	(10,862)	0.4
	Charlotte	1,440	2,019	(579)	0.7
	Collier	1,923	4,387	(2,465)	0.4
	Glades	106	0	106	-
	Hendry	386	17	369	23.0
	Lee	3,557	11,851	(8,294)	0.3

Note: Parenthesis indicate negative.

**Table 8.** Feeding Florida compared to FDEP reported values, continued.

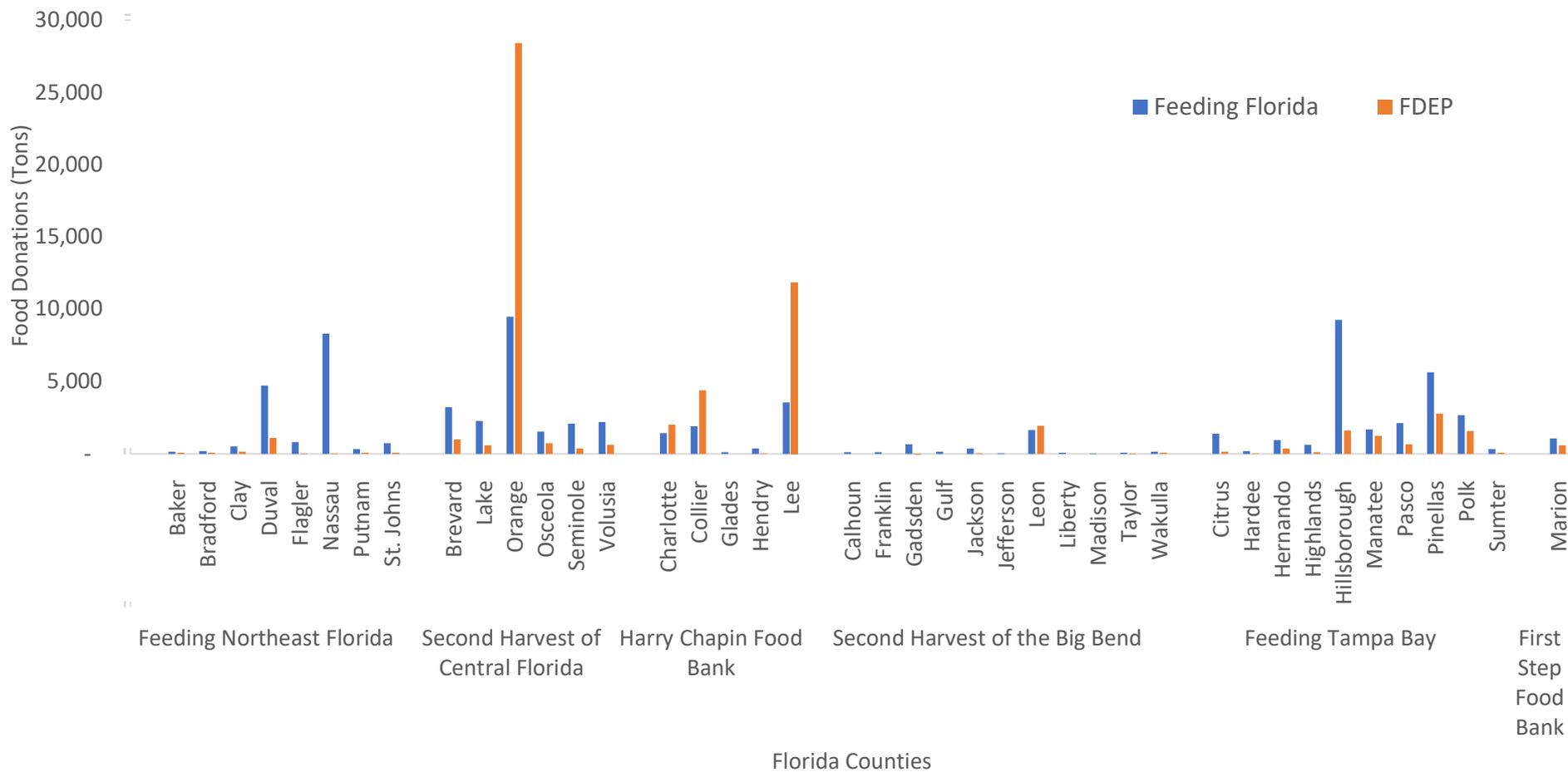
<b>Food Bank</b>	<b>County</b>	<b>Feeding Florida (tons)</b>	<b>FDEP (tons)</b>	<b>Difference (tons)</b>	<b>FF/FDEP</b>
Second Harvest of the Big Bend		3,454	2,109	1,345	1.6
	Calhoun	112	0	112	-
	Franklin	131	0	131	-
	Gadsden	665	35	631	19.1
	Gulf	139	0	139	-
	Jackson	368	47	321	7.8
	Jefferson	39	0	39	-
	Leon	1,643	1,934	(291)	0.8
	Liberty	91	0	91	-
	Madison	24	0	24	-
	Taylor	75	25	50	3.0
	Wakulla	167	68	99	2.5
Feeding Tampa Bay		24,943	8,607	16,336	2.9
	Citrus	1,402	144	1,259	9.8
	Hardee	173	31	142	5.5
	Hernando	971	360	611	2.7
	Highlands	642	105	537	6.1
	Hillsborough	9,277	1,630	7,647	5.7
	Manatee	1,706	1,245	460	1.4
	Pasco	2,118	651	1,467	3.3
	Pinellas	5,636	2,784	2,853	2.0
	Polk	2,693	1,569	1,124	1.7
	Sumter	325	88	237	3.7
First Step Food Bank		1,074	594	481	1.8
	Marion	1,074	594	481	1.8
All Faiths Food Bank		3,684	6,680	(2,996)	0.6
	Sarasota	3,226	5,989	(2,764)	0.5
	DeSoto	458	691	(233)	0.7
Florida Gateway Food Bank		902	8	894	106.3
	Columbia	623	1	623	1176.0
	Hamilton	22	0	22	-
	Suwannee	254	8	246	31.9
	Union	3	0	3	-

Note: Parenthesis indicate negative.

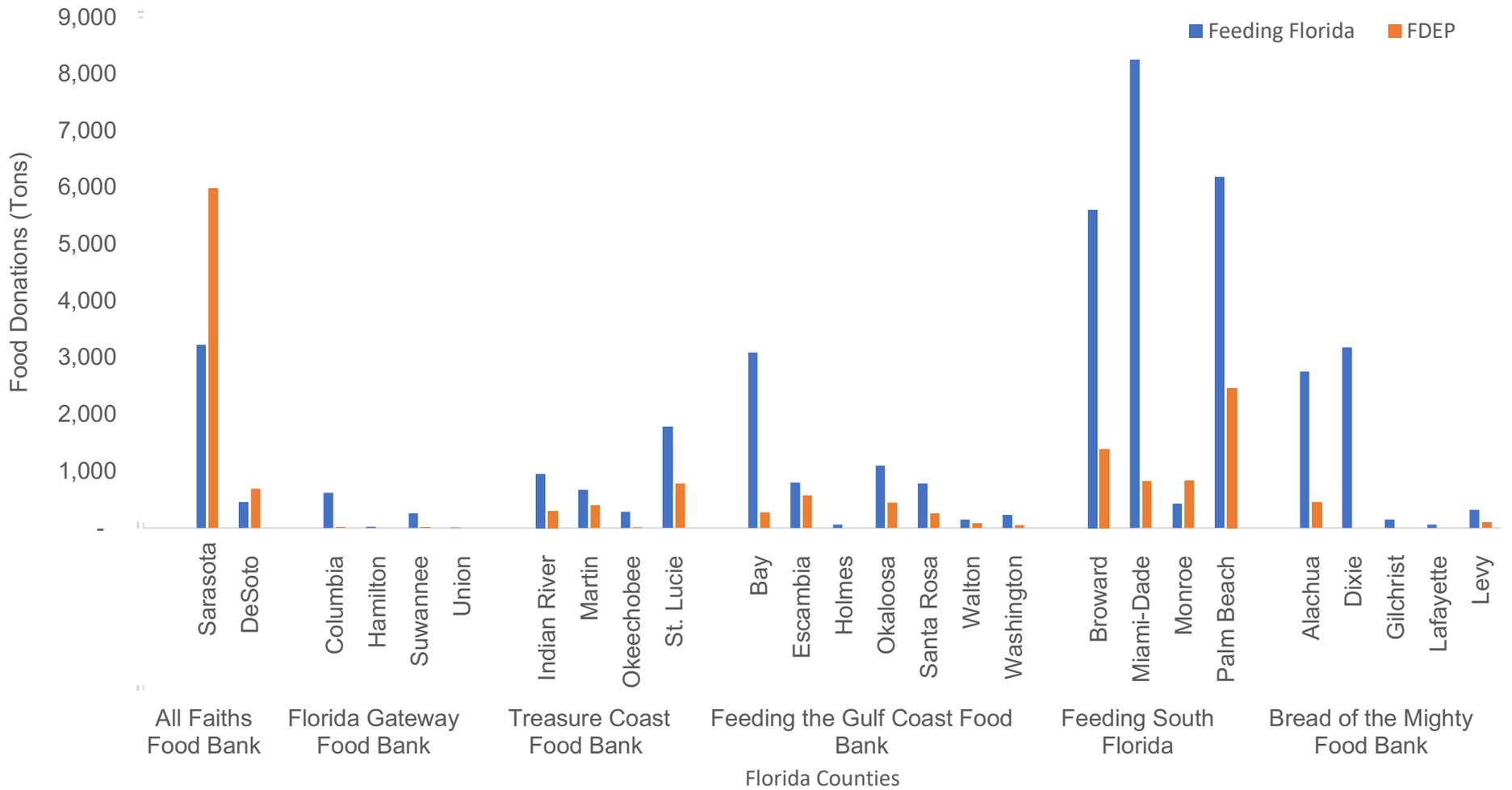
**Table 8.** Feeding Florida compared to FDEP reported values, continued.

<b>Food Bank</b>	<b>County</b>	<b>Feeding Florida (tons)</b>	<b>FDEP (tons)</b>	<b>Difference (tons)</b>	<b>FF/FDEP</b>
Treasure Coast Food Bank		3,688	1,498	2,190	2.5
	Indian River	958	305	652	3.1
	Martin	671	402	270	1.7
	Okeechobee	284	14	270	21.0
	St. Lucie	1,776	778	998	2.3
Feeding the Gulf Coast Food Bank		6,221	1,692	4,529	3.7
	Bay	3,094	272	2,822	11.4
	Escambia	804	577	226	1.4
	Holmes	62	0	62	-
	Okaloosa	1,097	449	648	2.4
	Santa Rosa	786	261	524	3.0
	Walton	150	81	69	1.9
	Washington	228	52	176	4.4
Feeding South Florida		20,479	5,514	14,965	3.7
	Broward	5,610	1,386	4,224	4.0
	Miami-Dade	8,256	825	7,430	10.0
	Monroe	428	837	(409)	0.5
	Palm Beach	6,186	2,466	3,720	2.5
Bread of the Mighty Food Bank		6,469	544	5,925	11.9
	Alachua	2,760	448	2,311	6.2
	Dixie	3,185	0	3,185	-
	Gilchrist	146	0	146	-
	Lafayette	56	0	56	-
	Levy	321	96	226	3.4
<b>SUM</b>		<b>114,909</b>	<b>78,910</b>	<b>35,998</b>	<b>1.5</b>

Note: Parenthesis indicate negative.



**Figure 8.** Comparison of Feeding Florida distributed to FDEP reported quantities.

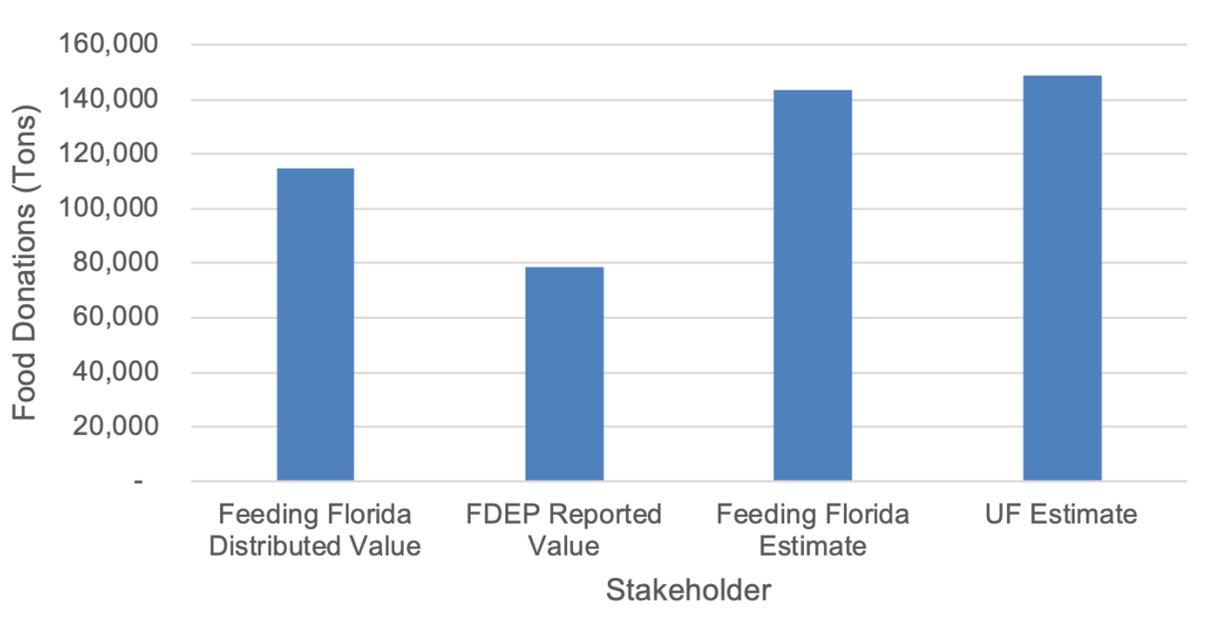


**Figure 8.** Comparison of Feeding Florida distributed to FDEP reported quantities, continued.

## 4.8 Estimation Summary

Figure 9 shows a summary of important values within this report. We estimate the total food donations handled in Florida to be 148,645 tons. The 2018 FDEP recycling workbooks reported a total of 78,910 tons. The Feeding Florida network cumulatively distributed 114,909 tons of source reduced food and the Feeding Florida representative estimated that 143,636 tons of food is handled in Florida.

The FDEP reported mass is likely the lowest because food is not required to be reported, and many generators and service organizations are private about their food donation numbers. This value is an underestimation of the total food donation mass of Florida. Our estimate is higher than Feeding Florida's distribution mass because our estimation includes Feeding Florida's distribution mass in addition to the distribution masses of the other four food banks in the state. Our estimate is similar to the estimate of the Feeding Florida representative. Both are estimates for the total mass of food donations in Florida and both are likely to be underestimations. Our estimate includes the distribution masses of 16 food banks in Florida and one agricultural organization's contribution to community distributors. The similarity between Feeding Florida representative's estimation for total source reduced food donations in Florida and ours shows that the Feeding Florida estimate likely does not adequately account for all food donations going directly from generator to community distributors.



**Figure 9.** Comparison of food donation values either reported or estimated.

## 5. ENVIRONMENTAL BENEFITS

### 5.1 Environmental Benefits Evaluation Methodology

We estimated the environmental benefits associated with donating food, landfill space, GHG emissions, and energy use. The GHG emissions and energy requirements of food donation were compared to landfilling, using impact factors and the total mass of food donated (reported in Section 4.5). Impact factors are in the units of environmental impact, such as GHG emissions, landfills space, or energy costs, per ton of food donated compared to landfilled.

Carson et al. (2019) determined the landfill space associated with one ton of food waste landfilled in a newly compacted mixed waste with no soil landfill. We extracted the landfill space impact factor, 1.2 yd<sup>3</sup>/ton of food waste landfill, reported in Carson et al. (2019) and applied it to the food donated mass to estimate the total landfill space savings, as shown in Equation 5, where TSDR refers to the total source reduced food mass in Florida.

$$\text{Landfill Space Saved (yd}^3\text{)} = 1.2 \frac{\text{yd}^3}{\text{ton}} * \text{TSDR (ton)} \quad \text{Eq. 5}$$

Where

*TSDR = Total source reduced food donation mass*

WARM was used to calculate GHG emissions and energy savings. WARM readily provides both GHG emissions and energy use impact factors for food waste landfilled and for source reduction. Since the environmental benefit is relative to landfilling, we subtracted the landfill impact factors from the source reduction impact factors. For the impact factors, we assumed WARM defaults except for the following: regional electricity grid mix emissions factor was changed to reflect a Florida energy grid, landfill gas was recovered for energy, and the landfill decay rate was set to 0.06 day<sup>-1</sup>. The resulting food waste GHG emissions impact factor was (-3.66 MTCO<sub>2</sub>E/ton - 0.41 MTCO<sub>2</sub>E/ton) = -4.07 MTCO<sub>2</sub>E/ton and the energy use impact factor was (-14.56 MMBTU/ton - (-0.03 mmBTU/ton)) = -14.53 mmBTU/ton. The GHG emissions and energy equations are provided below in Equation 6 and 7. TSDR again refers to the total source reduced food mass in Florida.

$$\text{GHG emissions saved (MTCO}_2\text{E)} = -4.07 \frac{\text{MTCO}_2\text{E}}{\text{ton}} * \text{TSDR (ton)} \quad \text{Eq. 6}$$

Where

*TSDR = Total source reduced food donation mass*

$$\text{Energy saved (mmBTU)} = -14.53 \frac{\text{mmBTU}}{\text{ton}} * \text{TSDR (ton)} \quad \text{Eq. 7}$$

*TSDR = Total source reduced food donation mass*

## 5.2 Environmental Benefits Results

The environmental benefits for donating 148,645 tons of food instead of landfilling them are shown in Table 9. The total food donated was associated with saving 178,374 yd<sup>3</sup> of landfill space. The resulting GHG emissions and energy saved were 604,985 MTCO<sub>2</sub>E and 2,159,811 mmBTU, respectively. By rescuing food at the manufacture, retail, or consumer level, all work and value required up to shelving and selling the food is conserved. This value includes the agricultural land use, harvesting labor, water use and energy employed to plow, process, cook, package, and transport the food (FAO, 2013). Other end-of-life specific benefits include conserving resources used in the disposal of food, such as the landfill space or efforts to compost, as well as preventing the release of GHG emissions as food biodegrades in those settings.

**Table 9.** Summary of environmental benefits of food donated compared to landfilled.

<b>Environmental Benefit</b>	<b>Quantity</b>
Energy Cost Saved (mmBTU)	2,159,811
GHG Emissions Reduction (MTCO <sub>2</sub> E)	604,985
Landfill Space Saved (yd <sup>3</sup> )	178,374

## 6. ISSUES IN FOOD DONATION REPORTING

We encountered multiple issues when collecting data, indicating a widespread lack of available data and consistency with food donation reporting.

### *6.1 Influence of Pandemic*

This research was conducted during the Coronavirus pandemic, in which food recovery organizations were often unresponsive due to overwhelming need within their community. As the job market has suffered, there has been an increased need for food donations, and thus food recovery organizations have needed to meet a higher demand. A Feeding Florida representative estimated that the organization is operating at 70% higher than usual operations.

Reduced staff and volunteers as well as reduced hours of operation resulted in difficulty collecting data. Due to advised distancing protocols, service organizations often suspended operations to limit virus exposure. As many recipients are in vulnerable age or health categories, community distributors especially have amended operations. In one case, a community distributor is only allowing donations from approved vendors pre-pandemic in order to limit excess individuals from entering the facility's campus. Some community distributors have decided to temporarily halt operations entirely.

### *6.2 Privacy Barriers*

Generators and food banks were frequently unwilling to release quantitative data regarding food donations but were more often willing to discuss general qualitative information. When retailers and restaurants were contacted, usually at the store location first, we were generally instructed to contact the corporate level. Corporate representatives were often withholding of information as well. One retail representative at the corporate level was informative on the company's food recovery programs but instructed the us to obtain quantitative donation information from the food banks, leading to subsequent privacy issues encountered when dealing with food banks. As seen in Chapter 3, Table 5, four out of twelve food banks provided generator breakdown categories, but when we requested quantitative data of specific generators, the team was always denied. The same requests were made for the food banks that did not have public generator breakdowns, and the team was also denied. Community distributors were also frequently skeptical of discussing or releasing quantitative information about operations. Additionally, the public records obtained through FDACS, pertaining to food recovery efforts on behalf of Feeding Florida and Farmshare, lacked information linking specific generators and their corresponding donation information. This barrier increased difficulty in estimating food donations associated with generator categories.

### *6.3 Lack of Documentation*

The UF team frequently encountered a lack of documentation when communicating with community distributors, such as information about the incoming or outgoing food donation mass. Some organizations were able to provide a percentage estimation of certain generators or types of products they receive but frequently did not keep a written log or were not willing to discuss their donation quantities if a written log

was kept. The lack of documentation created issues when the UF team was estimating food donations that go directly from generators to community distributors.

The lack of documentation with community distributors indicates a wider problem of reliable tracking of food donation origins. The origin of food donations was not recorded consistently between counties. Some recycling coordinators spoke with confidence that the values reported in their 2018 FDEP recycling workbooks represented food donations that originated in their county. Other county recycling coordinators said that the workbook values represented materials that were processed in their county. Meaning values reported in these recycling workbooks were of donations that were distributed to their county residents. The origin of food donations was not accounted for in other counties' recycling workbooks.

Duplexity in reporting values on behalf of the county workbook was also of concern for the UF team. Some counties reported values on behalf of a food bank or community distributor but then also reported values for retail generators such as Walmart and Save-A-Lot. Some counties, such as Pinellas County, attempted to prevent reporting food donation quantities twice, but other counties did not take the same precautions.

#### *6.4 Inconsistent Metrics*

A multitude of metrics are used in food donation weighing and documentation, resulting in difficulty to comparing and estimating a total food donation quantity. As encountered in literature and throughout data collection, organizations utilize different metrics to establish the weight of their donations, such as by mass, economic value, or number of pounds per meal (Hecht and Neff, 2019). In Feeding Florida food bank annual summary reports, food donation quantities are presented in several different ways, including total pounds distributed per specified year, number of meals provided per specified year, percent provided too each type of community distributor, and number of pounds distributed to each county within a food bank's service area. Sometimes a mixture of these different metrics is used. Community distributors provided data in one or a mixture of number of people fed per week/month/year, number of meals provided per week/month/year, or number of times a week or month food was provided by a food bank.

The unit of time used to report handled donation quantities results in further reporting inconsistencies. FDEP county recycling workbooks are on a calendar year of January to December. The Feeding Florida organization releases an overall report summarizing total pounds distributed on a fiscal year, July 1<sup>st</sup> to June 30<sup>th</sup>. Farmshare and FDACS report by the same fiscal year. Annual reports of Feeding Florida food banks report either "2018/2019 Annual Report" or "2018 Annual Report", leading to further confusion. Community distributors often provided data on a calendar year basis.

The conversion for pounds to meal also varies among service organizations. Feeding Florida uses Feeding America's metric of 1.2 pounds equaling one meal whereas one community distributor considers one pound equal to one meal, which was consistent to other findings in literature (Hecht and Neff, 2019). Other community distributors have their food donation quantities in terms of dollars and when converting to a mass equivalence, discrepancies can arise. The dollar value for conversions have been based off of, but not limited to, the purchased price or retail value (Hecht and Neff, 2019). One community organization uses a conversion factor of \$1.68 per pound, but we were unclear about the method used to determine this particular dollar amount. Converting the number

of donated items to a total mass based on the mass of the individual products has also been seen and proves to be inconsistent. The mass conversion can vary among food item with or without packaging or of items with high or low water content (Hecht and Neff, 2019). The variance in conversion factors for dollars, masses, and meals results in scattered reporting. As explained in Section 3.2, multiple programs, either in the form of Excel sheets, websites, or phone applications, use different metrics which ultimately results in inconsistent data.

## **7. CURRENT FOOD DONATION TOOLS, SUGGESTED TOOL, AND RECOMMENDATIONS**

### *7.1 Current Food Donation Tools*

Per the project's fourth objective, we researched various tools used in the food recovery industry to track, report, and educate about food donation. These tools are explained below and are summarized in table A5 in the Appendix. Some tools are useful for connecting and tracking generators to community distributors, such as MealConnect, Food Rescue US, and Donation Connection LLC. These tools are useful to service agencies and donors, however the data recorded is not made easily available for public viewing. Others are used to report food donations, either to the state or to the public, such as the FDEP recycling workbooks and K-12 Food Rescue. Tools can also be educational, such as the EPA's Excess Food Opportunities Map. Tools can be used for multiple purposes such as the K-12 Food Rescue app which reports to the public and in turn, educates on the environmental benefits of food recovery. Overall, inconsistent metrics between tools pose difficulties in comparing data between different tools.

#### *7.1.1 Tracking Tools*

Feeding Florida developed an application for food donation tracking, MealConnect. This tool allows donors to manage their donations and match surplus or unsold food items with Feeding America food banks and their partner agencies. MealConnect also organizes the delivery of donations. The donor's desired pick up times may be specified as a range of days and a specific time. Eight categories to describe the donation are available: bakery, produce, meat, dairy, prepared/perishable, beverages, mix, and nonfood. The donor may also add a note to their donation to further describe their food items as well as set a range of days or a specific time for pick up. Service organizations may choose to be matched with specific food item types. Service organizations are selected to receive a donation depending on their facility features, such as refrigeration, and their availability for delivery. Food banks save on their operational costs as MealConnect volunteers deliver donations directly to food pantries. MealConnect allows donors to create receipts of their food transfers and calculate tax benefits from their donations (Mealconnect, 2020).

Food Rescue US is a tool which connect surplus food generators to service organizations, all while providing transportation volunteers. Food Rescue US focuses on fresh foods that are in excess or undesired by the donor due to slight defects. Food is picked up daily by volunteers and transported directly to service organizations the same day. Donors may schedule recurring pickups or list donations at any time, after which volunteers can pick up and transport the donation. Service organizations may specify categories of food desired and preferred delivery times (Food Rescue US, 2020).

Food Donation Connection, LLC processes, catalogs, and connects generators with local service organizations through their website and mobile application. The generators are primarily in, but not limited to, the restaurant or foodservice food industry. The online program available to participants is called "Harvest eLog," and the mobile analog for smartphones is "eLog Mobile." Food Donation Connection is a multinational company and uses meals-per-second as a metric to demonstrate their productivity on

their website's frontpage. The tool connects donors with service organizations and orchestrates the recollection of food items. The generator will record known and unknown weights of the food items donated, which is summed into a total "known" weight. The receiving service organization will then confirm the weight (Food Donation Connection, 2020).

### *7.1.2 Reporting and Educational Tools*

K-12 Food Rescue, an online tool for schools and other organizations to record and publish their food donation quantities. Broward County schools were introduced to the tool and instructed on food recovery methods. Schools are encouraged to collect unopened and uneaten food from students and donate the items, and document the quantities donated. K-12 Food Rescue allows schools to input the amount of food rescued, and from their metric of pounds per meal, GHG emissions reduced in carbon dioxide equivalents are calculated. The tool publishes each organization's entry and displays a visual representation of the number of food items, meals, and CO2 equivalence saved (K-12 Food Rescue, 2020).

EPA's Excess Food Opportunities Map is an educational tool which provides locations of alternative handling of food waste. The map provides locations of service organizations in Florida (FDEP, 2019). This resource can be helpful for country recycling coordinators when developing their FDEP recycling workbooks (EPA, 2020).

## *7.2 Suggested Tracking Tool*

Food donation tracking tools currently in place are not structured for the uniform reporting of food donations. To make food donation data easily available to FDEP waste reduction staff and local government programs, we propose a spreadsheet for documenting food donations. This spreadsheet may be distributed to generators and food donation agencies, which can then be submitted to FDEP on a rolling or annual basis. The mass information requested from generators and service organization is in pounds because that is the unit overwhelmingly used within the food recovery field. The spreadsheet is shown in Table 9 and will be included alongside the report submission.

The spreadsheet is composed of three sections: general information, procurement information, and distribution information. The general information asks for the business or organizations name, whether it is a generator, food bank, or community distributor, and general contact information. A guide for the user to decide whether they are a generator, food bank, or community distributor is included. The user also will fill in the start and end month, day, and year of their annual year.

If the user is a food bank or community distributor, they may use the procurement section to record the generators of the procured food. There are ten procurement categories: retail, manufacturers, restaurants/food service, hotels/events, schools/institutions, farms, food drives, USDA, Feeding America, other food banks. The reader will note that of these ten options, we have not considered two of these options, Feeding Florida and other food banks, as generators throughout this report. Feeding America and other food banks do not produce food donations but are conduits for providing food banks and community distributors with food donations, so they are included in the spreadsheet. For each donation, the user will find the generator category and fill in the name of the generator, pounds procured, date of procurement, city, county, and state of the generator.

The distribution section can be used by a generator, food bank, or community distributor and applies to when the user is donating food to another organization or providing donations to the public. The user may input the organization to which they donated food to, the mass, date of distribution, city, county, and state of the receiving organization. If the user is providing food directly to the public, either through a food bank's mobile pantry or because the user is a community distributor, the name of the receiving organization can be "recipients" and the location information can refer to where the distribution happened. The total pounds distributed by the user is then entered and the start and end day, month, and year to which that total refers to. This flexibility in reporting the total distribution allows for the user to input the previous year's or chosen time span's total mass distributed. The user can also input their pounds per meal equivalence and dollar per meal equivalence. If the user distributes to people directly, then the number of meals per week or month, which should be noted, is open for filling in. The spreadsheet is shown in Table 10 and will be included alongside the report submission.

**Table 10.** Food donation tracking spreadsheet created for FDEP.

1. General Information					
Business or organization name:		Stakeholder	Description		Examples
Are you a generator, food bank, or community distributor? (See Stakeholder box for clarification)		Generator	One that produces food donations	-->	Supermarkets, manufacturers, restaurant/food service, hotels, schools, events, etc.
Address		Food Bank	One that receives food donations from generators and either a) distributes to food insecure people or b) to community distributors	-->	Food banks within the Feeding Florida network or independent food bank
City		Community Distributor	One that receives food from food banks or directly from generators AND distributes to food insecure people	-->	Food pantries, soup kitchens, homeless shelters, etc.
County					
State					
Point of Contact					
Dates of annual tracking (DD/MM/YYYY-DD/MM/YYYY)					

**Table 10.** Food donation tracking spreadsheet created for FDEP continued.

<b>2. Procurement Information</b>		*This section is for food banks or community distributors:					
<i>Of the food procured, how much of it was from....</i>	Name	Pounds	Date of Procurement	City	County	State	
A) Retail (Supermarkets, wholesalers, etc.)							
B) Manufacturers							
C) Restaurants/ food service (chain or small restaurants)							
D) Hotels/ events (leftovers from a conference or event)							
E) Schools/institutions							
F) Farms (including gleaning)							
G) Food drives							
H) USDA (TEFAP/CSFP)							
I) Feeding America's Choice program							
J) Other food banks							
<b>3. Distribution Information</b>							
How many pounds equal a meal?							
<i>Organizations distributed to....</i>	Name	Food Bank (FB) or Community Distributor (CD)	Pounds	Distribution Date	City	County	State
<b>3a. If you distribute to the public</b>							
How many meals do you distribute per person and during what length of time (per week, month, year)?							

### *7.3 Recommendations for FDEP*

The following steps are suggested for the improvement of food donation reporting within Florida. First, food banks and food pantries may be contacted outside of pandemic conditions to collect historical food recovery quantities. Service organizations were challenged with higher demand for food donations, reduction in hours of operation, and fewer staff members available. Many organizations were unresponsive or unable to provide information due to these conditions.

We recommend county recycling coordinators be provided further training on food recovery. County recycling coordinators may be given detailed instructions on how to promote food recovery, methods to obtain food donation masses, which food donations should be included in the workbook, and how to prevent double counting. FDEP may promote voluntary food donation reporting by sending out our tracking spreadsheet. Coordination among counties in a shared database may also improve the reporting of food donations. With a homogenous effort from Florida county recycling coordinators, more detailed data on food recovery can be collected. Also, we suggest the FORCE website be continually updated to serve as a centralized source of information on organic waste and food donations.

Furthermore, we suggest food be added as a recoverable material. If recyclers of food waste become certified, then the handling of 600 or more tons annually of food donations would be required. If defined as a recoverable material, food donations may still not be reported, in which increased education and a unified reporting tool can supplement.

Further incentives for food donations may also promote reporting of food donations in Florida. Federal tax incentives for generators exist (ReFED, 2020); however, similar incentives are not present at the state level.

## 8. SUMMARY AND CONCLUSION

The University of Florida team researched food donations within the state of Florida with the ultimate purpose of enhancing the efficiency of food donation tracking and reporting. Food donations are described as food items that the generator can no longer use and are directed to hunger relief organizations. These food items are considered source reduced as they are donated with the intent to be reused by food insecure populations instead of treated by traditional disposal methods. The four project objectives were to summarize food recovery efforts in Florida, estimate the quantity of food donated, evaluate the environmental benefits of food donations, and present the methods and tools currently used for tracking and reporting food donations as well as suggest a new tool for FDEP to use.

The first objective to summarize food donations was achieved by conversing with stakeholders within the food recovery field to collect qualitative and quantitative information on the flow of food donations. In this report, we present in-depth descriptions of the four stakeholders: government, generators, service organizations, and recipients. FDACS runs the Food Recovery Program which collaborates with businesses and organizations to promote donating food. Generators, such as retail, schools, and farms, produce food donations which are then donated to food banks or community distributors. The Feeding Florida food bank network handles most food donations within the state at 114,909 tons. Farmshare handles the second largest quantity of donations, 26,743 tons. A smaller quantity of food donations goes directly from generator to community distributors, but quantitative information on this parameter is severely lacking. The food is ultimately provided to recipients, food insecure people.

The second objective was to estimate the mass of food donations in Florida in 2018. We created an estimation method which summed the source-reduced food distributed by the 16 food banks in Florida and the mass of produce Society of St. Andrews donated directly to community distributors. This estimate resulted in 148,495 tons. We also estimated the mass of food donations in Florida using a method provided by a Feeding Florida organization representative. This method resulted in an estimate of 143,363 tons of food donations. Both estimations are likely to be underestimations because neither adequately includes the mass of food that goes straight from generators to community distributors. A comparison was then made between the Feeding Florida source-reduced distribution quantity of 114,909 tons and the total quantity reported in FDEP recycling workbooks of 78,910 tons. The values entered into the FDEP recycling workbook are supposed to be food donations generated in each county so there are concerns with the comparison as counties do not necessarily generate the same quantity of donations as they receive.

To fulfill the third objective of evaluating the environmental benefits of food donations, we calculated the landfill space, GHG emissions, and energy saved that results from 148,495 tons of food being donated instead of landfilled. Based on a landfill space saving factor from Carson et al. (2019), 178,374 yd<sup>3</sup> of landfill space were saved. Emissions and energy impact were generated from EPA's Waste Reduction Model (WARM) calculations and resulted in 604,985 MTCO<sub>2</sub>E saved and 2,159,812 mmBTU of energy conserved.

The last objective was to research the current tools used in the food recovery realm. We found a multitude of available tools, each with a set purpose. Some tools like MealConnect, Food Rescue US, and Food Donation Connection connect generators of food donations to service organizations. Other tools such as the K-12 Food Rescue and Re-Trac are designed to report recovered food, although Re-Trac does not separate food donations out from other types of recycled food. The K-12 Food Rescue and the EPA's Excess Food Opportunities Map are also examples of educational tools. The K-12 Food Rescue shows the public how much food has been recovered in terms of food items and meals, as well as pounds of CO<sub>2</sub>. For this objective, we also created a spreadsheet for FDEP to potentially disperse to generators and service organizations to make food donation data easily available.

Included in the report is a discussion of lessons learned as well as recommendations for FDEP. Issues experienced included privacy barriers, lack of documentation, and inconsistent metrics. Recommendations for FDEP to improve food donation documentation include increased education for county recycling coordinators, inclusion of food waste as a recoverable material, and increased communication between food donation stakeholders.

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## 10. APPENDIX

**Table A1.** Reported mass in 2018 FDEP recycling workbooks.

<b>County</b>	<b>Total Reported (tons)</b>	<b>Reported from Walmart and Save-A -Lot (tons)</b>	<b>Reported by Service Organizations (tons)</b>
Alachua	448	448	0
Baker	82	82	0
Bay	272	272	0
Bradford	67	67	0
Brevard	985	985	0
Broward	1,386	1,386	0
Calhoun	0	0	0
Charlotte	2,019	2,019	0
Citrus	144	144	0
Clay	139	139	0
Collier	4,387	203	4,184
Columbia	1	1	0
DeSoto	691	691	0
Dixie	0	0	0
Duval	1,121	1,121	0
Escambia	577	577	0
Flagler	8	8	0
Franklin	0	0	0
Gadsden	35	35	0
Gilchrist	0	0	0
Glades	0	0	0
Gulf	0	0	0
Hamilton	0	0	0
Hardee	31	31	0
Hendry	17	17	0
Hernando	360	360	0
Highlands	105	105	0
Hillsborough	1,630	1,630	0
Holmes	0	0	0
Indian River	305	305	0
Jackson	47	47	0
Jefferson	0	0	0
Lafayette	0	0	0
Lake	612	612	0
Lee	11,851	751	11,100
Leon	1,934	302	1,632
Levy	96	96	0

**Table A1.** Reported mass in 2018 FDEP recycling workbooks continued.

<b>County</b>	<b>Total Reported (tons)</b>	<b>Reported from Walmart and Save-A -Lot (tons)</b>	<b>Reported by Service Organizations (tons)</b>
Liberty	0	0	0
Madison	0	0	0
Manatee	1,245	462	783
Marion	594	594	0
Martin	402	47	355
Miami-Dade	825	825	0
Monroe	837	0	837
Nassau	33	33	0
Okaloosa	449	449	0
Okeechobee	14	14	0
Orange	28,408	2,774	25,634
Osceola	747	747	0
Palm Beach	2,466	1,123	1,343
Pasco	651	651	0
Pinellas	2,784	1,050	1,733
Polk	1,569	1,569	0
Putnam	79	79	0
Santa Rosa	261	261	0
Sarasota	5,989	486	5,503
Seminole	386	386	0
St. Johns	94	94	0
St Lucie	778	770	8
Sumter	88	88	0
Suwannee	8	8	0
Taylor	25	25	0
Union	0	0	0
Volusia	628	628	0
Wakulla	68	68	0
Walton	81	81	0
Washington	52	52	0
Sum:	78,910	25,738	53,172

**Table A2.** County representative responses of county sponsored food recovery programs, not including efforts on behalf of food recovery organizations.

<b>County</b>	<b>County Responses</b>
Alachua	No food recovery efforts
Baker	No food recovery efforts
Bay	No food recovery efforts
Bradford	No food recovery efforts
Brevard	No food recovery efforts
Broward	No response
Calhoun	No response
Charlotte	No response
Citrus	No response
Clay	No food recovery efforts
Collier	No response
Columbia	No food recovery efforts
DeSoto	No food recovery efforts
Dixie	No food recovery efforts
Duval	No food recovery efforts
Escambia	No response
Flagler	No response
Franklin	A food pantry coordinates with the county's emergency operations center to handle food.
Gadsden	No response
Gilchrist	No food recovery efforts
Glades	No food recovery
Gulf	No response
Hamilton	No response
Hardee	No response
Hendry	No food recovery efforts
Hernando	Not willing to participate at this time
Highlands	Does not record food donations
Hillsborough	No food recovery efforts
Holmes	No food recovery efforts
Indian River	<ul style="list-style-type: none"> <li>• Works with FDEP and The Sustainable Events Network, Florida and the Caribbean (SENEFC) to put on food recovery efforts such as for the Super Bowl.</li> <li>• Working with Broward County to increase food recovery within schools.</li> <li>• Has a Share Table program in place at the schools in which students can place their unwanted food items on a centralized location. The food items are open to other students. Via regulations, the food in Indian River County must be thrown out if not consumed.</li> <li>• Has begun documenting food waste at an elementary, middle, and high school.</li> </ul>
Jackson	No response

**Table A2.** County representative responses of county sponsored food recovery programs, not including efforts on behalf of food recovery organizations continued.

<b>County Responses</b>	
Jefferson	No response
Lafayette	No food recovery efforts
Lake	No food recovery efforts
Lee	<ul style="list-style-type: none"> <li>• County run food drive, Donated Not Waste food rescue program.</li> <li>• Collects snowbird population food items to reduce food waste, program run two weeks before end of season (Easter).</li> <li>• County has collection boxes in the libraries, recreation centers, and nature centers.</li> <li>• A waste hauling company provides the collection boxes.</li> <li>• 2018: 3,300 pounds were collected.</li> <li>• 2019: 2,700 pounds were collected.</li> <li>• All goods go to Harry Chapin Food Bank.</li> <li>• A sharing table also occurs in the schools.</li> </ul>
Leon	No county run food recovery efforts, Florida State University runs food recovery program.
Levy	No recovery efforts
Liberty	No Recovery efforts
Madison	No response
Manatee	No recovery efforts
Marion	No response
Martin	No response
Miami-Dade	No food recovery efforts
Monroe	No response
Nassau	No response
Okaloosa	No response
Okeechobee	No food recovery efforts
Orange	No food recovery efforts
Osceola	No response
Palm Beach	<ul style="list-style-type: none"> <li>• Solid Waste Authority of Palm Beach does not do food recovery efforts.</li> <li>• The non-profits handle the food donations.</li> <li>• Some schools have a share table program; others do not (up to the school's discretion).</li> <li>• SWA partners with Palm Beach County Food Bank by allowing drop off boxes for non-perishables during community 5Ks and SWA's America Recycles event.</li> </ul>
Pasco	No food recovery efforts

**Table A2.** County representative responses of county sponsored food recovery programs, not including efforts on behalf of food recovery organizations continued.

**County Responses**

Pinellas	<ul style="list-style-type: none"> <li>• Provides an “A to Z Guide for Recycling and Disposal” although the guide is no longer updated.</li> <li>• As food recovery efforts are handled by non-governmental organizations, a Pinellas resident can type “food” into the search bar of A to Z Guide and provide a zip code to locate organizations handling food donations. Results are based on locations nearest to the zip code.</li> <li>• Pinellas County has just completed its 30-year Solid Waste Master Plan, which has been approved by the Pinellas County Board of County Commissioners. It can be found on this webpage: <a href="http://www.pinellascounty.org/solidwaste/masterplan/project_updates.htm">http://www.pinellascounty.org/solidwaste/masterplan/project_updates.htm</a>. See the last document on the webpage entitled, “Master Plan.” The MP’s goal is zero waste to landfill; it outlines strategies for reducing waste, including food waste. Strategies include providing education and guidelines to businesses for the management of edible food, promote awareness of waste prevention and reuse opportunities through expansion of the A to Z Guide, promote County institutional diversion strategies for food waste that include in-house composting, and possibly implementing collection and composting programs for organics.</li> <li>• At least some Pinellas County schools donate food.</li> </ul>
Polk	No food recovery efforts
Putnam	No food recovery efforts
Santa Rosa	No response
Sarasota	No food recovery efforts, non-profits handle efforts
Seminole	No food recovery efforts
St. Johns	No response
St Lucie	No food recovery efforts
Sumter	No food recovery efforts
Suwannee	No food recovery efforts
Taylor	No food recovery
Union	No food recovery efforts
Volusia	<ul style="list-style-type: none"> <li>• No county food recovery efforts; Stetson University and Daytona State College operate food recovery.</li> <li>• At least one Publix is known to donate produce to the food bank (Second Harvest of Central Florida) and all breads/baked goods go directly to non-profits.</li> </ul>
Wakulla	No food recovery efforts
Walton	No Response
Washington	No food recovery efforts

**Table A3. Generator Responses or Food Donation Programs.**

Generator	Business/Organization	Response
Retail/Wholesale	Publix	<p><i>Perishable Recovery Program</i>                      -fresh vegetables, fruit, poultry, dairy goes to the food banks                      -180 million pounds of food donated since the start in 2009 (for all their stores within the 6 states)                      -weekly and bi-weekly partners that pick up the food</p> <p><i>Food for Sharing Program</i>                      -a point of sale event in which customers can donate at the register                      -the company then uses money to buy food products within the warehouse                      -the food is then donated to food banks</p> <p><i>Reclamation system</i>                      -food items not wish to be sold (too bent or issue with labeling) are picked up by a third party and the third party handles the donations                      -quantity handled by third party is unavailable                      Some stores donate food items, such as bakery items, directly to organizations                      Some stores do not donate baked goods, such as breads, if from the deli</p>
	Panera	<p>-Corporate didn't answer.                      -Day-End Dough-Nation program, donates food left over at the end of the sales day                      -Nationally partners with 3,500 local community organizations (Panera, 2015)</p>
	Aldi	No response
	Costco	Cannot get corporate numbers right now
	Whole Foods	Corporate did not answer
	Kroger's	<p>Zero Hunger   Zero Waste plan                      --More than 100,000 pounds of food donated in 2018 to Feeding America.</p>
Schools	Broward County School System	<p>-Stores donate to food recovery organizations and then the organizations send masses to Walmart/Save-A-Lot corporate                      -Corporate sends store recycling reports to FDEP                      -FDEP then distributes the report to county recycling coordinators and any store entries within county jurisdiction is claimed and put on recycling workbooks.</p>
	Orange County School System	<p>-14 schools use Food Rescue US                      -Donated 189,026 food items from years 2017 to 2020                      -equal to 39,371 meals</p> <p>-3 schools use Food Rescue US                      -Donated 522,777 food items from years 2017 to 2020                      -equal to 96,781 meals</p>

**Table A3.** Generator Responses and Food Donation Programs.

<b>Generator</b>	<b>Business/Organization</b>	<b>Response</b>
Agriculture	Society of St. Andrews	Society of St. Andrews is a non-profit organization that procures fresh food items from farms and delivers the food to service organizations, such as food banks and community distributors. One third of their food items comes from gleaning, or the act of collecting items in the agricultural fields that were not harvested. Two-thirds of their food items comes from farmers that could not sell their items to retail or on their own, often because the produce was blemished or not meeting shape, color, or size expectations of the consumer. From 2018-2019, Society of St. Andrews distributed 1,660 tons, 276 tons went out of state. Of the 1,383 tons that were distributed in Florida, 986 tons to food banks and 397 tons went from farm to community distributors.

**Table A4.** Summary of food donation generators.

<b>Generator</b>	<b>Reason for Producing Food Donations</b>
Retail (supermarkets)/wholesalers	<ul style="list-style-type: none"> <li>• Food items close to expiration/sell by date, produce that did not sell, and non-perishable items that are bent or mislabeled.</li> </ul>
Manufacturers	<ul style="list-style-type: none"> <li>• Food items not to be sold because of incorrect labeling, bent, or do not meet product expectations.</li> <li>• Some food banks purchase manufactured goods</li> <li>• food that was prepared, not sold, and can no longer be available for purchase.</li> </ul>
Restaurants/food service	<ul style="list-style-type: none"> <li>• Examples: bread/pastries from a bakery, cannot be sold the next day.</li> <li>• Need to be distributed quickly or else will spoil.</li> <li>• Prepared for a conference or event but were not distributed to the public.</li> </ul>
Hotels/Events	<ul style="list-style-type: none"> <li>• Need to be distributed quickly or else will spoil.</li> <li>• Leftover items, such as apples, milk, or fruit cups.</li> </ul>
Schools	<ul style="list-style-type: none"> <li>• Some schools have restrictions to donating these items, others allow donations</li> <li>• Some schools have sharing tables where the unwanted food is set on a communal location and the food items can be taken by whomever wants them.</li> </ul>
Farms	<ul style="list-style-type: none"> <li>• Food items include produce that was either gleaned or already harvested.</li> <li>• Gleaning is the act of collecting produce that was not harvested either because excess was grown, or the farmer knew the items did not meet the aesthetic standards (misshapen, too small or large) of a retailer.</li> </ul>
Food drives	<ul style="list-style-type: none"> <li>• Community members collect usually non-perishable food items either from their homes or buy from retailers with the intent of donating the items.</li> <li>• We do not include food drive items in estimation calculations due to a lack of information of the origin of the food items and if source reduced</li> </ul>

**Table A4.** Summary of food donation generators continued.

<b>Generator</b>	<b>Reason for Producing Food Donations</b>
United States Department of Agriculture (USDA)	<ul style="list-style-type: none"> <li>• The USDA receives federal money to run and support hunger relief programs.</li> <li>• Different sets of funds, such as Section 32, TEFAP and CSFP. Section 32 money is specifically used on surplus foods.</li> <li>• These funds can which can buy food for hunger relief programs such as TEFAP and CSFP.</li> <li>• There are 9 food banks in Florida that are approved by FDACS to distribute TEFAP and CSFP food, 7 of which are Feeding Florida network food banks, 2 are Farmshare food banks.</li> <li>• Food banks with TEFAP and CSFP food then distribute to approved community distributors</li> <li>• We do not include food drive items in estimation calculations due to a lack of information of the origin of the food items and if source reduced.</li> </ul>

**Table A5.** List of current food donation tools.

<b>Tool</b>	<b>Description</b>	<b>Reference</b>
Food Donation Connection, LLC	<ul style="list-style-type: none"> <li>• Global website and smartphone app that connects generators with food donation agencies</li> <li>• The tool coordinates the pick up and where the food will be delivered to</li> <li>• Volunteers transport the donation to the food bank or panty</li> <li>• Free to agencies, transactions are limited to 5 miles</li> <li>• Requires use of electronic chain of custody forms</li> </ul>	Food Donation Connection, 2020
Food Rescue US	<ul style="list-style-type: none"> <li>• Connects generators with receiving agencies</li> <li>• Participation requires use of a smartphone app which recruits a volunteer to transport the goods</li> </ul>	Food Rescue US, 2020
MealConnect <sup>tm</sup>	<ul style="list-style-type: none"> <li>• Matches generators with and food pantries</li> <li>• Free to use</li> <li>• Available in select cities</li> <li>• Volunteers provide transportation of the food</li> <li>• Allows scheduling for pick-ups</li> <li>• Calculates tax benefits for donors</li> </ul>	MealConnect, 2020
EPA Excess Food Opportunities Map	<ul style="list-style-type: none"> <li>• Identifies and displays facility-specific information about potential generators and recipients of excess food in the commercial, industrial, and institutional sectors</li> <li>• Helps identify gaps in infrastructure and the feasibility of new recipient facilities</li> </ul>	EPA, 2020
K-12 Food Rescue	<ul style="list-style-type: none"> <li>• Cafeterias are subject to waste reduction policy auditing</li> <li>• K-12 Food Rescue Log tool 3.0 is offered for free to cafeterias</li> <li>• Allows teachers, kitchen managers, and volunteers to track the environmental impacts of food recovery in their cafeteria with an automatic calculator for GHG equivalents</li> </ul>	K-12 Food Rescue, 2020