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The Impact of Act 148 on Food-Insecure Populations in Chittenden and Essex Counties of Vermont

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ABSTRACT

It is estimated that as much as 40% of the food produced in the United States goes to waste (Hall, Guo, Dore, & Chow, 2009), and much is still edible when it is disposed of. Simultaneously, the United States faces significant food insecurity, with an estimated 12.7% of the population meeting the criteria in 2015 (Coleman-Jensen, Rabbit, Gregory, & Singh, 2016). In 2012, Vermont passed the Universal Recycling of Solid Waste Act, or Act 148, which bans recyclable materials from landfills by 2020 by mandating their recovery (VT DEC, 2014). Because the law includes edible food waste and prioritizes food donation, it has the potential to increase donations to food-recovery and -distribution programs. I evaluate whether or not Act 148 has led to increased food donations; if so, whether its impact has been equal in diverse regions of the state; and if an increase in food availability has resulted in increased food access. I compare Chittenden and Essex counties, which differ greatly in population size and density, urban development, and rates of food insecurity, through a series of semi-structured interviews with directors of food-aid organizations in both counties. Of the generally larger and well-supported Chittenden organizations, 100% had heard of Act 148 and 75% had seen increases in donations as a result. The smaller organizations in Essex, serving populations with higher food insecurity, had seen no changes since the law's implementation. These findings lead to the conclusion that the impact has not been equal across the state and has not affected the most food-insecure populations.

ACKNOWLEDGMENTS

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INTRODUCTION

It is estimated that as much as 40% of the food produced in the United States is lost at various points along the supply chain (Hall et al., 2009). Although much of this food is still edible, almost all of it is destined for landfills. Simultaneously, an estimated 12.7% of the population of the United States met the criteria for food insecurity in 2015 (Coleman-Jensen et al., 2016). In sparsely populated rural areas, residents are served by fewer food-retail operations and average distances between consumers and stores are greater, and both of these factors exacerbate the problem of food access (McEntee, 2007). The dual challenges of food waste and food insecurity present opportunities for potential solutions, as there are many organizations that seek to relieve hunger, recover edible food from the waste stream, or both.

In 2012, the state of Vermont passed the Universal Recycling of Solid Waste Act, also known as Act 148, which bans food waste from landfills by 2020 by mandating recovery of a wide range of materials, including edible food, through recycling, food donation, and composting (VT DEC, 2014). As a result, this law offers the potential to increase donations to food-recovery programs, thereby increasing food availability for food-insecure populations.

In this thesis, I explore this potential through a multistep set of questions and approaches. The first step in evaluating this potential is to determine how the implementation of Act 148 has affected food-donation programs. If confirmed, as stated in media reports (Friedrich, 2016; Vermont Foodbank, 2016d; VPR, 2015), that there has been an increase in donations, the next step is to determine if the increases have been distributed evenly in parts of the state that differ greatly from each other, as defined by a set of measurable characteristics. In other words, has Act 148 led to increased food donations throughout the state, or has its impact been concentrated in certain areas with existing infrastructure and food availability? The final step is an assessment of

the significance of increased food donations for food-insecure populations. As many food-recovery and food-aid organizations are for emergency use only, there are restrictions on how often people can visit the operations as well as on how much food can be taken by each person (Levison, 2016). Given these limits, do increased donations mean more choice or higher-quality food is available for these populations, or lead to more people visiting food-aid organizations, or that more food is available per person? In short, if there has been an increase in food availability, has it resulted in a measurable increase in food access?

To examine these questions, I compared two Vermont counties with significant differences in population size and density, urban development, and food-insecurity challenges. Chittenden County has the largest population, the largest urban center, and low rates of food insecurity (Hunger Free Vermont, 2015; US Census Bureau, 2015). Essex County has a very small population compared with the other counties in the state and much higher rates of food insecurity (Hunger Free Vermont, 2015; US Census Bureau, 2015). A comparison of these counties provides an assessment to determine the impact that Act 148 has had on food-insecure populations in Vermont, highlighting challenges and successes thus far, and identifying needs for the future.

LITERATURE REVIEW

Food Waste

As global populations continue to rise, with 9.1 billion people expected to be on the planet by 2050 (UN FAO, 2008), a common argument in favor of conventional food production methods is the need to feed the ever-growing global population (Hunter, Smith, Schipanski, Atwood, & Mortensen, 2017). There is an estimated need for an increase of anywhere from 25-70% over current yields (Hunter et al., 2017; UN FAO, 2008); yet, these estimates fail to factor in global food waste and the potential food source it represents (Gunders, 2012). The Food and Agriculture Organization of the United Nations (FAO) has estimated that about a third of all food produced is lost or wasted – the equivalent of 1.3 billion tons (Gustavsson, Cederberg, & Sonesson, 2011); however, the occurrence of food waste is not equal across the globe.

Generally, low-income nations experience greater food *loss* through poor storage and lack of technology especially at the production level, whereas higher-income nations have greater food *waste* because of consumer habits and food culture, as well as the lack of coordination between the various steps of the food-supply chain (Gustavsson et al., 2011). Furthermore, the expectation is that high-income countries' food-waste situation has the potential to worsen over time (Parfitt, Barthel, & Macnaughton, 2010). The combination of low food prices, expectations of high quality, and a "disconnect" on the part of consumers as to how food is produced (something that is expected to worsen with increasing urbanization) will further heighten the current wasteful attitudes towards food in the higher-income parts of the world (Aschemann-Witzel, Hooge, Amani, Bech-Larsen, & Oostindjer, 2015; Parfitt et al., 2010). The food waste that could make the greatest difference in the world food supply is the gratuitous waste of perfectly edible foodstuffs that occurs every day (Stuart, 2009). Given that, this review

focuses on food loss and waste within high-income countries, especially the U.S., where the factors that contribute to food waste differ from those in low-income countries, and gratuitous food waste is a greater problem.

Food waste in the U.S.: How and why it occurs

Food waste is more prevalent in the United States than in any other country (Stuart, 2009). Food waste is a product of a surplus of produced food. Commonly cited estimates show that producing 30% more than nutritional needs (2,000 kcal/person/day) would result in a sufficient surplus to protect against food loss; however, in the U.S., there is a production surplus of almost twice as much food (3,800 kcal/person/day) as nutritional needs require (Papargyropoulou, Lozano, Steinberger, Wright, & Ujang, 2014). Because of this overproduction, since 1974, there have been steady increases in per capita annual food waste in the U.S., from 30% to now an estimated 40% of the total food supply (Hall et al., 2009). This correlates with general trends in the food industry of increasing consumer demand for fresh, nutritious products and products with fewer preservatives (Lyndhurst, Cox, & Downing, 2007; Mena, Adenso-Diaz, & Yurt, 2011). This means that as much as 40% of all food produced in the U.S. goes uneaten. The U.S. grows and raises more than 590 billion pounds of food per year, which means that even by conservative estimates of waste, 160 billion pounds of food are wasted yearly (Bloom, 2010). Yet only 10% of the U.S.'s edible wasted food is recovered yearly for distribution to food-aid organizations (Gunders, 2012). Recovery and reduction of food waste is a complicated issue because each step of the food supply chain contributes to it, each in different ways, and often causes are interrelated (Buzby, Wells, & Hyman, 2014; Mena et al., 2011).

It is important to note that the research on food-waste numbers are insufficient and outdated (Gunders, 2012; Gustavsson et al., 2011; Hall et al., 2009; Stuart, 2009), meaning that

most of the statistics cited above are merely estimates. The most extensive report on food waste in the U.S. was completed in 1997 (Bloom, 2010; Gunders, 2012; Stuart, 2009) and its findings are woefully incomplete and now 20 years out of date. It used outdated data (some from as far back as the 1970s) and it did not factor in the waste on farms – which has been noted to be a very important factor (Stuart, 2009). Thus, while the evidence presented below is best estimates given current data, additional research is necessary to acquire more accurate quantitative data.

The challenges begin at the farm level. As farming is inherently vulnerable to the forces of nature, including weather, pests, and disease, farmers, by necessity, build a surplus into the amount they plant (Barilla, 2012; Buzby & Hyman, 2012; Gunders, 2012; Lundqvist, Fraiture, & Moldon, 2008; Stuart, 2009; UN FAO, 1989). This inclination to surplus is furthered by the pressure to meet contract requirements in spite of losses to natural occurrences (Stuart, 2009) and the difficulty of predicting sales for farmers who do not work on contract (Buzby & Hyman, 2012; Gustavsson et al., 2011). Furthermore, in wealthy countries such as the United States, government subsidies for certain crops encourage overproduction even if the demand does not warrant it (Stuart, 2009). Additionally, farmers are affected by changes in market prices; low market prices caused by overproduction can result in food left to rot in the fields (Barilla, 2012; Gunders, 2012). Another economic factor is the diminishing return on the product as the ratio of labor costs for harvest to profits from sale becomes higher (Buzby & Hyman, 2012). Other contributing factors to farm waste are insufficient labor force for harvest, as well as food safety scares that influence consumer purchasing decisions and, while rare, lead to large amounts of wasted food (Barilla, 2012; Bloom, 2010; Buzby & Hyman, 2012; Gunders, 2012; Mena et al., 2011). Based on data from the United States Department of Agriculture National Agricultural Statistics Service (USDA NASS), 5.5% of principal crops go unharvested annually (the six-year

average from 2011-2016). This includes mainly grains, legumes, and potatoes, rather than fresh fruits and vegetables, for which the unharvested average would likely be even higher (USDA NASS, 2017). Unharvested amounts also vary by crop type and from year-to-year.

Another major factor contributing to food waste on farms is aesthetic standards. Enforced by supermarket chains with considerable buying power, cosmetic standards cause food to be rejected on the premise of defects such as size or shape, breaks or clefts, and small blemishes from pests (Barilla, 2012; Bloom, 2010; Buzby & Hyman, 2012; Gunders, 2012; Gustavsson et al., 2011; Mena et al., 2011; Stuart, 2009). These standards are put in place because consumers use product appearance as an assessment of quality, and infer that typical or normal products are better quality than abnormal ones (Aschemann-Witzel et al., 2015; Loebnitz, Schuitema, & Grunert, 2015) Thus, supermarkets can increase their profits by selling standardized, higher-grade produce (Stuart, 2009). Total production losses, including unharvested crops as well as postharvest loss, average between 15% and 35% annually, with variations due to crop type and highest waste rates for fruits and vegetables, of which an average of 20% go to waste during production, according to estimates by the Food and Agriculture Organization of the United Nations (FAO) for North America and Oceania (see Fig. 1) (Gustavsson et al., 2011; Lundqvist et al., 2008). However it is important to note that farm waste is difficult to assess and reduce because not all food loss on farms is considered to be waste, as it can be added to the soil to improve nutrient content or used as animal feed.

During storage and transport from the farm to processing or retail locations there are more points where loss can occur. Foods such as fruits and vegetables have high water content, and therefore spoil easily because disease microbes thrive in moist environments (Hailu & Derbew, 2015; Hammond et al., 2015). Lower temperatures can prevent the development of

those microbes, so perishable foods must be kept cool and transported quickly (Hailu & Derbew, 2015; UN FAO, 1989). Therefore, another rare but high impact cause of waste is refrigeration malfunction (Barilla, 2012; Buzby & Hyman, 2012; Gunders, 2012; Raak, Symmank, Zahn, Aschemann-Witzel, & Rohm, 2017). Spillage of and damage to products or packaging through impact, compression, or abrasion can also occur during transport (Barilla, 2012; Buzby & Hyman, 2012; Li & Thomas, 2014; Parfitt et al., 2010; UN FAO, 1989). Failure to follow standards for food safety and storage can also result in waste (Gustavsson et al., 2011). Additionally, long wait times for quality and food-safety tests can reduce retail shelf life for perishable products and rejected shipments can go to waste if another use cannot be found for them (Gunders, 2012).

Once a food item has passed the rigorous qualifications for supermarket display, what becomes of it? There is still a strong possibility that it will go to waste rather than be purchased by a consumer. Of the total food available at the retail level, 10% of it goes to waste yearly, amounting to 43 billion pounds (Buzby et al., 2014; Heller & Keoleian, 2014). Supermarkets seek to provide the perception of endless choice to their consumers – this results in constantly overstocked displays of surplus fruits and vegetables (Bloom, 2010; Gunders, 2012; Gustavsson et al., 2011; Mena et al., 2011; Stuart, 2009). An average of 11.4% of fresh fruits and 9.7% of fresh vegetables were wasted in supermarkets in 2005 and 2006 (Buzby, Wells, Axtman, & Mickey, 2009). Additionally, outdated products, such as those with seasonal availability around holidays, and unpopular items frequently go to waste (Buzby & Hyman, 2012; Gunders, 2012; Mena et al., 2011). Factors that contribute further to supermarket waste are the difficulty of accurate prediction of demand and industry emphasis on efficiency and product availability rather than waste reduction (Barilla, 2012; Mena et al., 2011). Finally, the expiration of "sell-by"

dates, which are often marked several days earlier than necessary out of fear of a food-poisoning scandal, results in the waste of large amounts of still-edible food (Gunders, 2012; Stuart, 2009; Wilson, Rickard, Saputo, & Ho, 2017).

The influence of supermarkets on waste accumulation is not restricted to the stores themselves. Supermarkets now stock ever-increasing amounts of prepared foods (Stuart, 2009). Not only does this practice lead to waste because the unsold food must be disposed of far sooner than fresh or unprepared foods, but the processing facilities create their own waste (Raak et al., 2017; Stuart, 2009). These are most often plant and animal trimmings or byproducts such as cheese whey and animal offal (Stuart, 2009). These perfectly edible and nutritious by-products are disposed of because they are, in general, not culturally accepted foods – although this is actually a fairly recent cultural phenomenon (Stuart, 2009). However, there are also instances of perfectly "acceptable" or recognizable foods going to waste. One example is a sandwich-manufacturing facility that threw out four slices of bread from each loaf that it used, resulting in a waste of 17% of each loaf and 13,000 slices from that single factory every day (Stuart, 2009). Additionally, just as in farming, overproduction to meet contract requirements and exacting quality standards create excessive food waste (Stuart, 2009). Finally, the packaging type chosen during processing stages can also impact food waste (Wikström, Williams, & Venkatesh, 2016). In a case study comparing meat packaged in a Styrofoam tray versus in a plastic tube, it was difficult to remove the meat from the tube and some stuck to the inside, while removal from the tray was easy and left none behind (Wikström et al., 2016).

Households are the greatest waste generators (Bloom, 2010; Stuart, 2009). Consumers waste 21% of the available food supply (Buzby et al., 2014; Heller & Keoleian, 2014), an average of 225 lbs./person/year amounting to around 90 billion pounds in 2010 (Buzby et al.,

2014; Thyberg, Tonjes, & Gurevitch, 2015). This has an economic impact as well; in 2010 the value of food waste and loss at the retail and consumer levels combined was $161.6 billion (Buzby et al., 2014), or about $1,600 per year for the average family of four (Venkat, 2012).

Demographic differences such as household size and composition can cause variation in the amount of food waste generated. Large families waste less per person than small families do; households with higher income tend to waste more, while those with lower incomes waste less; and young people waste more than the elderly (Buzby & Hyman, 2012; Jones, 2004; Lyndhurst et al., 2007; Parfitt et al., 2010; Quested, Parry, Easteal, & Swannell, 2011; Stancu, Haugaard, & Lahteenmaki, 2016). Young families with children and young professionals are identified as typically high wasters (Lyndhurst et al., 2007) There are cultural differences as well, for example, Hispanic households in the U.S. waste approximately 25% less than non-Hispanic (Jones, 2004; Parfitt et al., 2010). Retailers' practices also influence consumer waste. The labels used to indicate food quality – the 'sell-by' or 'best-by' dates on labels – are often interpreted as hard-and-fast expiration dates, which results in perfectly edible food being tossed (Aschemann-Witzel et al., 2015; Gunders, 2012; Parfitt et al., 2010; Stuart, 2009). Furthermore, supermarkets use bulk packaging, "buy one get one free" deals, and displays of impulse items to promote consumer purchases of surplus goods, which often simply leads to increased waste generation at the consumer level (Barilla, 2012; Bloom, 2010; Stuart, 2009).

The values of the individual come into play in the production of waste as well. Wanting to be considered a good provider or prioritizing convenience by having lots of food readily available can increase waste (Graham-Rowe, Jessop, & Sparks, 2013). The desire for convenience also promotes the value of simple waste disposal systems – while recycling is seen as simple, monitoring food waste and composting are seen as complicated (Tucker & Douglas,

2006). Finally, the valuation of the "freshness" of food, prioritization of food safety over waste reduction, and the general undervaluing of food due to its abundance and affordability – in the U.S., only 5% to 10% of income in spent on food (Barilla, 2012) – lead to carefree attitudes about its waste (Aschemann-Witzel et al., 2015; Bloom, 2010; Gunders, 2012; Gustavsson et al., 2011; Lyndhurst et al., 2007; Neff, Spiker, & Truant, 2015; Qi & Roe, 2016; Stuart, 2009). Another factor is awareness of the issue and its extent (Buzby & Hyman, 2012; Gunders, 2012; Quested et al., 2011; Stancu et al., 2016), as well as its connection to environmental issues (Tucker & Douglas, 2006). While awareness of the issue of food waste in the U.S. is fairly high, it is far from universal (Qi & Roe, 2016). Unawareness of the extent of waste at the household level can lead to consumers believing themselves clear of responsibility and placing the blame on producers and retailers (Graham-Rowe et al., 2013). In fact, one study found that Americans do not perceive themselves as wasteful in regard to food, and it also found that, based on current knowledge of food waste production, they consistently underreport waste levels in their homes (Neff et al., 2015). Along with awareness, Americans can also lack knowledge about food waste reduction strategies such as proper storage for various products, habits like planning meals and grocery shopping, or proper sizes of portions (Aschemann-Witzel et al., 2015; Buzby & Hyman, 2012; Gunders, 2012; Lyndhurst et al., 2007; Parfitt et al., 2010; Quested, Marsh, Stunell, & Parry, 2013). Finally, waste prevention behaviors are sometimes not pursued because they are private and not subject to social norms (Tucker & Douglas, 2006) or even because wasting food is considered an acceptable social behavior (Graham-Rowe et al., 2013).

Fig. 1. Food losses by weight at each step in the supply chain for the United States of America, Canada, Australia, and New Zealand, collectively.

Data: (Gustavsson et al., 2011). Graphic: (Gunders, 2012).

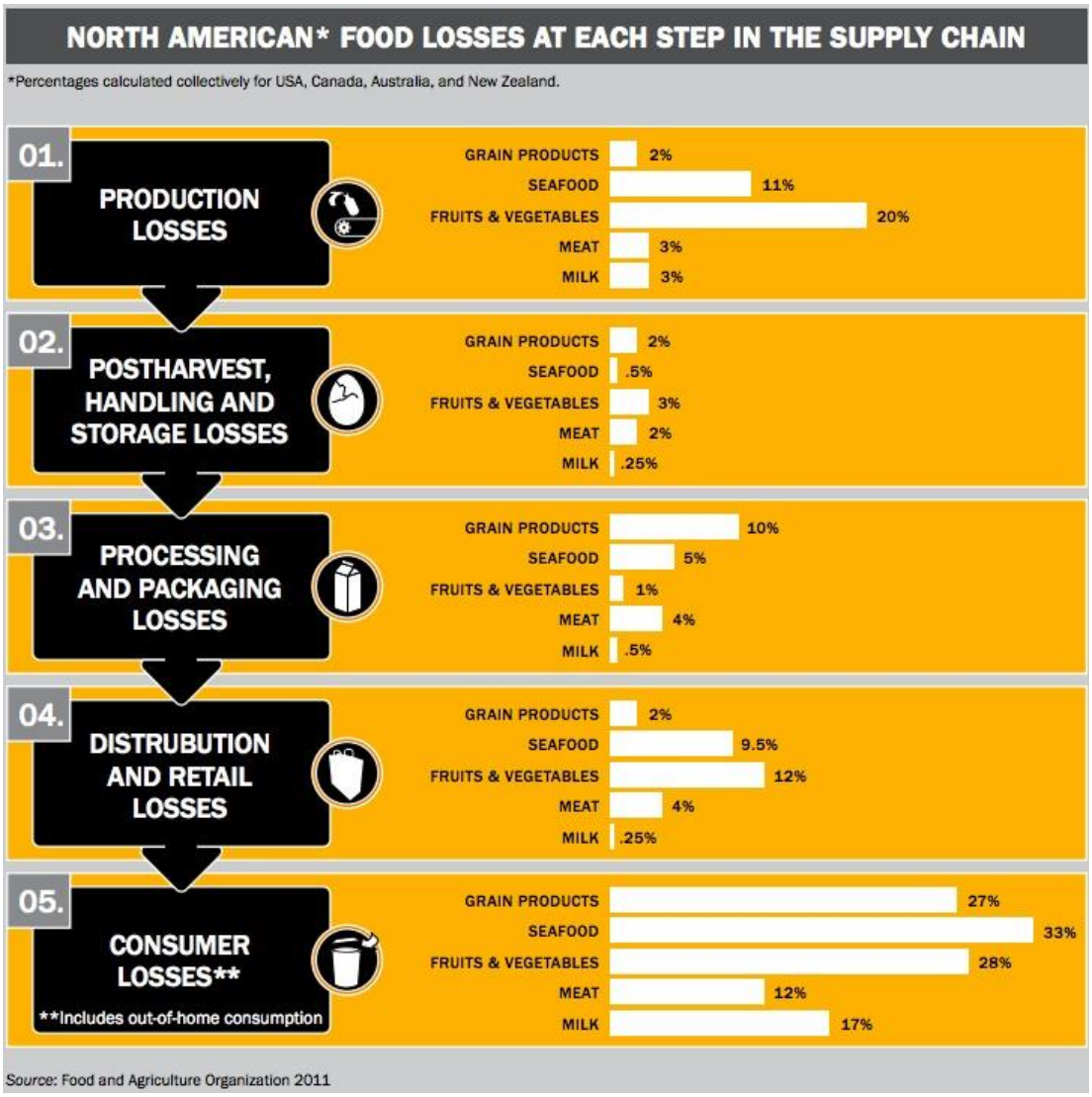
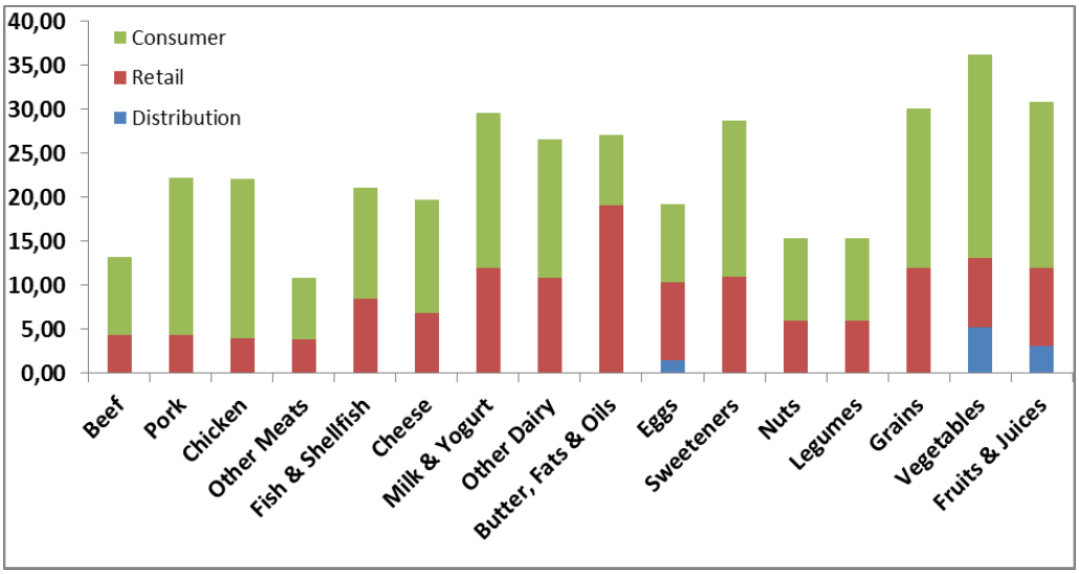


Fig. 2. U.S. avoidable waste by product in 2009, as percentage of production (Venkat, 2012).

Used with permission.



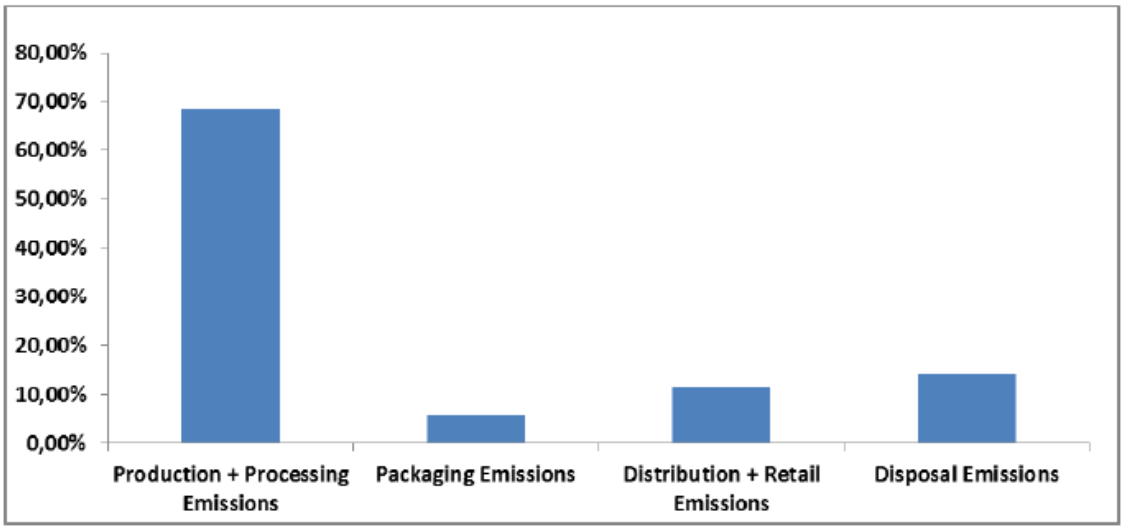
Environmental impacts of global food waste

This accumulation of waste has detrimental environmental impacts. First and foremost, food waste represents an accumulated waste of all the resources that went into its production. This includes the land and water required for its growth, as well as the pesticides, herbicides, and other chemical inputs used in conventional growing systems, and the energy upon which the system relies (Gunders, 2012; Stuart, 2009). Estimates for the percentage of total energy use accounted for by agricultural production in the U.S. range from 8% to 15%, depending on what inputs are included (Canning, Charles, Huang, Polenske, & Waters, 2010; Cuellar & Webber, 2010). However a general upward trend in the estimate over the years reflects the increased use of machine over human labor in the agriculture industry (Canning et al., 2010). Agriculture is also responsible for 80% to 90% of the U.S.'s freshwater usage (Schaible & Aillery, 2012) as well as 51% of the land, when including cropland, grazing land, and farmsteads (Nickerson, Ebel, Borchers, & Carriazo, 2011).

And these are only the most visible environmental impacts. The market changes for agricultural products in affluent countries have environmental consequences around the world. Increased demand leads to an incentive for clearing land for agriculture – which often occurs in rainforests (the Amazon is a well-known example) or other areas of critically important habitat, such as river deltas (Stuart, 2009). The resulting deforestation contributes to CO_2 emissions while simultaneously removing a CO_2 sink (Stuart, 2009). The loss of habitat is detrimental to many species. Currently, 80% of the world's endangered species are at risk because of agricultural expansion (Stuart, 2009).

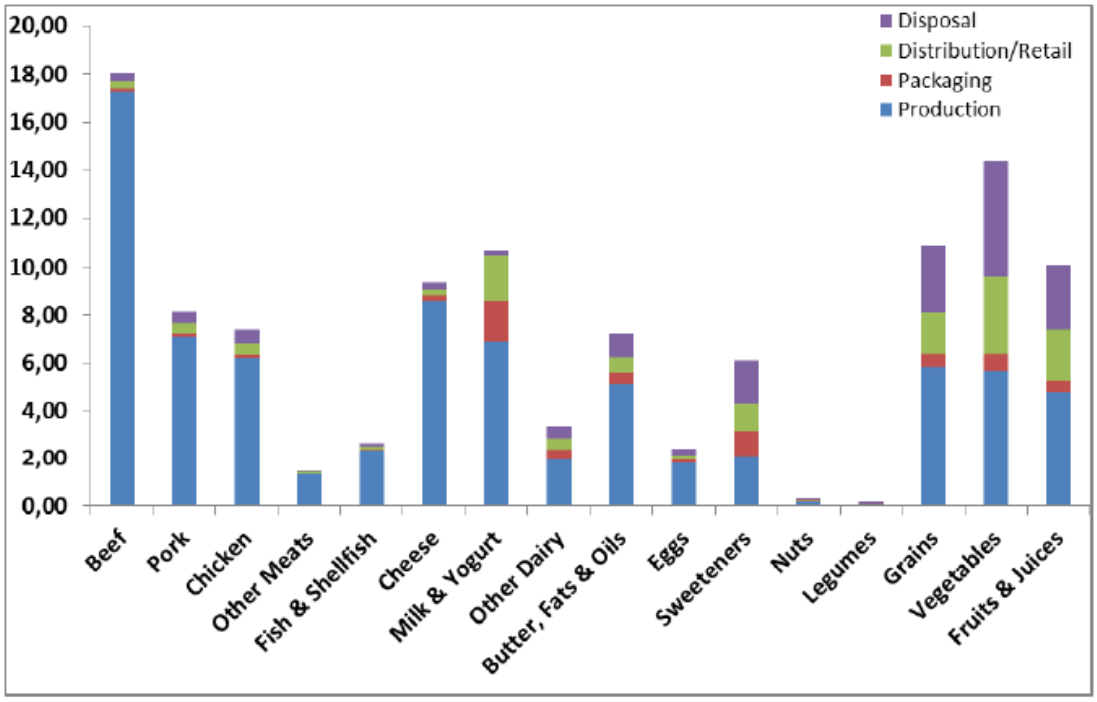
Setting aside the global picture and accounting solely for the U.S., agricultural emissions across all sectors of the food supply chain are considerable. In 2009, from production to disposal, greenhouse gas (GHG) emissions from avoidable waste food was 112.92 million metric tons (MMT) of CO_2 (Venkat, 2012), and accounted for around 8% of total U.S. GHG emissions in 2010 (Heller & Keoleian, 2014).

Fig. 3. How stages of the food supply chain contributed to GHG emissions from avoidable food waste in 2009, by percentage (Venkat, 2012). Used with permission.



It is important to note that different products can have drastically different environmental impacts. For example, animal products make up about 30% of all wasted food in the U.S., but are responsible for 57% of all GHG emissions from food waste (Venkat, 2012). Even more dramatic, the quantity of beef wasted in the U.S. is less than 2% of the total by weight, yet it accounts for 16% of total emissions (Venkat, 2012).

Fig. 4. U.S. GHG emissions from avoidable food waste in 2009 by product in million metric tons (MMT) of CO_2/year (Venkat, 2012). Used with permission.



How food waste is disposed of can also contribute to increasing amounts of greenhouse gases in the atmosphere. Organic material added to landfills results in emissions of methane, a greenhouse gas that is 25 times more detrimental to the atmosphere than CO_2 (Bloom, 2010; Gunders, 2012; Hall et al., 2009; VT DEC, 2014). Yard trimmings and food waste accounted for 28.2% of the total municipal solid waste (MSW) stream in 2014 – 38.4 million tons by weight

(US EPA, 2016). Of this, only 5.1% was composted, 18.6% was combusted for energy recovery, and 76.3% was landfilled – 29.3 million tons (US EPA, 2016).

Food waste in Vermont

84.9 million pounds of vegetables and 3.9 million pounds of berries are grown each year in Vermont (Snow & Dean, 2015). Of that, 85% is actually picked, and of what is picked, 81-86% is sold (Snow & Dean, 2015). This means that Vermont's estimated annual food loss is 14.3 million pounds (Snow & Dean, 2015). This loss is not evenly distributed between the counties because some produce more fruits and vegetables than others (Snow & Dean, 2015). The reasons cited by Vermont farmers for food going to waste in the field echo the problems throughout the U.S. The most common answers were damage from animals, weather, and disease; that the farmer was not confident that the produce would sell; and the lack of available or affordable labor (Snow & Dean, 2015). The reasons for post-storage and post-market loss were commonly attributed to a lack of demand for a product; oversaturation of the market for a product; and blemishes on the produce or partial inedibility after storage (Snow & Dean, 2015). The numbers on waste indicate how much room for improvement there is, as well as the potential for increased amounts of fresh, local produce for Vermonters.

The Vermont Universal Recycling of Solid Waste Act (Act 148)

Background

Vermont is the first state in the U.S. to take statewide legislative measures against food being discarded and to prioritize food donation (VT DEC, 2016). Passed in 2012, the Vermont Universal Recycling of Solid Waste Act was implemented to increase recycling rates in Vermont, which have remained between 30% and 36% for the past decade (VT DEC, 2014).

Additionally, the state has only two major landfills, one of which is close to capacity (VT DEC, N.D.-a). Finally, the materials to be diverted can be used for productive purposes, rather than simply going to waste in a landfill (VT DEC, 2014).

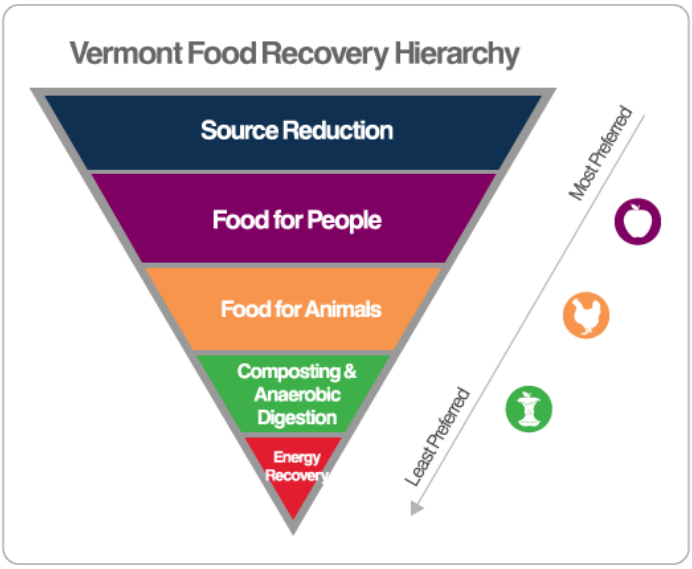
The act mandates changes at all points along the waste-removal chain. Facilities that offer trash collection will be required to also offer recycling and organic waste collection before each landfill ban takes effect (VT DEC, 2014). All towns must require waste haulers to combine fees for recycling and trash for residential customers, so that people do not have to make decisions about whether or not to recycle based on price (VT DEC, 2014). Waste facilities will establish "pay-as-you-throw" pricing that bases the cost of disposal on the volume of waste (VT DEC, 2014). As of July 2015, public-space recycling has been encouraged with the placement of recycling bins next to all trash containers in public places (VT DEC, 2014). Finally, there is a phased-in ban on organic materials in landfills (VT DEC, 2014).

Implications for food waste

Organic materials are defined as anything produced from decomposable plant or animal materials or byproducts (VT DEC, 2014). Food scraps currently constitute nearly a third of household waste in Vermont and more than half of all waste produced at food-service institutions, so diversion from landfills and use of these resources is crucial (VT DEC, 2014). The law includes a hierarchy (Fig. 5) for food recovery that moves from reduction of waste at the source to recovery of food for people to collection for use in agriculture (for example, as animal feed or bedding), in composting, and, finally, in energy recovery (VT DEC, 2014). Although it is not required that producers of food scraps donate still-edible food, the prioritization of this approach over other methods of diversion has the potential to positively impact food donations.

Fig. 5. Food Recovery Hierarchy passed as a part of Act 148, (VT DEC, 2014).

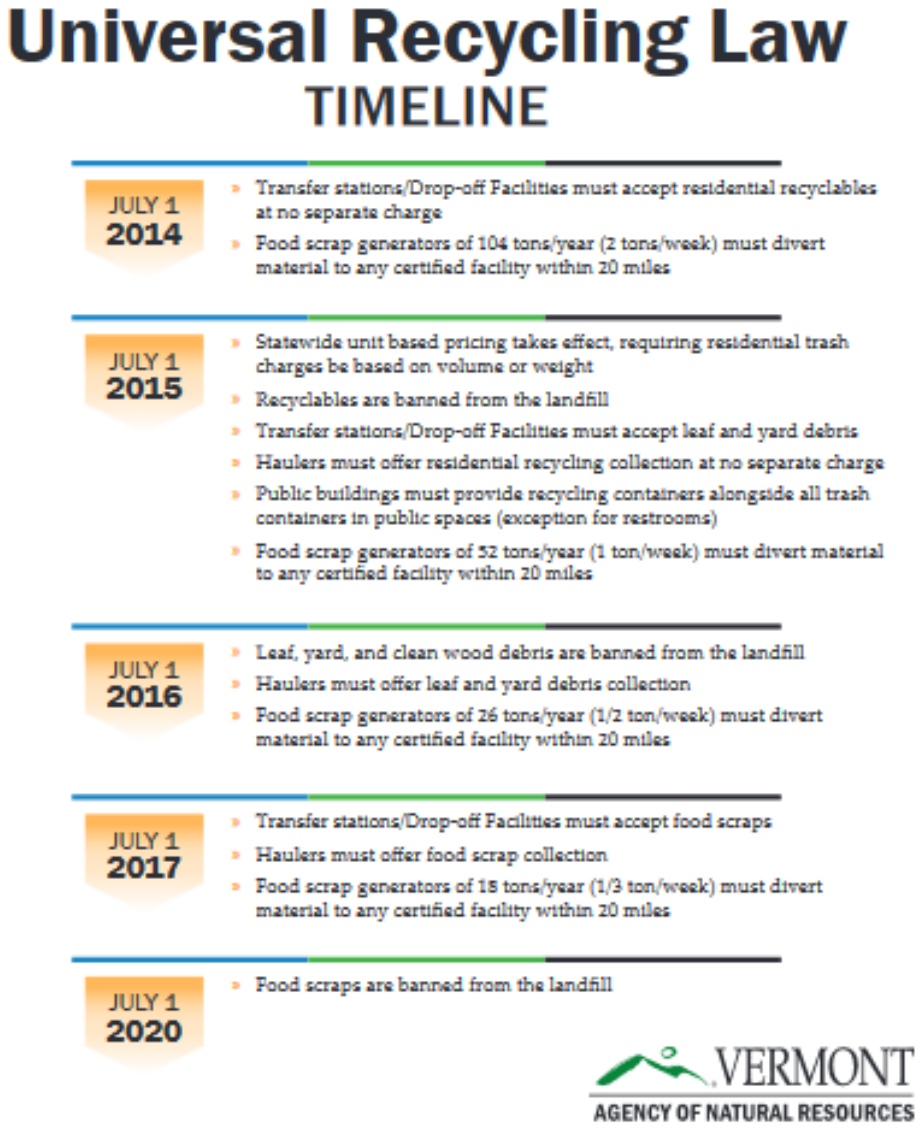
Used with permission.



There is also a timeline (Fig. 6) that outlines who must comply with the law and when, based on yearly amount of food-scrap generation (VT DEC, 2014). This phased-in timeline allows waste collection facilities to adapt and adjust practices and make necessary investments throughout the implementation (Flagg, 2014). Largest producers are required to comply first, likely because most are already diverting food scraps as part of their business practices (Oakleaf, 2016). The final phase, which includes food-waste diversion in individual households, will be reached in 2020 (VT DEC, 2014). At the time of writing, (less than halfway to completion of the law's timeline), generators of more than 52 tons of food waste per year must be diverting their waste, provided a facility is available within 20 miles.

Fig. 6. Timeline for the implementation of the food scrap landfill ban.

(VT DEC, N.D.-b). Used with permission.



Enforcement

Implementation of the act is overseen and enforced by the Vermont Department of Environmental Conservation (DEC) under the Agency of Natural Resources (ANR) (Oakleaf, 2016). The first step, favored over enforcement, is education for food-waste producers (Oakleaf, 2016). The Grocers and Retailers Association is aiding in the outreach to the small and medium

producers by sending mailings to addresses of food-retail businesses, as provided by the Department of Health (Oakleaf, 2016). Additionally, municipal-waste facilities must provide information to households in the region that they service (Oakleaf, 2016). There are also efforts to spread information through media sources such as public-service announcements designed to reach the general public through television (Oakleaf, 2016). Grants are offered to those businesses that would need to make significant investments in order to be able to comply with the law (Flagg, 2014; Oakleaf, 2016), and guidance on how to donate food safely is available as well (VT DEC, 2016). Enforcement relies on notification that a business is not diverting its waste in accordance with the act; typically, this information is provided by the waste haulers and all complaints are followed up on by the ANR (Oakleaf, 2016). Enforcement follows graduated levels: follow up with the business in question, the provision of educational materials, and the development of a timeline for compliance, created by the business and the ANR (Oakleaf, 2016).

Impacts

The food-recovery hierarchy prioritizes re-allocation of edible food waste to people, so it has great potential to increase food availability at food banks and food-recovery organizations. According to Vermont Public Radio, this impact has already been seen and recognized by the Vermont Foodbank; an interview with Alex Bornstein, Chief Operations Officer, cited a 30% increase in food rescue and a 209% increase in donations from retail establishments in 2015 from the previous year (VPR, 2015). A newsletter released by the organization in 2016 described the connection between the organization and Act 148, stating that the foodbank is working with the Agency of Natural Resources during the implementation process to educate communities about the law, waste reduction, safe food donation, and composting (Vermont Foodbank, 2016d). Another section described the Fresh Rescue Program, which was established in 2014 to unite

food donators with local acceptors of food waste, thus keeping fresh food from spoiling before use (Vermont Foodbank, 2016d). The organization describes, with great pride, the amount of food it has been able to redistribute as a result of the law, and there are certainly many success stories. In a 2016 article in the Stowe-area newspaper *News & Citizen*, the manager of the Lamoille Community Food Share described a large increase in food donations (Friedrich, 2016). Other areas, however, have not been so lucky. Food shelves that do not partner with larger grocery stores, such as the Johnson Emergency Food Shelf and the Waterbury Area Food Shelf, have not benefited from large increases in donations. (Friedrich, 2016).

Food Insecurity

The potential for Act 148 to provide increased donations to food banks and other food-assistance programs could have profound impacts on food-insecure populations in Vermont. Food insecurity is a way of describing the number of people or households in an area who are unable to access adequate food regularly enough to fulfill basic needs due to financial constraints (Hunger Free Vermont, 2014i). Food insecurity with hunger is another category indicating even greater financial difficulties that cause people to be regularly hungry and to eat lower quality food (Hunger Free Vermont, 2014i).

Although this is a problem more typically associated with impoverished countries, it is still present in the United States today. In 2015, 42.2 million people in the U.S. lived in food-insecure households (Feeding America, 2016a). This number is higher than it had been several decades previously; food insecurity increased during the Great Recession, from 11.9% in 1995 to 14.3% in 2013 (Schattman, Nickerson, & Berlin, 2013). Across the period from 1997 to 2015, Vermont's food insecurity rate tended to be lower than the national average, but Essex and

Orleans counties, which have the highest rates in Vermont, were above the national average (US Census Bureau, 2017). Vermont's food insecurity rates have also increased over the past decades, rising from an average of 9.1% across 1999-2001 to a 13.2% average across 2011-2013 (Schattman et al., 2013).

There are many factors that contribute to food insecurity. Income level is an obvious correlation, but an even more accurate indicator is unemployment rate (Feeding America, 2016a). Factors that have contributed to the increase in food insecurity rates include: the condition of the economy of the state and nation; a rising cost of living, including increases in health-care costs and basic necessities, such as utilities; lack of affordable housing; fewer affordable grocery stores; and the effect of the minimum wage on all of these factors (Hunger Free Vermont, 2014i; The Governor's Hunger Task Force, 2008). A lack of public transportation networks or of access to a car are other important factors on the ability to access food (McEntee, 2007; The Governor's Hunger Task Force, 2008). 42% of foodbank clients in 2006 did not have access to a working car (The Governor's Hunger Task Force, 2008). In 2015, parts of Burlington and Shelburne were identified as areas of low vehicle access, but no areas of Essex County were identified as such (Ploeg & Breneman, 2015). Essex County has been classified as a food desert — an area where physical proximity to a grocery store with fresh, good quality, and diverse options of food are lacking — by Jesse McEntee in his work on the identification of such areas in Vermont (McEntee, 2007).

Rural areas often suffer higher food insecurity rates than in more urban settings (Feeding America, 2016b). Urban areas offer more opportunities for employment, and jobs available in rural areas are more often low-paying ones (Feeding America, 2016b). The average level of education in rural areas is generally lower, and services such as child care, public transportation,

and communication networks are more limited in rural areas which create challenges for those trying to find or travel to work (Feeding America, 2016b). These difficulties mean that unemployment rates are higher in these areas, which in turn contributes to higher rates of food insecurity (Feeding America, 2016b). This is highly significant to Vermont, of which 61% of the population lives in rural areas (Clark, 2013).

Food Waste Reduction and Redistribution Efforts

As the issue of food waste gains attention from policy makers —as evidenced by Vermont's passage of Act 148 or the European Union's declaration of declaring 2014 as the Year Against Food Waste (Godoy, 2014) — there have also been increasing efforts to decrease food waste at the household level by raising awareness of the issue and altering people's perceptions. Great Britain's Waste & Resources Action Programme (WRAP), an organization devoted to waste reduction, launched a campaign in 2007 entitled *Love Food, Hate Waste*, the goal of which was to increase awareness of the necessity of reducing food waste (Barilla, 2012). The campaign includes posters that garner attention, and direct the reader to a website that provides information on proper portion sizes and storage techniques (Barilla, 2012). The "Inglorious Fruits and Vegetables" campaign was created by a French marketing agency for Intermarche, France's third largest supermarket, to celebrate "ugly" produce and encourage people to use products that do not meet supermarket quality standards (Godoy, 2014; Hohenadel, 2015). Similarly, in 2016, Whole Foods started a program in California offering cosmetically imperfect produce at reduced prices in a limited number of stores (Aubrey, 2016). In Burlington, Vermont's City Market, there is a small display of discounted damaged produce. These are only a few examples (Barilla, 2012; Godoy, 2014).

Whereas retail food waste is traditionally distributed to food-recovery organizations such as food banks and food pantries (see below), another, newer, initiative is the food-waste supermarket. Examples of such stores have been implemented in several locations. WeFood is a food-waste supermarket in Denmark that is believed to be the first of its kind in the world (Sheffield, 2016). Open to everyone, it sells donated goods at prices that are 30% to 50% lower than the local averages (Sheffield, 2016). Closer to home, Daily Table in Dorchester, Massachusetts, a low-income neighborhood near Boston, sells donated foods at very low prices (Daily Table, 2015). The goal is to price healthy foods to be competitive with available fast-food options, thus encouraging families to make the healthy food choice (Daily Table, 2015).

Food-Rescue and Food-Aid Organizations in the United States

The joint issues of food waste and the plight of the hungry in America are by no means going unaddressed. There is a plethora of agencies working both nationally and regionally here in Vermont to rescue food that would otherwise go to waste and distribute it to people in need (USDA Office of the Chief Economist, N.D.). The following section will highlight just a few of these entities.

National level: Feeding America

The largest hunger-relief organization in the U.S. is Feeding America (Feeding America, 2017c). It is a nationwide network of 200 food banks and 60,000 meal-providing programs and food pantries (Feeding America, 2017c). The organization functions by obtaining donations of food and grocery items from all levels of the food-supply system, as well as from government agencies and other organizations (Feeding America, 2017c). It then distributes these goods via its network of member food banks around the country (Feeding America, 2017c).

This reallocation of resources is the core work of Feeding America, but the organization also provides numerous services targeting specific needs for vulnerable population groups. The Senior Grocery Program aids seniors in meeting their nutritional needs, and other programs help to increase seniors' food security and provide access to services that assist with mobility and health needs (Feeding America, 2017e). There are also programs aimed specifically at providing food for children, such as the BackPack Program, which supplies children with nutritious food for the weekends, and summer food programs, which function at times children do not have access to school lunch and breakfast programs (Feeding America, 2017b). Feeding America also provides disaster relief by distributing food and emergency supplies (Feeding America, 2017e).

In addition, Feeding America works with families, designing programs such as the Mobile Pantry Program, which delivers food to people in high-need areas, and the School Pantry, which provides easily accessible food-aid sites at schools (Feeding America, 2017a). Feeding America also launched the Collaborating for Clients initiative, which seeks to improve stability for families by addressing the root causes of food insecurity (Feeding America, 2017e). Through this initiative, food-insecure individuals are connected with Feeding America partners in multiple sectors who can provide support for health problems and assist with finding housing and employment (Feeding America, 2017e).

Finally, Feeding America seeks to raise awareness of the problem of food insecurity in America. It undertakes marketing and communication campaigns, such as public service announcements (Feeding America, 2017d). The organization also advocates for programs that assist and protect people with insufficient access to food by maintaining both a policy staff in Washington, D.C. and an online-based grassroots advocacy community (Feeding America,

2017d). Feeding America also conducts research on food-insecurity rates and demographic information on people using food-assistance programs (Feeding America, 2017d).

State level: Vermont programs

Vermont Foodbank:

The Vermont Foodbank, a member of Feeding America's distribution network, has three locations in Barre, Rutland, and Brattleboro, from which it dispenses food to its network of partner organizations across the state of Vermont (Dauscher, 2017). Combined, these partner organizations serve an estimated 153,000 Vermonters each year (Dauscher, 2017). Member of the Feeding America network have access to the food procured by that organization. Each member foodbank is allotted a certain number of shares based on the size of the operation, and these shares can be used to bid on food shipments from Feeding America (Dauscher, 2017). Food is also acquired from grocery stores and other businesses, food manufacturers, restaurants, and donations from individuals (Vermont Foodbank, 2016b). The Foodbank organizes the largest gleaning program in the state, which partners with 80 farms to collect top-quality or lightly blemished foods for distribution (Dauscher, 2017). The organization also oversees the management of two federal food distribution programs: The Emergency Food Assistance Program and the Commodity Supplemental Food Program, a USDA program that provides free monthly food and nutrition information to qualifying seniors (Vermont Foodbank, 2016c). The Feeding America BackPack Program has been introduced in Vermont and now serves 1,250 students per week at 27 schools across the state (Dauscher, 2017). The Vermont Foodbank has also created VeggieVanGo; it is based on Feeding America's Mobile Pantry Program but has a focus on fresh produce (Dauscher, 2017).

As a result of the VeggieVanGo initiative, as well as the Foodbank's tendency to bid on produce from Feeding America, as it requires fewer shares, more produce gradually became available; however, the clients were unfamiliar with how to cook and prepare it (Dauscher, 2017). This led to the establishment of VT Fresh, which organizes cooking demonstrations and taste tests of dishes using fresh produce (Dauscher, 2017; Vermont Foodbank, 2016e). The program also seeks to improve the shopping experience with pleasing displays, signs, and promotions, inspired by the results of behavioral economics research showing that changes in the food environment can have an impact on food-related behavior (Dauscher, 2017; Vermont Foodbank, 2016e).

The Foodbank has also launched a career-development program, Community Kitchen Academy, which trains Vermonters struggling with a lack of employment for food-service careers (Dauscher, 2017; Vermont Foodbank, 2016a). Students learn culinary skills while preparing meals from rescued foods that are then distributed to Vermont Foodbank's network partners (Vermont Foodbank, 2016a). The accredited program has graduated 224 students since 2009 and has a post-graduation employment rate of 91% (Vermont Foodbank, 2016a).

Hunger Free Vermont:

Started in 1993, this statewide nonprofit works to provide nutrition information and increased access to nutrition programs with the mission to "end the injustice of hunger and malnutrition for all Vermonters" (Hunger Free Vermont, 2014b). The organization has instituted many programs to accomplish this mission. One focus is school-meal programs: through advocacy for legislation that supports these programs as well as through direct involvement with schools, Hunger Free Vermont helps to establish and improve nutritional quality of food provided by schools (Hunger Free Vermont, 2014g; Parisi, 2016). In addition to supporting lunch

programs, the organization promotes the adoption of at-school breakfasts, afterschool meals, and snacks (Hunger Free Vermont, 2014g; Parisi, 2016). By working with local farms to create farm-to-school partnerships, Hunger Free Vermont promotes interest in the local food system, supports local farmers, and improves the quality of the meals provided by schools (Parisi, 2016). Another program is The Learning Kitchen, through which Hunger Free Vermont aids schools and community groups by organizing classes that educate children and their parents on cooking, nutrition, and economical shopping practices (Hunger Free Vermont, 2014f). There are also programs aimed at seniors, which help to ensure that all who are eligible have access to 3SquaresVT, as well as to meal sites and home delivery (Hunger Free Vermont, 2014h). Hunger Free Vermont also advocates for 3SquaresVT (Vermont's federally funded food stamps program) at the state and national level, while facilitating efforts to improve the program's services throughout the state (Hunger Free Vermont, 2014a). It also works on outreach and education to promote awareness of the program and increase its usage (Hunger Free Vermont, 2014a).

The organization has become the state of Vermont's foremost agency in the fight against hunger and a primary advocate for nutrition policy (Hunger Free Vermont, 2014c). A principal aim of Hunger Free Vermont is education on the issues, and great effort are made to communicate these problems to community members, politicians, and policy makers (Hunger Free Vermont, 2014c). The organization oversees a network of Hunger Councils, groups of community members that are interested in learning about hunger and working to improve food security at the community and household levels (Hunger Free Vermont, 2014d). Additionally, it targets health professionals, providing them with information and resources to accurately detect

hunger in children, and training them in the skills needed to speak with the patients and parents about the issue (Hunger Free Vermont, 2014e).

Salvation Farms:

In 2005, this organization was started as a community gleaning project that salvaged food left as waste in fields and instead distributed it to food-aid sites, including the Vermont Foodbank (Salvation Farms, 2013b). It went on to merge with the Foodbank and organized the Foodbank's gleaning program, but in 2011 it reorganized as an independent nonprofit (Salvation Farms, 2013b). Its mission is to increase utilization of the local food system by managing Vermont's agricultural surplus (Salvation Farms, 2013a). The organization oversees two programs: the Vermont Gleaning Collective and the Vermont Commodity Program (Salvation Farms, 2013c). The Vermont Gleaning Collective organizes several individual gleaning initiatives around the state into a single collection, for which Salvation Farms provides guidance, support, training, and technical aid (Salvation Farms, 2013c). Farms are not paid for the collection of this second harvest, but they do receive free publicity through the volunteers who come to work on the farm (Titterton, 2016). The newer Vermont Commodity Program collects, cleans, processes, and packages surpluses that are too large to be efficiently distributed by local methods, and distributes them to sites of charitable food aid (Salvation Farms, 2013c; Titterton, 2016). Another key aspect of the commodity program is the workforce development initiative, which trains workers from challenging backgrounds in proper food-service practices (Titterton, 2016). Such programs serve many purposes, from waste reduction and the accompanying environmental benefits, to a greater appreciation of Vermont's local food system, to increased equity, as they provide local food to people from a wider range of socioeconomic backgrounds (Snow, N.D.).

METHODOLOGY

Selection of Counties for Study:

Essex and Chittenden counties were selected for areas of study because they offered the opportunity for a meaningful comparative analysis, given their significant differences. Consequently, this comparison provides an accurate assessment of how certain impacts of Act 148 could play out in diverse parts of the state. Below are profiles of both counties, demonstrating key differences in the populations as compared with the state as a whole.

Demographics	**Chittenden County**	**Essex County**	**Vermont**
Population estimate[1-2]	161,382	6,163	626,042
Land area, sq. mi.[1-2]	536.58	663.6	9,216.66
Population/sq. mi[1-2]	291.7	9.5	67.9
Median household income[3]	$65,350	$36,599	$55,176
% of civilian labor force unemployed[3]	3.5%	5.4%	3.7%
High school or higher education[4]	93.8%	84.5%	91.8%
4-yr college degree or higher education[4]	56.9%	16.0%	36.0%
% of population below poverty level[5]	11.4%	15%	11.5%
Number of food-insecure children[6-7]	1 in 7	1 in 3	13.8%
# of people participating in 3SquaresVT[6-7]	15,432	1,343	78,878
% of population participating in 3SquaresVT[6-7]	9.6%	21.8%	12.6%
# of VT Foodbank partners[8]	15	5	225
% of housing units with no vehicle available[9]	7.4%	6.0%	6.7%
Bus routes in the county[10-11]	18	2	
*Although a seemingly relevant statistic is the number of businesses in each county currently affected by Act 148, this factor was not included because the study was limited to Vermont Foodbank partner organizations that could be affected by donations from outside that county received through their partnership with the foodbank.			
US Census Bureau, QuickFacts [1]Chittenden County [2]Essex County https://www.census.gov/quickfacts/table/POP060210/50007 https://www.census.gov/quickfacts/table/POP060210/50009,50 U.S. Census Bureau, 2011–2015 American Community Survey 5-Year Estimates: Chittenden and Essex Counties of Vermont			

[3]Income: Selected economic characteristics
[4]Education: Educational attainment
[5]Poverty: Poverty status in the past 12 months
[9]Housing: Physical housing characteristics for occupied housing units
https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml
https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml#
[6]Hunger Free Vermont. (2015). Statistics by County. Retrieved from https://www.hungerfreevt.org/learn/statistics
[7]Hunger Free Vermont. (2017). Hunger in Vermont. Retrieved from https://www.hungerfreevt.org/hungerinvermont/
[8]Vermont Foodbank (Cartographer). (2017). Agency Locator. Retrieved from https://www.vtfoodbank.org/agency-locator
[10]Green Mountain Transit. (2017). About Chittenden County. Retrieved from http://ridegmt.com/regions/chittenden-county/
[11]Rural Community Transportation. (2017). Route System Maps. Retrieved from http://www.riderct.org/route-info/

Chittenden:

With an estimated 161,382 residents, Chittenden has the largest population of any of Vermont's counties and the highest population density (US Census Bureau, 2015). It also contains the largest urban center, Burlington, with a population of 42,452 (US Census Bureau, 2015). Along with higher population and larger urban centers comes a high number of food retailers and businesses, such as grocery stores and restaurants (VT ANR, N.D.). Chittenden is also one of the wealthier counties in the state, with a median household income that is higher than the state average. Likewise, education levels are high: more than 90% of the population has a high-school education, and 56% holds a college degree or higher. The percentage of households at or below the poverty level is representative of the state as a whole, but unemployment rates are lower than most other counties. Food insecurity is lower than in Essex County and a smaller percentage of the county's population uses 3SquaresVT (the program formerly known as the Vermont Food Stamps Program). There are also a large number of readily available food resources, such as the 15 Vermont Foodbank partners in the county. And despite

having a higher percentage of households without available vehicles than in the state overall as well as in Essex specifically, the county is well serviced by plentiful bus routes.

Essex:

By comparison, Essex County has one of the smallest populations of any county in the state and the smallest population density (US Census Bureau, 2015). Both income and education levels are lower than the averages of both the state and Chittenden County specifically. In fact, average household income is almost half that of Chittenden County. At 15%, the percentage of the population below the poverty level is higher than the state overall, as is the rate of unemployment, at 5.4% of the population. Food insecurity is more acute than in Chittenden, and a higher percentage of the county's population — more than twice the percentage of Chittenden's — uses the 3SquaresVT program. There are also fewer resources available to the food-insecure population, with only five Vermont Foodbank partner organizations in the entire county. Despite having a greater percentage of housing units with access to a vehicle than the state average and in Chittenden County, Essex County is served by only two bus routes (there was formerly a third route, but it was discontinued early in 2017).

Process:

I conducted qualitative semi structured interviews with six representatives from food-recovery and -aid organizations, representing seven locations: four in Chittenden County and three in Essex County. The interviewees were selected by contacting all member partners of the Vermont Foodbank in each county and scheduling interviews with those individuals who were willing and available to participate. This approach was similar to the one used by Smith and Morton in their research into rural food deserts (Smith & Morton, 2009) and by Feeding America to acquire the information for its annual report on hunger in America (Weinfield et al., 2014), as

both also used qualitative methods. Smith and Morton conducted focus groups and Feeding America conducted a survey; however, I chose semi structured, individual interviews because I found this approach allowed for a deeper exploration of my questions, resulting in a clearer understanding of direct impacts that Act 148 has had on these organizations. Interviews were conducted both in person and by telephone. In-person interviews were accompanied by tours of the organization's facilities. The names of those interviewed have been excluded to maintain anonymity. After consent was received from the interview subjects as per Institutional Review Board protocol, interviews were audio-recorded to enable ease of transcription and analysis.

I developed an interview schedule that explored the impact Act 148 had on these organizations, if changes in food donations had occurred as a result, and the subsequent effect on food-insecure populations in that county.

Core questions for semi structured interviews

1. Please describe how your organization provides food aid. How do food resources get to you? How are they allocated to people coming in? What are some of the challenges that face your organization?

2. On average, how many people use the resources provided by your organization per week or month? What percentage of these are "regulars" (people who return often)?

3. Recent changes in state legislation now limit food waste disposal and have the potential to affect food donations. Are you aware of these legislation changes?

4. Act 148 was passed in 2012 and the first phase of food waste landfill-bans went into effect in 2014. Has your organization seen any changes since the law was implemented? Do you think there is a relationship between these changes and Act 148?

5. If there have been increases in food donations, how have they affected the operation of your organization?

6. What do you consider to be the greatest barriers to food security?

After conducting the interviews, I manually transcribed them and then used HyperRESEARCH, a software application used to code and organize qualitative data, to analyze the results and to search for themes in the responses to help answer my guiding questions. This procedure followed the process described in the two articles on qualitative research cited here (Gale, Heath, Cameron, Rashid, & Redwood, 2013; Hsieh & Shannon, 2005). First, each line of the transcribed interviews was assigned a code relating to the content of that passage. The codes were then grouped under broader headings. The same set of codes was used for all interviews. Upon completion of coding, all codes were organized into groups. The data was then charted to summarize the information and facilitate analysis and identification of general themes emerging from the responses. I analyzed the data, comparing how responses varied between the two counties and reviewing them against my core questions (see Introduction) to discover what the data revealed in relation to them.

Limitations of the Method

There were several limiting factors in this study. The first was the selection of participants, which was limited to those who responded to initial emails or phone calls requesting an interview. Despite subsequent attempts to contact individuals who did not initially respond, the final sample size was still relatively small for qualitative research of this type. Nevertheless, the seven organizations represent 35% of all the potential food-aid organizations across the two counties, 25% of all of those in Chittenden and 60% of all in Essex. Additionally, the limited sample size resulted in not having an equal number of organizations participating from each county: roughly 27% of all organizations in Chittenden versus 60% of all organizations in Essex.

RESULTS

As the result of the organizational process, six broad categories emerged in the responses: 1) operations of the organizations, 2) how organizations receive food, 3) challenges faced by the organizations, 4) awareness of Act 148, 5) impacts and effects of Act 148 on the organizations, and 6) barriers to food security.

Operations of the organizations

Much of the data gathered from the interviews were related to the day-to-day operations of the various facilities. This information included the number of clients who used each location and the percentage that returned from month to month; the hours of operation; staffing and budget information; and how food was allocated to clients.

Chittenden:

The four food shelves interviewed in Chittenden County ranged greatly in scale. The number of clients served at each of the four food shelves was 275, 120, 90-95, and 50-60 households per month. One factor that influenced this variation was that two of the four served only one town, so would therefore serve smaller numbers of households. Half of those interviewed allowed clients to return twice a month, and the other half only once per month. The percentage of clients who were termed “regulars” — those who returned frequently, month after month — was cited as 28%, 60%, 80%, and almost 100%. Two of the food shelves were open 12 times a month, one was open four times a month, and the fourth 20 times. Half were open for 2-hour shifts at a time; the others were open for full business days. All were volunteer-run, although one facility also had one paid staffer. Only one cited a budget, which was $70,000 annually. Resource allocation to clients occurred in one of two ways: either by providing prepacked bags of food or by allowing clients to “shop” — with limitations on how much could

be taken based on family size. Two of the four food shelves allowed families to "shop," one gave clients prepacked bags of all food except bakery items, which they could choose for themselves, and one gave "target clients" a shopping experience, but non-target families a prepacked bag.

Essex:

The three food shelves in Essex were generally smaller, serving 23, 50, and 90 households per month. Clients could return once a month in one location and four times a month the other locations. "Regular" clients accounted for 75% of the total in one location and 100% in the other two – a higher percentage of the clientele than in Chittenden. The organizations were open one, four, and 16 times a month respectively. One was volunteer-run and the other two were each run by one person. The budget for two locations was $3,000 per year. One site offered a "shopping" experience, the other two used prepacked bags.

How organizations receive food

Chittenden:

Table 1: Reported Ways That Chittenden County Food Shelves Receive Food

Sources of Purchased Foods	**Sources of Donated Foods**
VT Foodbank	Hannaford's, Costco, Price Chopper
Costco	*Deli*
Hannaford's	*Produce*
Dollar Trade	*Bakery*
	Meat
	Community members
	Canned/Boxed
	Garden
	Panera
	Starbucks

	Local churches Local bakeries Harrington's Local farms

There were a wide variety of sources for food. Purchases from the Vermont Foodbank were common across all four locations. Two of the four purchased food from local grocery stores, citing cost as the deciding factor of where to purchase. One stated, "We make purchases, which we do very thoughtfully and carefully. If we can get it cheaper than [from] the food bank and it's on sale, even if we have some, we'll buy some more." There were many sources of donated food. All received donations of canned goods from members of the community, and one mentioned gifts of produce from peoples' home gardens in the summer. Two cited local bakeries that gave bread and pastries, and two others cited local farms donating produce in the summer. Three of the four received weekly donations from the meat, deli, bakery, and produce departments of Hannaford's, Costco, or Price Chopper.

Essex:

The only sources of food mentioned by the food shelves interviewed in Essex were monthly deliveries from the Vermont Foodbank. One facility described the diverse types of foods received from the Foodbank:

> *"We receive frozen meats from the grocery store. We will receive kind of jumbled boxes of assorted, say, it might be tomato products, or fruit products — canned fruit — or the meal boxes that would have tuna or canned soup and stuff….We also have received a lot of fresh produce: potatoes, carrots and onions, cabbage, sometimes some apples. Boxed items … reclaimed or discarded box items from stores … cereal. All different things."*

The Foodbank receives donations from grocery stores around the state, which the partner organizations might receive when they order from the foodbank, but these organizations did not have partnerships with local grocery stores as the Chittenden County organizations did. The same site also noted price and utility as factors in deciding what to order from the Foodbank, "price, and what I would think a family would use." These same factors were also cited in the types of food purchases made at the other two locations: "It depends on the cost of the product….On our shopping list for the foodbank, there are a lot of items that are free that we just pay delivery charges for, so I try to stock up on the free stuff before I spend my money each month….for me, it depends on what's free." When asked about produce, the response was, "We do get regular emails that they [the Foodbank] have fresh produce, and usually the fresh produce is carrots, potatoes, and cabbage, which we can get 50 lb. bags of. [But] I can't get rid of 50 lbs. of cabbage here … that fast … so I usually don't order it unless it's Thanksgiving."

Challenges faced by the organizations

Organizations in the different counties cited very different challenges to their operations. As most of the Chittenden food shelves served greater numbers of families and were generally larger operations, they faced more day-to-day challenges.

Table 2: Reported Challenges for Organizations in Chittenden and Essex

Challenges Cited in Chittenden	**Challenges Cited in Essex**
Client food preferences	Cost/utility of products limiting ordering
Funds	Low on food by end of the month
Providing fresh/quality food	
Receiving food close to/past expiration dates	
Receiving too much food	
Space	
Volunteer staff	

Two of the Chittenden locations said that small display space and limited storage space was a problem. Two also noted that they sometimes receive too much food from their donors. These issues are related; as one site explained it, "There are times when we actually don't go pick up because we don't have any place to put it." There were other problems related to the kinds of food received. Two food shelves said that receiving food close to or past its expiration date was an issue. One noted that sometimes unusual products were donated that were not wanted by the clients, which created the problem of what to do with those products. Other difficulties included organizing and holding fundraisers, and relying on a volunteer staff that wasn't necessarily dependable. Finally, there was the challenge of providing what were considered fresh, good-quality foods. Two food shelves said that these foods were the most expensive, so finding money to purchase them could be difficult.

The Essex food shelves listed far fewer challenges. As they are smaller operations, they had fewer logistical difficulties and their problems related more to ordering food. As limited funding was available and the smaller number of clients made it harder to get rid of fresh products in a timely manner, ordering was limited to the free items that were still deemed useful to clients. Another challenge that one location commented on was running low on food by the end of the month, as deliveries from the Foodbank were only made once a month.

Barriers to food security

When the interviewees were asked to comment on the larger problem of food insecurity, and what they considered the main barriers to achieving food security, several themes emerged.

Table 3: Factors Impacting Food Security Reported by Interviewees

Chittenden County	**Essex County**
Financial burdens Health Low-wage jobs Unemployed Vulnerable populations	Financial burdens Health Lack of available jobs, leading to unemployment Lack of education Transportation Vulnerable populations

Themes that were common across the two counties were: financial burdens, health, vulnerable populations, and income/employment. In Chittenden County, all four interviewees cited low-wage jobs or unemployment as a common factor in clients' food insecurity. Yet only one location — that which served the largest number of clients per month — mentioned other factors. Regarding clients' health, the interviewee stated, "There's often in every family, at least one person who has medical bills. But in our families, we tend to see people with greater illnesses, worse diseases. There tend to be more smokers, so their general health is not as good. And as a result, they're buying more medications." At the same location, vulnerable populations were also cited as those suffering from high rates of food insecurity, as the representative noted, "I would say probably 25 to 40% of our families are retired seniors or disabled people." One representative from a food shelf in Essex also noted that vulnerable populations are among those often suffering from food insecurity, but cited other types of populations: "And they're young people, they're people that probably have drug addiction or other mental health issues….there's just a lot of that here in the Northeast Kingdom."

The interviewees from Essex also cited some additional barriers to food security that were not common between the two counties. One interviewee pointed out that regardless of

income level, financial burdens could make it difficult to make ends meet. The examples this interviewee gave were, "Well, they could have three kids in college and medical bills….They could be paying for their mother in a nursing home, you never know." Lack of personal transportation was noted to be a factor in unemployment status, and a common factor among clients of two food shelves. One interviewee succinctly summarized the challenges of living in a rural area and how they could lead to food insecurity. "In the Northeast Kingdom altogether it really is a lack of employment and education. Especially in Canaan and Island Pond, you have to travel so far for stable employment that people are just not able to do that….There are very [few] jobs here in the Northeast Kingdom."

Awareness of Act 148

There were notable differences in the levels of awareness of Act 148 in the two regions. In Chittenden, 100% of the interviewees were aware of Act 148. Two knew the full details of it, whereas two did not know the details. Only one stated that the organization had seen no changes as a result of the Act's implementation. The others were all aware that the Vermont Foodbank worked with local grocery stores to provide them with donations. In Essex County, only one interviewee was familiar with Act 148 — 33% of all interviewees — and did not know details about it. None of the locations had noted any changes in their donations since its implementation. One interviewee did note regularly seeing produce available at the Vermont Foodbank, but not typically order it for the organization. Thus, 75% of the Chittenden County organizations had seen impacts from Act 148, and 0% of the Essex organizations had seen the same impacts.

Impacts and Effects of Act 148

The three food shelves — all located in Chittenden County — that had noticed changes as a result of Act 148 all had similar comments on the results of those changes. They all cited

increases in food donations generally, particularly from large grocery stores or chains. One food shelf representative noted:

> *"And so we were concerned that the big resources, like the grocery stores, would come knocking at our doors to see if we would take their food. And that has happened a couple of times. And we've had to say no. Because again, not only am I limited by what my volunteers can do, but I have a limited amount of space here, and a limited amount of refrigeration space…. So we haven't had a lot of requests from big places to take their food, but we've had a couple and we've had to turn them down, because we're really pretty much at capacity now."*

Specific types of food that had increased in amounts donated were produce and deli items. The same interviewee described the change as follows:

> *"Before Hannaford's gave us their produce, we had to purchase any fresh produce. And we were purchasing — we had a program called the Fresh Initiative, and we would purchase two items every month, usually one vegetable and one fruit….Then Hannaford's offered us their produce….We could get a lot of produce. We get between 150 and 400 lbs. of produce every shift."*

As such, all affected locations believed that there had been an increase in the nutritional value of the foods they received. All three also stated that the increased donations had led to more food available per client, in one form or another. One location offered unlimited amounts of all perishables, one offered no limits on produce, and the third simply noted a general increase in food available per person. Finally, the three also agreed that clients were happy to receive the extra food and produce. One representative said, "Now our customers are thrilled. Our [clients] are very happy to get fresh produce." Another qualified this observation, however, saying "I

think that the clients — those who actually cook — which are not necessarily the majority of them, are happy to take, they're really pleased when you open the refrigerator door and they see we have [produce]…And, like I said, the people who will cook from scratch are really happy to have that extra."

DISCUSSION

There are clear differences between the operations of the Chittenden and Essex food shelves, based on the demographics of the two counties. Although the actual need for supplemental food resources is greater in Essex (Hunger Free Vermont, 2015), the Chittenden food shelves serve larger populations than the facilities in Essex, a reflection of the larger population of Chittenden County. The Chittenden organizations also have more varied clients, and, on average, a smaller percentage of them are "regulars." This statistic indicates that Chittenden residents depend less on these emergency resources than residents of Essex, where the majority of food-resource locations see all of their clients returning on a monthly basis. Essex organizations also allow clients to access the resources more frequently, which corresponds directly with the higher need for them. All locations in Chittenden allow clients to "shop" to some extent, which indicates that those organizations provide a greater amount of choice and clients may, therefore, be more pleased with what they receive. Limited data on budgets indicated that the Chittenden organizations have the advantage of higher annual budgets than the Essex food shelves, as well as larger volunteer staff numbers. This is likely due, in part, to the higher average income per household of the communities in which the Chittenden organizations are located (see Methodology: Selection of counties for study), as residents of these communities are more able to donate their time and funds. The Chittenden food shelves also have access to more food resources. Whereas Essex organizations named only the Vermont Foodbank as a food source, which limits their offerings because of cost, amount, and usability of the goods available, the Chittenden operations mentioned a diverse variety of donor sources, which allows them more choice in allocating their financial resources. These local donor sources also provide diverse

foods, including breads and pastries, meats, and produce, all of which results in greater variety for clients in that county.

The larger organizations also face a greater array of logistical challenges, however, including coordination of a volunteer staff, sufficient fund-raising, space limitations, and issues related to the food itself, such as providing quality items, receiving food past its sell-by date, and receiving too much food for their available storage space. The smaller organizations in Essex face the opposite problem: running low on foods, which may be a result of the fact that the Vermont Foodbank is their sole source of resources. Staffing issues were not cited as often as challenges by these food shelves because they typically required a smaller staff. Space was less of an issue because food resources were only received from one source, and orders were already limited by the cost and usefulness of the products available at the Vermont Foodbank.

The Chittenden organizations were the only ones that indicated a goal of providing fresh, high-quality foods; the Essex organizations were focused mainly on stretching limited budgets and ordering the least expensive products from the Foodbank. Unfortunately, this finding shows that areas of highest need are not necessarily receiving food of high nutritional quality because of the limited financial resources of those areas.

When interviewees were asked about the factors contributing to food insecurity, the most commonly mentioned factors across both counties were unemployment or low-wage jobs, which are two of the most accurate indicators of food insecurity in an area (Feeding America, 2016a). Other references were made to medical bills, illness, and disease. Notably, however, the interviewee from Chittenden who mentioned health as a factor referenced only physical health. An interviewee from Essex noted issues of mental health and addiction as well. This is noteworthy because, if these problems are widespread and not limited to a few individuals, they

could indicate more systemic social problems. Other factors discussed by the representatives from Essex were reflective of the rural setting: lack of available jobs, education, and transportation. These factors in food insecurity are more common in rural areas because there are fewer job opportunities, there are fewer public services available, and education levels are typically lower, leading to more people in low-paying, entry-level jobs (Feeding America, 2016b). Despite the fact that Essex County is not considered a "low vehicle access" area — with the exception of a small section in the south of the county — but parts of Chittenden County (specifically, the Burlington and Shelburne areas) are (Ploeg & Breneman, 2015), it appears that because of limited public transportation in Essex, lack of a car there is more detrimental than in Chittenden, where plentiful public transportation and larger urban centers with necessities and jobs within walking distance make car ownership less necessary. This finding correlates with research indicating that transportation is a key factor in food access (McEntee, 2007; The Governor's Hunger Task Force, 2008).

Differences were also apparent when it came to the effects of Act 148's implementation in the two counties. All of Chittenden's organizations were aware of the act to some extent, but only one of the Essex interviewees was informed about it at all. Whereas none of the Essex organizations had experienced any changes as a result of the law's implementation, other than seeing additional produce available at the Foodbank but not purchasing it themselves, the majority of the Chittenden organizations did attribute changes in their operations to the implementation of Act 148. Overall, these changes were positive. All of the affected organizations saw increases in the overall amount of foods donated as well as in the amount of produce. All also noted that these increases had positive impacts for their clients, including better nutritional value of the food available, more food available per person, and more satisfied clients

because of increases in overall food and specifically in access to fresh produce. There was also a change, however, that was viewed negatively by the affected food shelves: the donation of too many items for which they had inadequate display or storage space, or could not use quickly enough. As this led, in turn, to food being wasted farther down the food-supply chain or to food-aid organizations simply not picking up donations, it is an important reminder that efficient distribution is a key issue — wasted donations are of no benefit to anyone. Overall, Act 148 had generally positive impacts on the organizations it affected; these impacts, however, were limited to Chittenden, the county with higher numbers of food retailers available to donate food to these food-recovery organizations, and higher average wealth, resulting in more residents willing and able to provide donations, funding, and volunteer time to the food shelves.

CONCLUSION

In returning to the core questions that guided the research, it is apparent that whether or not food-recovery organizations have been affected by Act 148 in a positive way (e.g., increased donations; higher nutritional quality of food available for clients; and more food available per person), as discussed in reports from the Vermont Foodbank (Vermont Foodbank, 2016d; VPR, 2015), depends on that organization's location within the state and proximity to food-retailers able to donate, as cited by independent media reports not released by the Vermont Foodbank (Friedrich, 2016). The majority of food shelves in Chittenden now receive more food donations as a result of the act, whereas Essex has seen virtually no change. Furthermore, only one of the representatives from Essex had even heard of Act 148, as compared with the organizations in Chittenden, who were all aware of it. This may change as the act continues through its timeline of implementation (Fig. 6), however, it still seems likely that Chittenden, with greater numbers of food resources available, will continue to see more positive impacts from the implementation of the law. As a result of this unequal regional distribution of resources, food waste that could aid the food insecure is still not necessarily reaching the most food-insecure populations.

While Chittenden food shelves are benefitting most from the implementation of Act 148 thus far, they are also facing a new problem: receiving too much food for their available space. This turns the supposed "gift" of food donations into a difficulty for these organizations and simply pushes the problem of what to do with excess food onto food-recovery organizations, rather than properly reallocating food to those who could most benefit from it.

In light of these conclusions, the following recommendations as next steps are put forth:

- Provide detailed information on Act 148 to food-recovery organizations.
- Increase financial support for food-recovery organizations in low-resource communities.

- Reallocate excess food in Chittenden County to areas with higher food-insecurity, possibly requiring new infrastructure and transportation systems.
- Continue work to educate residents across the state on the issue of food waste and potential solutions.
- Evaluate additional methods of food redistribution at the state and regional levels.

First, a simple step would be to provide complete information on Act 148 to all food-recovery organizations in the state, as they stand to benefit from the food-waste landfill ban and can best facilitate return of this food to the community. Although lack of awareness was considerably lower in Essex County, even in Chittenden County, not all representatives were fully aware of the details of the act.

It is also critical to increase resources and support for food-recovery/redistribution organizations in low-income areas. Where local communities do not have the ability to donate time and money, these organizations are limited in the community support they can offer and the types of food they can provide. Further research should be carried out to determine how best to aid food-recovery organizations in the areas that rely most heavily on them, as well as help them to provide food of the best nutritional quality to their clients. As low-income communities are most at risk for food insecurity and could benefit most from a thriving food-redistribution network, it is essential to provide that infrastructure.

Third, the current excess of food resources in Chittenden County should be reallocated to areas that suffer from greater food insecurity. Current redistribution of food occurs through partnerships with local food producers and retailers (which are more abundant in Chittenden County), or through the Vermont Foodbank. Yet the Foodbank process is relatively slow, as the organization first receives or collects donations, sends notice of available products to its partner

organizations, which then place orders, and, finally, delivers the orders. Thus, for products with limited shelf life, this process further shortens the time they are usable for clients. A more extensive transportation system could eliminate some of this delay and connect food retailers with more isolated and remote food-recovery organizations. Again, further research is required to determine how food waste in Vermont can be reallocated more effectively, and whether this would require new infrastructure systems, or whether it is possible to achieve more efficient results using the one currently in place. It is likely that new policy decisions at the state level focusing explicitly on food waste will be necessary to successfully implement the law as it was initially envisioned and to accomplish the changes required to best redistribute usable food that would otherwise go to waste.

As a general observation, during my time working on this project and speaking with friends and family members about my research, it has become apparent to me that the issue of food waste is not one that most people are aware of, which only contributes to food waste at the household level. Although there have been recent attempts to decrease food waste by increasing awareness and altering people's perceptions, such as the "Inglorious Fruits and Vegetables" campaign in France (Hohenadel, 2015), the efforts of Whole Foods in California (Aubrey, 2016), and in Burlington's City Market, the efforts to date are limited in scope. The issue is definitely gaining attention at the national and global political levels, but in my experience with my own circle of family and friends, there was a general lack of awareness of the problem at the individual citizen level. I believe it is more effective to explain *why* the issue of food waste is important (such as the environmental impacts, the moral arguments against waste, or the relevant issue of hunger) rather than simply telling someone not to waste. Therefore, I see the question of

how to best inform the general public of the issue as another important area of future research, followed by community education and outreach.

Finally, as food-recovery organizations are typically intended for emergency use, serve a limited population, and typically have limited hours of operation, it is apparent that food shelves are not well equipped to redistribute all usable food that would otherwise go to waste — as evidenced by the excess food available in Chittenden County. Other methods of redistribution may be necessary if the goal of Act 148's food-recovery pyramid (Fig. 5), which prioritizes food to people before other disposal methods, is to be met. One option could be the creation of a food-recovery grocery store, similar to Denmark's WeFood (Sheffield, 2016) or Daily Table in Dorchester, Massachusetts (Daily Table, 2016). Open daily and to all, not restricted to emergency use, and selling food that would otherwise go to waste at lower-than-normal prices, this type of facility would be useful to low-income populations who are more likely to be at risk for food insecurity. Future research could be carried out to determine whether this type of facility or a similar solution would be a viable option in Vermont.

Although food waste can probably never be fully eliminated, because of the extremely diverse range of causes and factors, finding an efficient means of redistribution could at least result in the recoverable portion of it going to those who could most benefit from it. The effect of excess food resources going to waste in Vermont's wealthier counties rather than reaching the areas of greater need reflects the broader problem of resource allocation in the world today, where high-income countries have higher food production, more food resources, and therefore more food waste, than low-income countries. If these issues can be resolved on Vermont's county level, the solutions may provide a model that could be scalable to state, national, and perhaps even global levels.

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APPENDIX A

Interview schedule: Core questions for semi-structured interviews

1. Please describe how your organization provides food aid. How do food resources get to you? How are they allocated to people coming in?

2. What are some of the challenges that face your organization?

3. On average, how many people use the resources provided by your organization per week/month? What percentage of these are "regulars" (people who return often)?

4. Recent changes in legislation limit food waste disposal and have the potential to impact food donations. Are you aware of these legislation changes?

5. Act 148 was passed in 2012 and the first phase of food waste landfill-bans went into effect in 2014. Has your organization seen any changes since the law was implemented?

6. Have these changes affected your organization or the people in your community who use these services?

7. Do you think there is a relationship between these changes and Act 148?

8. If there have been increases in food donations, how have they affected the operation of your organization?

    a. Are you now able to offer more meals (for non-food shelf operations)?

    b. Has there been better quality, higher nutrition food available? Could you provide some examples?

    c. Has there been more food available for each person?

    d. Have more people been coming to make use of the facilities? If not, what are some factors that you think contribute to this?

    e. Have there been logistical issues such as lack of storage space or refrigeration?

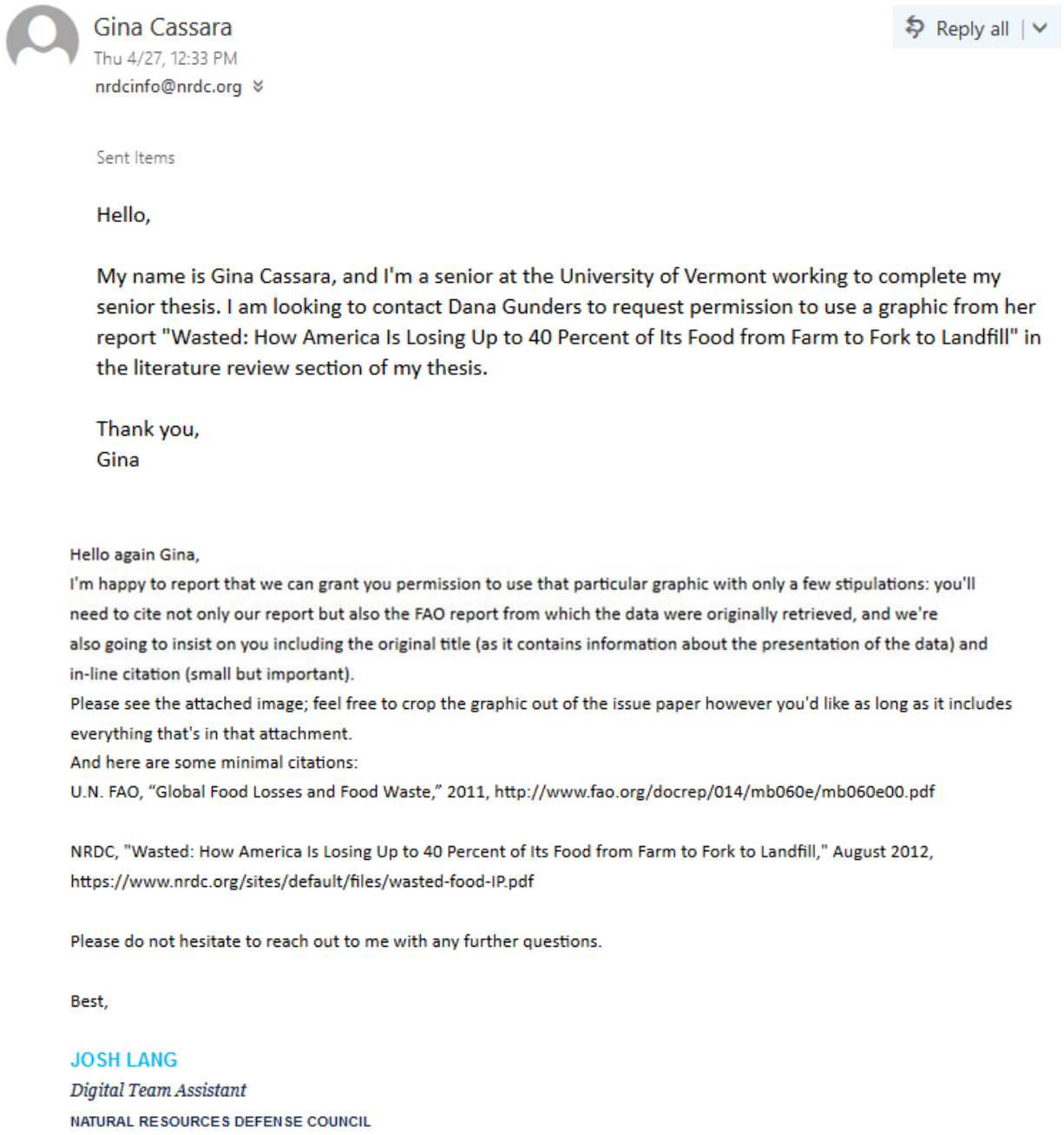
    f. Has there been sufficient staff to deal with the increases?

9. What do you consider to be the greatest barriers to food security?

APPENDIX B

Permissions for use of graphics:

Natural Resource Defense Council: Fig. 1



Gina Cassara
Thu 4/27, 12:33 PM
nrdcinfo@nrdc.org

Reply all

Sent Items

Hello,

My name is Gina Cassara, and I'm a senior at the University of Vermont working to complete my senior thesis. I am looking to contact Dana Gunders to request permission to use a graphic from her report "Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill" in the literature review section of my thesis.

Thank you,
Gina

Hello again Gina,
I'm happy to report that we can grant you permission to use that particular graphic with only a few stipulations: you'll need to cite not only our report but also the FAO report from which the data were originally retrieved, and we're also going to insist on you including the original title (as it contains information about the presentation of the data) and in-line citation (small but important).
Please see the attached image; feel free to crop the graphic out of the issue paper however you'd like as long as it includes everything that's in that attachment.
And here are some minimal citations:
U.N. FAO, "Global Food Losses and Food Waste," 2011, http://www.fao.org/docrep/014/mb060e/mb060e00.pdf

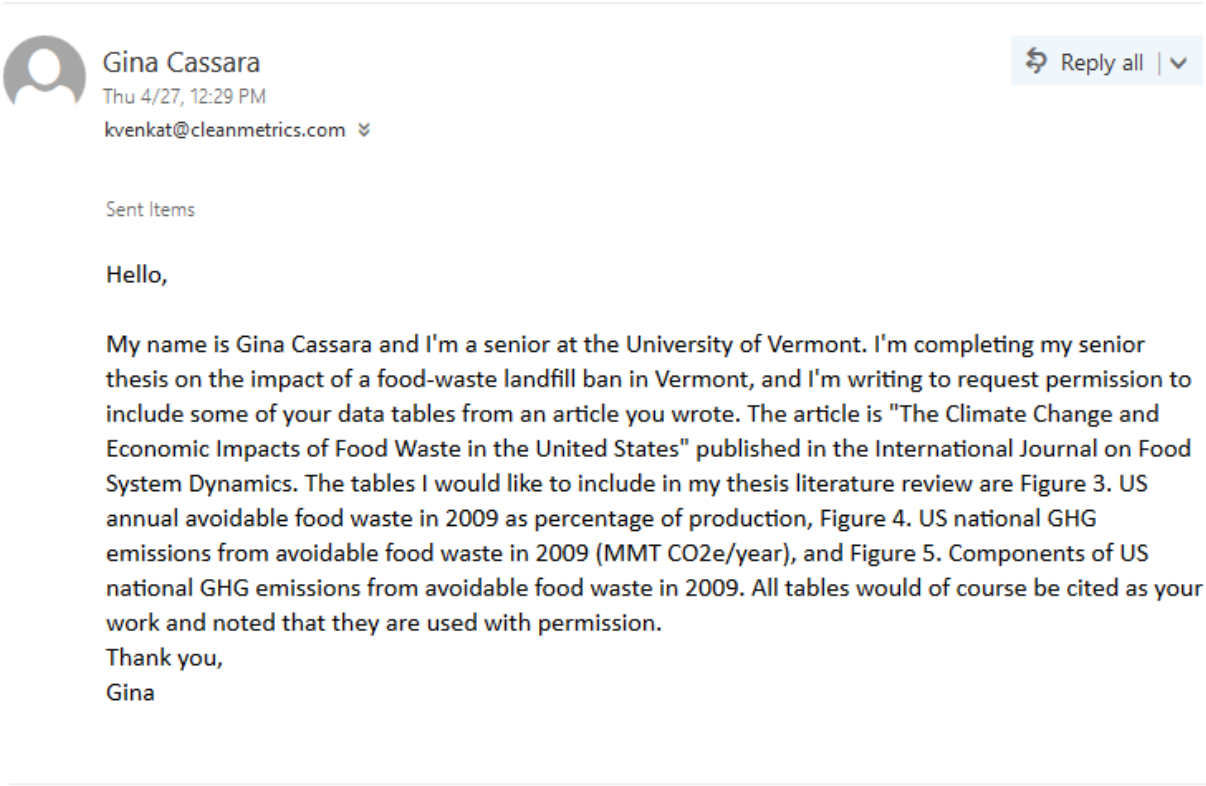
NRDC, "Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill," August 2012, https://www.nrdc.org/sites/default/files/wasted-food-IP.pdf

Please do not hesitate to reach out to me with any further questions.

Best,

JOSH LANG
Digital Team Assistant
NATURAL RESOURCES DEFENSE COUNCIL

Kumar Venkat: Figs. 2-4



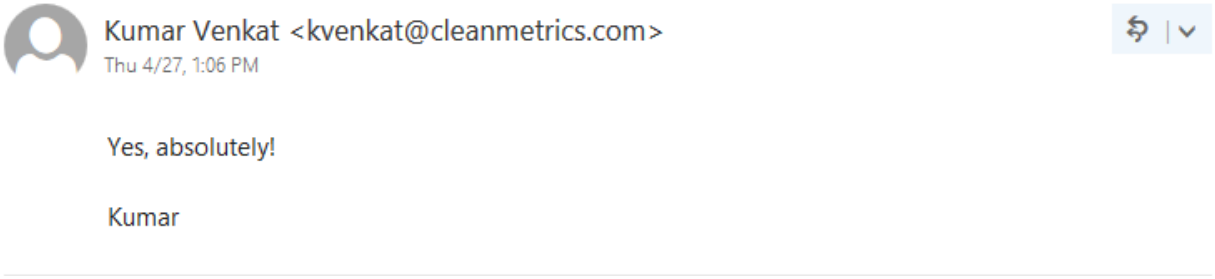
Gina Cassara
Thu 4/27, 12:29 PM
kvenkat@cleanmetrics.com

Reply all

Sent Items

Hello,

My name is Gina Cassara and I'm a senior at the University of Vermont. I'm completing my senior thesis on the impact of a food-waste landfill ban in Vermont, and I'm writing to request permission to include some of your data tables from an article you wrote. The article is "The Climate Change and Economic Impacts of Food Waste in the United States" published in the International Journal on Food System Dynamics. The tables I would like to include in my thesis literature review are Figure 3. US annual avoidable food waste in 2009 as percentage of production, Figure 4. US national GHG emissions from avoidable food waste in 2009 (MMT CO2e/year), and Figure 5. Components of US national GHG emissions from avoidable food waste in 2009. All tables would of course be cited as your work and noted that they are used with permission.
Thank you,
Gina



Kumar Venkat <kvenkat@cleanmetrics.com>
Thu 4/27, 1:06 PM

Yes, absolutely!

Kumar

Vermont Department of Environmental Conservation: Figs. 5-6

Sent: Thursday, April 27, 2017 12:41 PM
To: Marshall, Renita <Renita.Marshall@vermont.gov>; Lutchko, Greg <Greg.Lutchko@vermont.gov>; Chamberlin, Carol <Carol.Chamberlin@vermont.gov>
Subject: [Website feedback] Request for permission

Gina Cassara (ginacassara@gmail.com) sent a message using the contact form at http://dec.vermont.gov/contact.

Hello,

My name is Gina Cassara, and I'm a senior at UVM working to complete my senior thesis on Act 148. I am hoping to include some images created by the DEC in the literature review portion of my thesis and am writing to request permission to do so. I was unsure who to contact directly, so hopefully this message can be passed on to the right person. Thank you!
Gina

RE: [Website feedback] Request for permission Inbox x

Marshall, Renita <Renita.Marshall@vermont.gov> Apr 27 (9 days ago)
to me

If this is for limited academic use, please feel free to use any content on our website, including photos for your purpose.

Please let me know if you have any further questions.

Renita Marshall, Commissioner's Office | Executive Assistant
Vermont Department of Environmental Conservation
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