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Closing the loop of food systems: analyzing compost within community bounds

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Analyzing Compost within Community Bounds

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Abstract

The aim of this thesis is to construct a philosophical and ecological argument that places great value in localized food systems in terms of waste. This composition develops the claim that building composting infrastucture on a community scale will curb the global climate crisis and enhance the interconnectedness humans have within themselves, each other, and the natural world. The first prong of this thesis entails a theoretical framework we must function under in order to implement such radical food revolutions in our communities informed by Buddhist principles. This proceeds an international case study of the composting infrastructure of Fort Albany First Nation, Canada; Rwinkwavu, Rwanda; Havana, Cuba; Surabaya, Indonesia; and Dhaka, Bangladesh which emphasize the Indigenous, health-informed, war-related, colonial, and economic dimensions of compost in their respective communities. Following this, a national case study investigates community composting in Chicago, Illinois; Palmas de Mar, Puerto Rico; New York City, New York; Tucson, Arizona; and Sarasota, Florida under the lens of class, business, gender, education, and environmental justice within local food waste. The final case study of this thesis examines the systems of food waste within the author's home town and the work that she contributed to building food system resiliency in terms of compost in her community.

Introduction

The present literature on building resillient food systems has been growing in popularity. However, what has not received extensive attention in constructing a sustainable network of food is compost. Waste is often left out of the conversation in

terms of food because it is not seen as 'sexy'. However, when done right, waste can beautifully and poetically connect us with what we eat every day and build community. The purpose of this thesis is to move readers in order to think up their own agricultural revolution in their locality, in their own unique way, by laying out the paradigm we must function under moving forward coupled with an exploration of inspiring international, national, and municipal composting case studies.

In terms of next steps in embodying revolutionary thinking, there is no doubt that we have to change the way in which we view ourselves, our relationships with each other, and our link to nature. Understanding an interbeing of ourselves, an intertwining between one another, and an interconnection between us and nature lays the foundation for building resilient food systems. With this rebellious perspective, we can understand our place and community in the conversation of food. Localizing food may be our only hope to curb the global climate crisis and halt a dangerous globalization of all aspects of our known reality. Compost can be seen as the missing piece of the food puzzle.

Manifestations of closed loop local food systems can be found all over the world. This thesis will explore the composting infrastructure of Fort Albany First Nation, Canada; Rwinkwavu, Rwanda; Havana, Cuba; Surabaya, Indonesia; and Dhaka, Bangladesh. Each of these communities revolutionized their local food narrative. Through these case studies, we are able to understand the Indigenous, health-informed, war-related, colonial, and economic dimensions of compost.

We can also see profound composting here in the United States. Composting initiatives in Chicago, Illinois; Palmas de Mar, Puerto Rico; New York City, New York; Tucson, Arizona; and Sarasota, Florida can be witnessed in the following thesis.

Compost in terms of class, business, gender, education, and environmental justice class will be explored in these case studies.

The final prong of this thesis is how my home of Chattanooga, TN has built composting infrastructure. I gladly get to say that I have played a part in the push for compost in my community. I, however, must credit my several friends, peers, and colleagues who have put in that same work.

This thesis will lay the foundation for anyone who wants to foster a community of composting. This thesis will follow a philosophical mapping as well as an investigation of organic waste management in communities internationally, nationally, and municipally. It is the hope of this thesis to revolutionize and radicalize readers' thinking, and inspire them to take action.

Theoretical Framework

Humans are irrevocably bound to the world around them. That is not to say that humanity has an obligation to tap into their surroundings due to some subjective moral code. Whether we like it or not, there is no "I" in who we are. We are a collective whose actions most certainly have holistic impacts just like any property of the natural world would. Whether mankind wants to believe it or not, we have an innate interconnectedness within ourselves, among each other, and with the ecological world (Lim, 2019).

This alleged individualistic society we were thrust into is highly deceptive as it leads us to believe that we are innately a greedy species. On the contrary, humanity embodies an interbeing that goes beyond scientific understanding of organisms (Lim, 2019). We are dynamic, ebbing, and flowing creatures that are impacted by the world

around us just as we impact it. An all-encompassing sort of radical empathy is necessary in order to navigate this world properly, which means an equitable view of all things in the periphery, like nature.

Our innate interbeing ought to inform our inherent interconnectedness with our fellow humans. Fighting our natural connection with one another is inexplicable and must only originate in a heinous force knowing what the power a united society could do for the world. Personal interbeing should easily go hand-in-hand with human connection overall.

This interrelationship we have with one another should most certainly inform the way we think about the natural world that lives and breathes with us every day. Every breath a person takes is thanks to one of the trees out there. However, photosynthesis exists thanks to every last exhale we puff out. The most obvious answer is to recognize humanity's interdependence on nature and nature's interdependence on humanity as there is no moving forward without recognizing and letting the process continue onward.

There is a rather profound interaction between humanity and itself, humans alike, and our surrounding nature especially when viewed with an innate interconnectedness. This sort of interconnectedness informs the philosophical framework this thesis is functioning under in terms of the power of closing the loop.

If one were to view a community, humans, nature, and all, as a positive feedback loop, there is no reason why someone would want to keep such a loop open, spilling out and wasting Earth's resources. Positive feedback loops provide great sustainable support for phenomena at a local scale. Homogenization and globalization are quite possibly incapable of fostering positive feedback loops. Such a concept is only achievable when a

local community is connected with the interbeing of its members, the interconnection in their periphery, and the nature they are surrounded by. A very common manifestation of a conceptual feedback loop are the food systems.

The food systems are made up of four different pillars which include production, distribution, consumption, and waste. If even one of these pillars is not in sync with the rest, it is literally non-existent in terms of food, and the community and the environment suffer as a result. As we can see with what the photo below tells us, the environment, the economy, and society enable each other to be prosperous, even within the scope of food (Reynolds & Bomford, 2020). We must operate under the assumption that the work we do in terms of food heals the system it comes out of. We can no longer see any resource as dispensable or limitless.

Figure 1

Yale Experts Explain Sustainable Food Systems

Note. Graphic by Kristin Reynolds and Mark Bomford, 2020.

However, due to the indoctrinated paradigm we suffer under, most facets of life sort of have this open loop system, and it is rare to see any communities being

self-reliant and self-determining. A lack of local sovereignty is worrisome due to a fear of oligarchy but also because that sort of global reliance is not sustainable for a world in a climate emergency. An example in which our food systems are disjointed can be found in our waste. Food waste makes up almost a quarter of our nation's landfills (NewTerra Compost, 2021). The concerning part of that is what organic matter does once it is in a landfill. Organic waste produces a tremendous amount of methane into the atmosphere which is a very strong greenhouse gas that is contributing to global rising temperatures. Produce can last up to 25 years in a landfill opposed to the 3 months it would roughly take for it to decompose and turn into compost (Barlaz et. al, 1997).

Composting is a unique solution in creating closed loop resilient food systems. Composting can be engaged in someone's backyard, be conducted in a community garden, completed as a governmental good, or provided as a private service. This thesis argues that community composting is the most sustainable way to close the loop of food systems and curb the global climate crisis.

International Case Studies

Fort Albany First Nation, Canada

The Indigenous subartic community known as Fort Albany First Nation (FAFN) has been able to take back their food sovereignty through integration of their own compost in the soil. As prices of imported foods rise in subarctic communities, gardening has been adapted as a cheaper way to survive (Tsuji et. al, 2019). Not only that, but the global climate crisis has made it possible for more and more communities in high latitude regions to be able to garden. Composting in FAFN has improved soil

quality, increased crop yield significantly, and provided an avenue to incorporate Indigenous customs into their food systems.

The Indigenous community of FAFN was able to improve their quality of soil, food, and life all by tapping into traditional practices of composting. Thanks to a 30 percent soil amendment of compost in the soil, there is much more phosphorus and potassium which is advantageous for plant growth (Tsuji et. al, 2019). Without better soil quality, crop yield would suffer along with overall plant nutrition and health. Tsuji et. al's journal on "Fertilizing bush beans with locally made compost in a remote subarctic community" proves this argument to be true (Tsuji et. al, 2019). Better soil quality directly translates to better crop quality and yield.

An unprecedented crop abundance was witnessed among the small subarctic community of FAFN all thanks to compost (Tsuji et. al, 2019). According to Tsuji et. al's aforementioned journal, there was around a 75 percent increase in crop yield in some cases (Tsuji et. al, 2019). The food that this community grows is their livelihood. This is what allows an individual, a community, and even a greater geographical region to be self-reliant. Without abundance in the crops they grow, FAFN had to rely on expensive imports concerning food that is not even healthy for them (Wilton, 2020). Food sovereignty is limitlessly powerful. Another way the Indigenous people of FAFN are able to have independence is through the cultural traditions the community was able to tap into through the composting process.

Throughout this subarctic community, Canadian geese and snow geese are a very important food staple and source of protein (Tsuji et. al, 2019). However, it seems highly wasteful to eat only some of the animal just to throw the rest in the landfill. The method of composting that FAFN engages in is hot composting which is able to safely

decompose the non-edible portions of the geese. Through this locally sourced process of compost, the FAFN members are able to connect better with their compost, soil, food, and back again. It creates this symbiotic relationship between humans and the nature they are surrounded by.

The town of First Albany First Nation was able to improve their soil quality, increase their crop yield, and connect with Indigenous customs all through adoption of composting practices. This has been one of the most remarkable adaptations to a warming climate. This community was able to utilize gardening practices previously untapped due to cold temperatures in order to improve the overall state of their food systems. Most importantly, FAFN was able to restore food sovereignty which had been lost to colonization and industrialization. FAFN serves as a model for other arctic and subarctic communities.

Rwinkwavu, Rwanda

The Rwinkwavu District Hospital conducts matters of rehabilitation and healing in alternative ways, opposed to traditional clinical practices (Coates, 2016). Many of the hospital's patients are admitted due to malnutrition. This issue with malnutrition that these patients are facing cannot be addressed when symptoms appear. Clinicians must start working from the vantage point of prevention. Composting in this community has the ability to restore the physical earth, connect people with the nature around them, and clinically heal people.

The Rwinkwavu Hospital has a three-quarter-acre garden, home to an ecosystem of edible crops, rabbits, ponds, classrooms, and compost piles (Coates, 2016). The hospital workers are in the business of teaching clients how to cultivate the land, create compost, and use it for soil. An example of one of the gardens utilized for the program is

a simple bed constructed by tires, rice stacks, and sticks. This and other gardens in the hospital community are very practical constructions patients can become inspired by and bring home with them after they have healed. Not only does the gardening and composting within this program restore the earth, and grounds people in the nature around them.

The power that nature has when humans are immersed within it is bountiful. This hospital environment is nothing short of untraditional (Coates, 2016). Typical clinical settings are sterile and almost life-sucking, the opposite work that hospitals were designed for. Through this program, patients are able to learn how to grow their own food, learn the nutritional properties of sustenance, cook for themselves, and understand where their waste goes. This approach to care is incredibly practical. The Rwinkwavu community has seen the growth of eggplants, avocados, beets, chives, oranges, garlic, lettuce, sweet peppers, onions, carrots, cabbage, and more. Not only does this composting and gardening program connect community members with nature, but it has the power to heal people in a much more profound way than traditional clinical practices.

Sustainable and resilient solution to illness is the aim of the Rwinkwavu Hospital program (Coates, 2016). Hospitalizing children for malnutrition decreased rapidly thanks to this program's alternative approach to health. The 1994 Rwandan genocide left its healthcare system worse for wear, and a direct result of such an atrocity was widespread malnutrition. Understanding the nuances of why someone is malnourished is key for long-lasting results. There may be issues in family dynamics that end up with children not being fed. Food might be available but the knowledge of how to cook is not there. Financially, individuals might not be able to afford food to buy and eat. Feeding

tubes are not enough. Supplementing the individual's suffering with knowledge of how to grow their own food, compost their waste, cook, and connect with nature sticks with someone for the rest of their life.

Composting and gardening in this Rwinkwavu community restores the earth, connects people with nature, and has lifelong clinical benefits (Coates, 2016). Rwanda has suffered for decades as a result of the Rwandan genocides leaving massive amounts of people with chronic malnutrition. Hospital approaches to treatment have not been cutting it. The Rwinkwavu Hospital program was able to revolutionize the way clinicians handle care in central Africa. Food in the form of waste, produce, and sustenance has powerful healing properties which can build a resilient community.

Havana, Cuba

Cuba, predominantly within the city of Havana, had to create its own sustainable agricultural revolution out of necessity (Clouse, 2014). Due to the collapse of the Soviet Union and U.S. embargoes, Cuba was forced to rely solely on its own domestic materials in order to provide sustenance for its people, meaning everything being locally sourced (Bloom, 2009). They no longer could rely on fertilizers with standard petroleum, so they began engaging in compost. Some of the most robust composting infrastructure is just within the walls of Havana, Cuba. Birthed out of obligation, Havana was able to foster its own urban agricultural revolution, through many avenues much like El Japonés Farm that engages in several different composting methods that simultaneously feeding its community.

After the collapse of the Soviet Union, industrial farms were failing, which led to the Período Especial wherein 60 percent of the country's constituents died due to starvation, and Cubans lost an average of 30 pounds per person for 10 years (Bloom,

2009). Despite that dip in livelihood and wellbeing, there was a redistribution of land amongst Cuban families. In Havana, that manifested in food cooperatives and local families growing and distributing food amongst the community members. That local food growth would not be possible without local compost fertilizing the soil and improving crop yield. An example of a Havanan farm with resilient food and compost production is El Japonés Farm.

The farm is run by a mother-son duo named Olga and Alex Oye (Bloom, 2009). The two engage in many different compost methods including vermicompost, mushroom waste compost, and overflow organics. The way their vermicompost system works is that they house worms in a large and dark container where they are fed vegetable scraps. The compost from the vermiculture is made into tea. The tea is distributed through a drip irrigation system in the greenhouse and is mixed with the rest of the compost in the vegetable garden. Not only do the Oyes rely on compost for sustenance, but so does their entire community.

Thanks to Olga and Alex, their El Japonés Farm feeds the greater Havana area from orphanages and schools to neighborhoods and even a military unit (Bloom, 2009). They would have no wellbeing without Cuba's adoption of compost as a natural fertilizer. El Japonés Farm and many throughout the country serve as models for permaculture design. These methods lack an industrial and robotic touch which connects people back to the food they eat. Thanks to the Oyes in Havana and tons of other farmers throughout the nation, Cuba was able to gain food sovereignty.

Though an agricultural revolution was the country's only choice over widespread starvation of its people, nations all over the world aspire to have even half of the self-reliant structure that exists within Cuba's food systems (Clouse, 2014). Despite an

upending of the global food systems that Cuba previously had, Cuba prevailed through creating a new and strong compost, food, and community structure that the country had not previously seen. We can see a manifestation of such resilience in Havana's El Japonés Farm wherein a strong composting structure can feed an entire body of people (Bloom, 2009).

Surabaya, Indonesia

A city in Indonesia called Surabaya is making remarkable strides in waste reduction through compost, especially given its socio-politcal status within the Global South. The waste generated within the city is made up of 70 percent compostable materials. Decades ago, Surabaya's MSW infrastructure was worse for wear (Medina, 2010). Because of disorganized waste collection, much trash would be scattered throughout the streets. What waste did end up in collection sites most likely ended up being incinerated or composted, but mostly the former.

In 2004, due to an obvious need for better MSW management alongside a legacy of composting and compostable waste accumulation, the city decided to adopt the Takakura Composting Method (Medina, 2010). A non-profit organization called Pusdakota partnered with Kitayushu International Techno-cooperative Association (KITA) in order to make this possible. This method is built on a foundation of an unspoken collective agreement. If residential citizens place their organic waste into the compost bin as opposed to the landfill bin, the city redistributes the composted soil back to its community including folks like interested farmers, schools, and vendors. Not only that, but with a simple behavioral adjustment by the city's constituents, garbage collection can be reduced by 50 percent, and 8,000 tons or more of CH_4, or methane, generation can be reduced from the city's landfills.

What is most profound about this case study is the fact that Indonesia is a part of a greater political sphere known as the Global South (Hickel, 2022). For a crash course on this classification, some argue that the world is divided into two categories, the Global North which includes the United States, Canada, Europe, Australia, New Zealand, and Japan as well as the Global South which encompasses Africa, Asia, and Latin America. As one might notice this sort of classification most certainly has colonial dimensions, which sadly would probably be better explained in a separate thesis entirely. In general, it seems that the Global North strictly reaps the rewards of the global climate crisis while the Global South suffers from the consequences.

Though representing a small anecdotal increment, Surabaya provides hope for a Global South disproportionately impacted by the global climate crisis. Surabaya can pave the way for similar communities who can now envision their own version of such a win for the environmental movement.

Dhaka, Bangladesh

Waste Concern, a non-governmental organization, has aided in one of the most robust municipal composting programs in South Asia (Yelda, 2012). The program is known as Dhaka's community-based decentralized composting (DCDC) which is based in Bangladesh. However, what is unique about DCDC is that compared to other composting initiatives across the nation and the greater geographical region, the program has very unique community-centered and inclusive features. The characteristics of DCDC that contributed to its success are manifested in their interfacing complementing sectors, holistic public-private-community partnership, and and sustainably-minded business model.

In order to effectively execute a program like DCDC that is as big as the city of Dhaka, the service needs to not only benefit itself, but also the landscape of services throughout the city (Yelda, 2012). Standing alone while surrounded by so many industries, businesses, and organizations that have the ability to grow one's own entity, would be a foolish and unsustainable pursuit. For example, the fertilizer industry, the agriculture industry, the pesticide industry, the recycling industry, and the formal and informal Municipal Solid Waste (MSW) industry in the city must work together in order to build each other up instead of competing to be the best. In addition, this sort of complementary organization and paradigm centered in resiliency is something that consumers and policymakers can get behind in order to combat a world in flames. Not only is integration of industry so important for the continuation of a project like DCDC, but this success also necessitates an overlap of public, private, and community entities.

Utilizing all types of organizations, whether they be an unspoken good owned by people, a governmental institution, or a for-profit business, is a key in creating successful community projects, evidenced by DCDC's success (Yelda, 2012). Using a wide array of operations for such an undertaking is only advantageous. Where other failing compost programs lack is simply their bias. For example, some programs sway towards, say, private entities, when incorporation of the government as well as the common person would only strengthen its continuity. Partnerships improve efficiency, resiliency, and sustainability. Composting is a part of the greater food systems which involves many players in terms of growth, distribution, consumption, and waste. Not including them in the conversation would be detrimental to progress. What goes hand-in-hand with partnerships is a business that works in favor of sustainability which will be explored in the following paragraph.

The final piece of the puzzle as to why DCDC is able to see success through sustainability is appropriate tactical entrepreneurship which envelops technology and product quality control (Yelda, 2012). That entrepreneurial incorporation is one of the main ways DCDC is able to incorporate all sectors of business no matter the industry. Not only that, but what is important for DCDC is maintaining a resilient community through sustainable waste and cheap and replicable technology that can withstand the elements. This sort of technology is what the success of DCDC really hinges upon. Lastly, with all good business modeling, comes product quality control which is what allows what comes out of this process to be usable by the community again and again, instead of being created into another form of waste, which would simply be counterproductive.

DCDC is most certainly an impressive municipal-based organic waste management program. Thanks to *Waste Concern*'s implementation of complementing service industries, partnerships between public, private, and community entities, and a sustainable business model, Dhaka, Bangladesh has one of the best community composting programs in the world. It is only a matter of time before this program is replicable in other communities.

Conclusion of International Case Studies

Each of the above case studies were very unique in their approach in their application of community-based composting infrastructure. In Fort Albany First Nation, Canada, an accetuation of native cultural practices were accentuated through compost. In Rwinkwavu, Rwanda, compost was able to contribute to actual clinical healing of malnourished patients. In Havana, Cuba, despite a traumatic shift of government and traumatic war-related events, hope and food sovereignty was restored through compost

and other forms of urban agriculture. In Dhaka Bangladesh, an inclusive and mutualistic approach to the economy of compost built sustainable food infrastructure that has not been witnessed previously in South Asia. The common thread of each of these programs is the localization of them. Within these towns, scaling up nation-wide is not an option nor is considered. That is because the locality of each of these initiatives is what makes for long-lasting composting and resilient food system infrastructure.

National Case Studies

Chicago, Illinois

A neighborhood in Chicago, Illinois called Auburn Gresham is home to an anaerobic digester that simultaneously transforms food waste into compost, creates fertilizer, and produces biogas (Henderson, 2023). What is unique about the community responsible for such a state of the art feat of urban agriculture is that this is not the typical people at the forefront of the environmental movement. White, middle, and upper class individuals are the typical demographic one sees, almost gatekeeping such an all-encompassing movement (Bullard, 2022). This self-determined community is 96 percent Black, 60 percent of households with incomes below $50,000, individuals who have been disproportionately disinvested in and the most impacted by harmful emissions. Auburn Gresham in Chicago, Illinois is on the come up thanks to a state of the art composter in an area with unique environmental dimensions and social dynamics.

The unique composting site is intricately holistic in its capacity to better the urban ecosystem of Chicago (Henderson, 2023). The most common composting simply diverts organic waste from landfills. This digestor not only does that, but also creates

readily usable compost. This allows the greater Chicago area to tap into local gardening. On top of that, these facilities produce high-grade fertilizer, which not only can benefit an independent gardener, but also a commercial farmer. A rather impressive quality of this composter is that it turns the community's organic waste into biogas that can literally be used by Chicago's utility company, and is pipeline ready. That is as near to a closed loop as any of us could get. This is most certainly the mark of a rather resilient community. Not only does this community have such a powerful force in its food systems, these people must suffer from some of the worst effects of the global climate crisis.

Auburn Gresham was not only capable of building such a profound trifold composter, digester, and energy producer, but this was created amongst some pretty terrible environmental factors (Henderson, 2023). Residents of all ages that live in the area, including young children and students who definitely had no say in where they grew up, are suffering from emissions and the chronic illnesses that come alongside pollution. Auburn Gresham is on the South Side of Chicago. A person living in the area is 50 percent more likely than any other city constituent to develop asthma because of local and concentrated air pollution. A local waste diversion entity curbs the local air pollution and its effects on community members. Not only did this urban agricultural feat defy environmental odds, but also defied compounding social disparities.

The neighborhood of Auburn Gresham has a 16.5 percent employment rate, is a food desert, and suffers historical disinvestment by Chicago (Henderson, 2023). This composting facility had to be created by the community for the community. The facilities are located on the Green Era Campus which won the Climate Change Adaptation category of the Climate Challenge Cup hosted by the United Nations. Green

Era Campus is overseen by Urban Growers Collective. It was this collective and the students of the neighborhood that really sought this project out. Community residents envision an ebbing and flowing ecosystem of a garden nursery, composting, and job training for formerly incarcerated individuals and local residents alike within the Green Era Campus in the near future.

The powerful composter, digestor, and energy producer emerged from a community disproportionately affected by the global climate crisis, racism, and classism (Henderson, 2023). Through a dynamic relationship between the neighborhood of Auburn Gresham, Urban Growers Collective, and Green Era Campus, an urban agricultural revolution is underway. Through this urban agriculture will come a local economy, a local culture, and a local self-determination.

Palmas de Mar, Puerto Rico

Palmas de Mar, Puerto Rico exists as almost an entirely closed loop community except for electricity and fresh water which is only sourced from Humacao, a city next door (Trojak, 2010). The trick to this independence is clever and lucrative composting methods and sales. Palmas de Mar's composting methods actually save the community $60,000 because they would have to pay to dispose of the organic waste otherwise. Palmas de Mar can serve as an example for other communities on similar paths towards getting off the grid and becoming self contained through a clever way to deal with waste water and compost.

Palmas de Mar stands out from other typical Puerto Rican cities as it is almost entirely self-reliant due to composting practices (Trojak, 2010). The small 3,000 acre community has a lot to put up with in terms of organic waste thanks to general upkeep and maintenance of the flora throughout the area. Before the in-house composting

facilities were established, organic waste had to be shipped off to the mainland of the United States and would cost Palmas de Mar quite the pretty penny. Through composting, the community creates a product out of its waste that they are able to sell back to the general public, gardeners, farmers, and landscapers which turns a profit for Palmas de Mar. A unique way Palmas de Mar is able to have self-determination in terms of organic waste is through the way in which wastewater is dealt with.

The way in which wastewater is treated in Palmas de Mar contributes to the community's resilience (Trojak, 2010). In addition to the green waste, contributions to compost include treated biosolids. The community's wastewater treatment is possible through the Stahlermatic process, a German technological advent. First, biosolids are separated and composted and then the rest of the wastewater is treated and then pumped and used to recharge a pond that irrigates golf courses and other landscaping projects. Another distinctive means that Palmas de Mar is able to have self-determination in terms of organic waste is through the way in which composting is conducted.

Palmas de Mar's composting process is novel as it allows the city to be an almost completely independent community (Trojak, 2010). Green waste from local landscaping is added to piles of mulch and turned periodically to limit extremely high temperatures. Then, there is a filtration process in regards to the waste water and the biosolids. Next, the biosolids and mulch are combined, and all of the organic matter combines into windrows. The organic waste in windrows are turned every three days because of oxygen necessities. After three months of the process, the compost is a sellable product. The composting process in Palmas de Mar completely closes the loop of organic waste for this Puerto Rican community.

Palmas de Mar, Puerto Rico is a uniquely self-contained city thanks to sustainable and tactful methods to deal with compost and waste water. Not only is organic green waste composted, but so are the biosolids from the community members' waste water. On top of that, the compost then generates a $60,000 yearly profit for Palmas de Mar because of a local sale of the newly created soil amendment (Trojak, 2010). Other communities ought to look towards this Puerto Rican community in order to be sustainable while saving money.

New York City, New York

Since 2014, New York City has had great success in waste reduction through The New York City Compost Project (NYCCP) as well as curb-side organic waste collection funded by the city (Morrow & Davies, 2021). What is so special in New York City is the way NYCCP operates. The organization pushes for community outreach, education, and change of behavior for New York City's residents. Not only that, but what makes this municipality stand out in terms of compost is their attention to the social dimensions of sustainability. The NYCCP implements a feminist ethic of care which is at odds with an argument to create a more sustainable city for purely economic reasons.

When New York City residential volunteers come together to compost, they stare their trash right in the eyes and finally understand what it is they are really doing when they throw away trash (Morrow & Davies, 2021). The city's members love this decentralized approach because it is better for the environment when not so many trucks are producing emissions and hauling away waste to an unknown land.

This project is creating a culture of nurturing the traumatized world around us that is constantly battered by an industrializing, economizing, and urbanizing status quo (Morrow & Davies, 2021). This technique is also referred to as the "slow compost"

approach wherein hundreds of tons of organic materials are processed by hand. Having the weight of the community's compost on one's shoulders alongside a careful attentiveness to processing it, quite literally slows the process of composting down. One unearths a sort of more-than-human relationship with the organic waste and all food in general.

Amidst all the ways that the food systems and composting could be approached, the NYCCP shifts focus from an patriarchal lens to one centered in a community of care. This New York City-based compost program is unique in that its first priority is not capital but human-lives. What is more important for the NYCCP is maintaining the livelihood of New York City residents. In turns out that a program that functions under this ecofeminist vantage point is successful, sustainable, and in essence props its own self up through its mutualistic and localized approach to compost.

Tucson, Arizona

The organization known as the Compost Cats is a University of Arizona student-led composting program that serves the greater Tucson community (University Wire, 2013). The program began in the fall of 2010 and simply took off from there. Over the past 3 years, these students have diverted over 1.1 million pounds of organic waste from landfills. They bring the organic waste taken from around town to the San Xavier Co-Op Farm which begins the process of turning the waste into compost. Composting in Tucson, Arizona has proved to reap environmental, university, and community-wide benefits thanks to the University of Arizona's student-led Compost Cats.

The city of Tucson experiences a multitude of ecological advantages thanks to the efforts of the college students in the area (University Wire, 2013). Composting at the sheer volume that the Compost Cats do, they are taking a huge weight off of the city's

landfill yearly. On top of that, the emissions of a common greenhouse gas, methane, is reduced. In addition, the diverted food waste becomes a soil additive that allows for more nutrient dense and abundant foods for the farm. Not only does Tucson's student-led composting program have environmental benefits, but it also witnesses university-wide assets.

In recent years, the program expanded into the city-wide landscape (University Wire, 2013). Before that, Compost Cats only served the student body. Especially for a student population, the utility of a university-based composting program can serve two purposes: one, simply serving as an alternative form of waste removal and two, being an interactive educational tool to simultaneously learn about and make contributions to one's community. San Xavier Co-Op Farm serves as an experiential learning opportunity that can teach students a lot more than just what can typically be found in a classroom setting. Students of any age passionate about building resilient food systems can join the Compost Cats in returning organic waste back to soil where it belongs. Not only do the Compost Cats interact with the University of Arizona campus community, but they also uplift the greater Tucson area.

Tucson, Arizona reaps the benefits of this student-led composting initiative of course throughout campus, but also through 20 different restaurants as well as the City of Tucson itself (University Wire, 2013). This program is able to return food waste, landscape waste, and zoo animal manure back into the soil as opposed to going straight to the landfill. Compost Cats are building a public benefit through partnering with the community. Not only does this community composting program foster education for the students, but it also allows for city-wide education. That is because some community members might not be behind the cause due to a lack of knowledge on the topic.

Compost Cats made an incredible mark on the Tucson community thanks to its student-led efforts.

Tucson, Arizona has been able to reap ecological, campus-wide, and city-wide rewards thanks to the University of Arizona's student-led Compost Cats (University Wire, 2013). Thanks to the program, the environment and the urban food landscape has never been better in Tucson. Students being at the forefront of this initiative allows for unconventional learning opportunities. The greater Tucson community being able to reap the rewards of the service of the Compost Cats allows it to break down the elitist barrier of academia and connect students with the city they live in. The Compost Cats can serve as an example for campuses and their surrounding cities all over to start an urban agricultural revolution locally.

Sarasota, Florida

The program known as Sunshine Community Compost serves the greater Sarasota area through grassroots-centered organic waste diversion (Sunshine Communtiy Compost, 2021). The program has a mission to transform, inspire, connect, and create through community-based composting. This sort of composting program is made by and for the community. Members of the program have bountiful opportunities to engage with the compost they created. Sunshine Community Compost curbs the global climate crisis, serves a lot of people throughout the greater Sarasota area, and employs an environmental justice lens of social composting.

Composting is a powerful entity in our world's path towards mitigating the global climate crisis (Sunshine Communtiy Compost, 2021). According to the program's website, composting is contained within a web of relations. These connections include air, water, fire, earth, communities of people, communities of unseen relations,

communities of all life on the planet, communities of microbes, clean air, clean water & conservation of water, slow climate change, healthy soil, and much much more (Sunshine Communtiy Compost, 2021). It is important to see how our planet and the entities we interact with on a daily basis have an inherent interconnectedness between one another. With this paradigm, one would be able to understand the importance that compost has on the food systems as well as the greater human and plant life cycles. Not only does Sunshine Community Compost better the physical world, it works with and for the community.

This Sarasota-based community composting program has touched the lives of countless individuals throughout the greater region (Sunshine Communtiy Compost, 2021). Sunshine Community Compost has composting locations in the Center AMI, Manatee Square Garden, Visible Men Academy, North Water Tower Park. Gillespie Park, More Marine, Girl Inc., and Arlington Park. Not only that, but composting services range from a simple food scrap drop off system, commercial resident or business composting, apartment or condo composting, to at-home composting via educational programs. To date, Sunshine Community Compost has been able to divert 155,000 pounds of food scraps from the landfill. In addition to serving the environment and the geographical region, this composting initiative implements social composting practices.

Social composting practices, which are explored in this paragraph, are a pillar to Sarasota's Sunshine Community Compost Program (Sunshine Communtiy Compost, 2021). Social composting follows the legacy of the earth in order to implement a collective care and necessary transformation of a withering framework that most certainly does not follow human or nature's inherent form. Social composting necessitates an intersectionality in environmentalism wherein social dimensions are

intertwined with matters of the environment. Sunshine Community Compost is built on sustained community organizing in terms of action and education. Social composting is a pillar of Sarasota's community composting program as should such an ideology be present when enacting composting initiatives at any scale.

Thanks to Sunshine Community Compost, the city of Sarasota, Florida is able to witness a better local environment, so many individuals within the community are touched, and environmental justice is intertwined in every facet of the organization's existence (Sunshine Communtiy Compost, 2021). Sunshine employs an interconnectedness of care between humans and nature. This allows transformation, inspiration, connection, and creation to be an endless cycle that is forever bound between one another. If only more localities could employ these same practices at home! The solution to the global climate crisis must begin where globalization and homogenization ends.

Conclusion of National Case Studies

We can also see profound composting here in the United States. Composting initiatives in Chicago, Illinois; Palmas de Mar, Puerto Rico; New York City, New York; Tucson, Arizona; and Sarasota, Florida can be witnessed in the prior portion of this thesis. Compost in terms of class, business, gender, education, and environmental justice class will be explored in these case studies.

The wide array of composting infrastructure even within the United States is profound. In Chicago, Illinois, in order to implement just a robust composting infrastructure a program was constructed by the community members because there was a need for it. In Palmas de Mar, Puerto Rico, the community is nearly completely independent thanks to tactful composting and the smaller scale of it. In New York City,

New York, a feminist ethic of care is employed in order to create lastign and resilient food system infrastructure. In Tucson, Arizona, students are able to build community through an educational framework that has been scaled out to the greater Tucson area. Sarasota, Florida emphasizes environmental justice in their path towards creating access for city residents to participate in composting. The common thread of these programs is that the social dimensions of each of these communities were deeply considered in creating resilient compost structures.

Municipal Case Study

Chattanooga, TN

In my home of Chattanooga, municipal level composting can take many different shapes. There is free community garden-based and private subscription-based composting. Unfortunately, composting seems to have flown right over the heads of our city's lawmakers, and they have yet to catch wind of the endless benefits and possibilities that come with widespread composting. Composting in the community grounds Chattanoogans in their food systems and closes the loop of food systems from farm to table to soil and back again. Community composting facilities can be witnessed through City Farms Grower Coalition, Crabtree Farms, Atlas Organics, and NewTerra Compost.

City Farms Grower Coalition oversees a number of community gardens including the Westside Greenhouse, the Peeples Peace Garden, the Bethlehem Center Urban Farm, and Neema Taking Roots Community Garden (City Farms Grower Coalition, 2019). These gardens are a web of ecosystems accessible for anyone to stop by, hang out, grow crops, and harvest food at no charge at all. The gardens just drip with this holistic

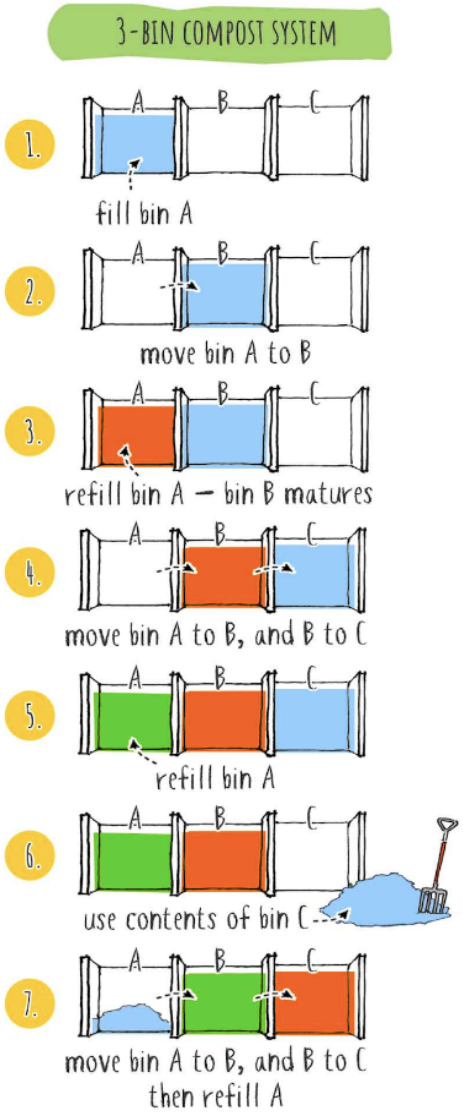
feeling that they are built by and for the people. Another important sentiment about City Farms is that they are not running a business. Not many business transactions or purchases go on in the coalition other than that which is awarded when writing grant applications and occasionally receiving them. If anything economic comes into the system it typically follows the barter system. Why waste money and resources when someone in our community probably already has it?

Not only are the City Farms Grower Coalition gardens there for community members to come and go as they please, these gardens are immersive educational opportunities for Univresity of Tennessee at Chattanooga (UTC) students. As a matter of fact, I have been a part of a class that manages and designs the Peeples Peace Garden as well as other classes that have visited the Bethlehem Center Urban Farm and the Westside Greenhouse. Connecting and growing food is an educational experience that will always beat what is learned in the traditional classroom.

So, as far as specifically compost goes, nothing too industrial is going on at the City Farms sites. The most high grade composting system is the three-bin composting approach at the Bethlehem Center. The design is pretty simple (Roebuck, 2023). As one can see in the figure below, organic compost goes into the first bin. Once the first bin is full, the organic waste is moved to the second bin while still emptying new organic matter into the first bin. Once the second bin is full, the organic matter in the second bin is emptied into the last bin. Once the third bin is full, that compost should be able to act as an amendment for the soil. The purpose of three bins comes down to time, temperature, and aeration. Overall, organic matter needs time to decompose in order to turn into compost. Stretching out the organic waste into the three bins gives it time to decompose. In regards to temperature, organic matter should never get too hot, and

Figure 2

3-Bin Compost System Diagram



Note. Graphic by Anthony Roebuck, 2023.

consistent movement keeps temperatures from getting too high. Lastly, three bins forces the user to aerate the organic matter which helps the organic waste decompose faster and cools down temperatures. Composting at the Bethlehem Center is free for anyone to come by and drop their kitchen scraps, paper, and green waste. Other composting among the gardens that City Farms Grower Coalition oversees is currently just a compost pile at Neema Taking Roots Community Garden, and there have been plans to have a compost tumbler at the Peeples Peace Garden.

The only other well known community urban farm operation in Chattanooga is Crabtree Farms. Crabtree Farms is slightly more centered in turning a profit through crop production, but is most certainly centered in the community (Crabtree Farms, 2018). They host a multitude of community events and volunteer days. Collaboration with community members also involves a Land Give Back Program that provides land for black and brown individuals as a means to implement some amount of reparations in terms of land ownership. Crabtree is also known for its workshare program wherein 3 to 5 hours of weekly volunteers ensure a person a

biweekly produce box. Crabtree Farms ensures a legacy of local food grown by and for the people. Crabtree has a presence in the local Farmer's Market scene as well.

Atlas Organics, a nationwide compost facility utilizes Crabtree Farms' land and facilities to distribute compost to Chattanooga residents as well as commercial businesses like the Chattanooga Lookouts and others (Atlas Organics, 2022). Subscribers have the option to utilize the finished compost if they pay for the service.

Another composting program available in the greater Chattanooga area is NewTerra Compost. The organic waste collected by NewTerra can be found on a plot of land in Wildwood, Georgia (NewTerra Compost, 2021). The composting facility utilizes the Aerated Static Pile Method. Compost turning is unnecessary because oxygen is pumped into the compost piles through pipes. The facility serves both Chattanooga and Cleveland residents and institutions. This aeration is known as active composting which is a 30 day period of temperatures of 140 degrees or more. After that, the compost enters the curing phase of 60+ days. After that, all compost is screened to ensure that particles do not go above a quarter of an inch. If not, back to the pile it goes to be broken down more. Once the compost is screened and approved, members of the program have the option to use the compost for soil amending.

Some efforts have been made in order to contract NewTerra Compost out with public entities, but none have been successful except for quite possibly this year. I have a good relationship with one of the founders of NewTerra, Normand Lavoie and one day I voiced to him that I wished that UTC could have a composting program available to the student body, much like what the University of Tennessee at Knoxville campus, a university that falls under the same University of Tennessee system just a couple hours drive North. Norm assured me it is incredibly possible, but the steps through the

bureaucracy of UTC would be cumbersome. As a matter of fact, it should be easy because NewTerra already has previously been composting with UTC at the CrossRoads dining hall and the University Center. Not only that, but UTC has a highly untapped green fee that students pay every semester for tuition. A small portion of that green fee can go towards a minor fee to pay NewTerra to provide materials to compost on campus. So, through a collaboration with the part-time Sustainability Coordinator, Nick Funk, a pivotal member of SGA, Kayleigh Barron, and our upward battle against Resident Housing and UTC administration, composting was finally approved for UTC students this semester, spring 2023. If there is consistent and wise composting usage, this will be a yearly accommodation for the student body. Let's cross our fingers this will stick!

Another project I am proud to be working on is the Zero Waste Festival scheduled at the beginning of Earth Week, April 15, 2023. The event is being thrown by Sunrise Movement Chattanooga, a hub of a youth-based movement fighting for intersectional environmental justice and Green New Deal policies in communities across the United States, which I was able to help found in the fall of 2020. For our Zero Waste Festival, we are bringing together speakers to discuss issues environmental justice, environmental education, and the zero waste lifestyle, as well as, local justice-seeking non-profit organizations, vegan restaurants, small business owners, musicians, bands, and DJs together to party, get informed, be sustainable, and produce no waste at all for the entire day. NewTerra Compost graciously will be providing compost bins for the event, and Sunrise Movement Chattanooga will handle the rest of the waste.

Conclusion

In order to build resilient communities, an exploration of humanity's interconnectedness is warranted. This interconnected sentiment goes hand in hand in order to understand the importance of closing the loop in local communities, especially, for the purposes of this thesis, within food systems. This thesis was able to bring out case studies that defied the odds and were able to create a closed loop system in terms of food thanks to composting efforts. Due to a global need for a reconstruction of our theoretical approach to food systems, readers can look towards the international communities, national communities, and my hometown of Chattanooga in order to understand how to foster an agricultural revolution in their own community.

A reconstruction in the theoretical approach to food comes from awareness of the interconnectedness that binds us all. There is an interbeing that exists within ourselves, an interconnection between us and the people we are surrounded by, and a profound intertwining between humanity and nature. When viewing it all as one big entanglement, closing the loop would only naturally come as the next step. Closing the loop of food systems and connecting the farm to the table to the soil and back again through compost is a very logical and practical approach. We can shift the paradigms we function under one community effort at a time.

The international case studies presented above can serve as a good model to inspire readers to start an agricultural revolution in their community. Each of the international communities mentioned, Fort Albany First Nation, Canada; Rwinkwavu, Rwanda; Havana, Cuba; Surabaya, Indonesia; and Dhaka, Bangladesh revolutionizes composting in one way or the other. These revolutionary practices took into account Indigenous, health-informed, war-related, colonial, and economic dimensions as to why composting was necessary in order to push each of their communities to prosperity. The

international case studies presented can serve as a model to readers wanting to start an agricultural revolution in their neighborhood.

The national case studies mentioned earlier in this thesis can connect with readers as a means to start transforming their local food systems through compost. A history of class, business, gender, education, and environmental justice unfolds for the communities of Chicago, Illinois; Palmas de Mar, Puerto Rico; New York City, New York; Tucson, Arizona; and Saras. Without careful considerations of the context of food in a region, agriculture cannot be engaged in. Plus these sorts of revolutions need to, of course, be made by and for the community.

The work that my loved ones, community members, and colleagues have engaged in, in order to revolutionize food in Chattanooga inspires me deeply. The aim of this thesis is that the exploration of radical composting infrastructure mentioned above can inspire readers to start that same work. Waste connects us with the rest of the food conversation. Without a return of waste to the soil, we are simply exacerbating the problem. Waste in terms of organics, spurs life. Composting in communities is how we find the missing piece of the food puzzle in order to create lasting and resilient efforts to curb the global climate crisis.

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