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OHIO WESLEYAN UNIVERSITY

HOW GLOBAL URBAN FOOD SYSTEMS CAN COMBAT CLIMATE CHANGE AND
ENVIRONMENTAL RACISM, SIMULTANEOUSLY: A CASE STUDY

Presented in partial fulfillment
of the requirements for
graduating with University Honors and
Palmer Global Scholars

In
Environmental Science and International Studies

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May 2023

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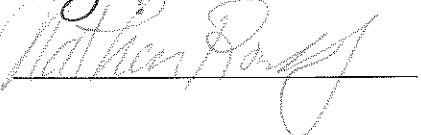





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Statement of Diversity

The material discussed in this research acknowledges the injustice, privilege, and power that lies within our communities, social hierarchies, and global networks today. As a white, upper middle class, female, I want to acknowledge the privilege that I have had throughout my life. I have been very fortunate to have the opportunities that I have been granted throughout my life. I have never experienced the hardships many people face today. I was never on food stamps, I have never lived in a red lined neighborhood, I have never had to survive off of subsidized foods. I have never been discriminated against for the color of my skin, I have never been shamed for not making enough money to support my family, I have always had access to a good education, with the technology and resources to elevate my performance. I have lived a privileged life, with opportunities to attend a private university, opportunities to study abroad, and opportunities to travel and see other parts of the world. If there is anything my privilege has given me, it is the chance to see the smallest glimpse of the life of those who are not as privileged. Therefore, I want to use my privilege to speak out for those whose voices are often silenced. I want to shed light on the issues in our communities that are neglected and hidden behind closed doors. I want to use my privilege for good, and use my voice to give attention to some of the most significant problems facing our communities each day.

Introduction

Our world is affected daily through the impacts of environmental racism and climate injustice. Rising greenhouse gas emissions and effects of environmental racism such as food insecurity, water insecurity, and climate displacement are arguably some of the most significant environmental issues in our world today. Heat waves, wildfires, and flooding often affect communities of color disproportionately, resulting in a “climate gap: the disproportionate and unequal impact the climate crisis has on people of color and the poor” (Morello-Frosch et al, 2009). Each year, the climate gap continues to grow in health and economic consequences. These inequalities rise in conjunction with rising greenhouse gas emissions, rising global temperatures, and increasing environmental disasters. Not only do these disasters and local crises continue to rise, but they are also affecting various communities around the world disproportionately more than others. Communities in urban cities across the country that are primarily populated with low income people of color have been “redlined” against economic investments, depriving them of fair access to “economic mobility and opportunity” (Townesley et al, 2021). These neighborhoods are deprived of things such as equal access to healthy food, affordable housing, and are at a higher risk to be victim to environmental injustices like lack of access to clean air, or clean water. Through this research, I hope to conclude how urban food systems can be one possible solution to all of these problems, simultaneously.

I will introduce the issues of food inequality, rising greenhouse gas emissions and other impacts of environmental racism. In our society today, communities of color are disproportionately harmed through the effects of redlining. These communities frequently experience a lack of access to whole, healthy foods and a lack of transportation accessibility and neighborhoods across the world are experiencing overall neglect, which decreases the quality of life of these communities and their residents. The current state of our climate, and the effects of rising greenhouse gas emissions and climate change, can also disproportionately impact low income communities and communities of color. This research will first assess how these issues of environmental racism, and the effects of climate change affect communities in both the United States and internationally.

This research will then explore how urban farming can be utilized through national and international non-profits. These nonprofits focus their missions to finding solutions to social

injustices like food insecurity, and environmental injustices such as the rise of greenhouse gas emissions. Many of these organizations use avenues of community engagement, education, and circular economies to tackle these global injustices. Although their missions are not identical to one another, nonprofits can combine their strengths to solve these problems holistically. Through this work, I aim to explore how urban food systems are an underutilized tool to tackle the complex issues of environmental racism, and the effects of climate change, and how it can be one way to reduce these insecurities in urban neighborhoods across the world.

Environmental Racism in the United States and Abroad

Environmental Racism is defined as “the disproportionate impact of environmental hazards on people of color” (GreenAction.org). Environmental racism is rooted in the laws, political and government policies, and institutional rules that have been built into our society to deliberately harm neighborhoods that typically are home to people of color. These environmental hazards can range anywhere from poor and unlivable water and air quality, to local exposure of toxic waste, to a lack of healthy food options.

A very well known example of environmental racism in the United States is the Flint, Michigan water crisis of 2014. When the city of Detroit switched its water supply from Lake Huron to the Flint River in a desire to save costs for the city, the residents of Flint began receiving discolored, unfiltered and untreated water through their pipes. This water was contaminated with high levels of lead, causing elevated blood-lead levels in residents, an outbreak in Legionnaires' disease (severe pneumonia), and elevated levels of total

trihalomethanes (cancer causing reagents) in water samples.

When the story of Flint hit the news in 2014, many were struck by the lack of humanity and awareness occurring in this case.

Flint is a community whose residents are primarily people of color; today, Flint, Michigan has a composition of 54.04% Black or African American, 38.45% White, and 5.96% Bi or Multiracial (*Figure 1*) (World Population Review.com). The lack of attention and awareness allocated to this issue by the state of Michigan and its officials, caused The Michigan Civil Rights Commission to conclude that “the poor government

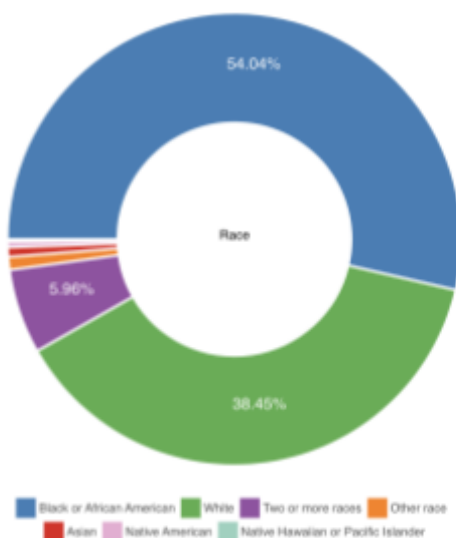


Figure 1 - Flint, Michigan Demographics (2023) - WorldPopulationReview.com

response to the Flint crisis was a direct result of systemic racism” (NRDC.org). The Flint Michigan story is a high profile example of environmental racism that helped increase awareness for environmental racism in various forms throughout our society.

Another form of environmental racism is food insecurity in low income, and marginalized communities. Across the country, hundreds of communities are living in areas without access and/or transportation to a basic grocery store. In the United States, the percentage of Americans living without food security was 12.3% in 2016, which is around 15.6 million food insecure households. Of these 15.6 food insecure households, 3.1 million of these households have children under the age of 18 (Borras et al, 2020). If we compare these numbers internationally, there are only 1.3 million households in Canada that experience food insecurity, and only 2.7% of Canadian households were designated as ‘severely food insecure’ (Borras et al, 2020). If this issue is examined globally, global hunger and food insecurity has been rising since 2015. From 2015 - 2018, global hunger and undernourishment increased by 36.2 million people. In the United States, the federal average of the US population living in food security in 2016 was 12.3% (Borras et al, 2020). These populations tend to consist of marginalized groups of people. For example, 32% of households whose incomes are less than 185% of the poverty threshold, 32% of all households with single parented families headed by women, 23% of all black, non-hispanic households, 19% of all hispanic households, and 17% of households with children are food insecure (Borras et al, 2020). In comparison to the national average of food insecurity of 12.3% of the total U.S. population, all of these groups are at a higher risk of living in food insecurity than the rest of the population of the United States. As a result of food insecurity, households and families can only access and afford to shop at local convenience stores that often fail to provide fresh produce and healthy alternatives to fast foods and processed goods. For many families across the nation, the only route to a traditional grocery store is by a two mile commute on foot (Baek et al, 2016). As a consequence, food insecure families are more likely to shop at local convenience stores, consuming fat filled, frozen, artificial, and chemically altered foods. In response to lack of access to affordable, healthier options, people living below the poverty line often rely on fast food chains as a cheap, calorie dense option that will keep their children full until the next morning. This puts food insecure households and families at a higher risk of health disparities, due to poor diet and poor health.

A diet of fast food, chemically altered products, and a lack of fresh produce is very common for families living in low income neighborhoods. A diet without a healthy balance of fruits, vegetables, grains, proteins, and dairy, is not a sustainable diet for the long term growth and health for a person of any age. Many families living in food insecurity will have severe health disparities in their lifetime as a result of an unhealthy diet. In the United States, “food insecurity is significantly linked to the top ten chronic diseases: hypertension, stroke, chronic heart disease, asthma, chronic obstructive pulmonary disease, diabetes mellitus, kidney disease, cancer, hepatitis, and arthritis” (Baek et al, 2016). In addition, mortality rates for severely food insecure people on average are 95.3% higher than food secure people. For moderately food insecure households, they have a 40.4% higher mortality rate compared to food secure households compared to marginally food insecure homes with a 26.8% higher mortality rate than food secure homes (Gundersen et al, 2016).

These families are living in what is called a Food Apartheid. Many may be more familiar with the term “Food Desert”. However, although these two terms refer to similar injustices surrounding food insecurity, the term Food Apartheid is “used to highlight the racially discriminatory structures that past and present impact food access and control” where as the term Food Desert simply highlights “areas with poor access to healthy foods, specifically the locations of grocery stores and transit lines” (UTEnvironment.org). By using the term food desert, we are simply identifying the areas of our cities where economic prosperity and food equality is lacking. We “often further entrench the idea that “black people need fixing” in public discourse and perpetuate the belief that these communities have little or no investment in creating their own place-making strategies toward food self-sufficiency” (Reese, 2019). The word desert gives the connotation that these communities are “dry”, “lifeless”, and “unable to be rebuilt”. The use of the term food desert offers no real solution to food insecurity. However, the term Food Apartheid shifts our focus to the systemic barriers that exist in these communities, and the discriminatory practices that cause these communities to lack in prosperity. Identifying barriers helps to shift the focus away from blaming residents, and creates a narrative of a healthy environment that promotes economic prosperity and a highly valued way of living.

In order to fully understand the concept of food apartheid’s, we first need to understand the reasons behind why they exist, and why marginalized communities in particular are being impacted. To do this we must analyze the history of redlining and gentrification, as a result of

decades of social and environmental injustices. Systemic and geographical racism exists today due to practices dating back to the early 1900's. During a time of extreme economic growth and change, redlining was a practice that was used for brokers to deny potential homeowners mortgages and business loans, based on their "risk factor" and their likelihood of paying back the loan with interest. The neighborhoods that had a high population of people of color, immigrants, and working class families were listed as "high risk" and were "redlined".

To understand redlining on a realistic level, let's take a look at the history of redlining in Columbus, Ohio. In 1936, the Home Owners Land Corporation (HOLC) created the first official

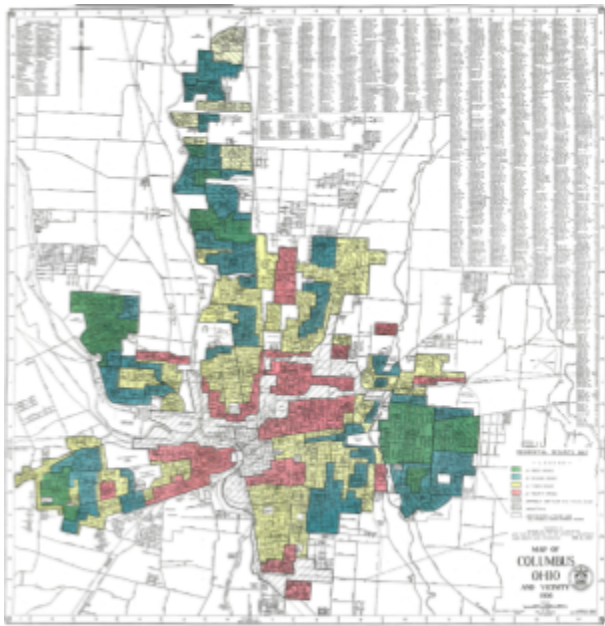


Figure 2 - Original 'Redlining' Map - 1936 (Federal Home Owners Loan Corporation (HOLC))

redlining map of the city of Columbus (*Figure 2*). Social stereotypes were used by the HOLC to designate communities with a high population of people of color, and immigrants as unworthy of receiving loans for their homes and businesses. Areas were graded with a level of security for real-estate investment in the area. An area received an A for 'Most Desirable for Mortgage', a B for 'Still Desirable for Mortgage', a C for 'Declining for Mortgage', and a D for 'Highest Risk for Mortgage' (Ohio State University Libraries). In *Figure 2*, the neighborhoods in green received A status for 'Most Desirable'. The neighborhoods in blue received B status. Neighborhoods in yellow received C status, and neighborhoods in red received D status. Neighborhoods with D status were outlined in red on the city maps as a warning for lack of

economic prosperity, and a declining business and home environment, thus coining the term "redlining". The neighborhoods that were flagged red on this figure were rarely awarded loans from banks on mortgages, businesses did not want to buy property, and large grocery store chains like Kroger, Meijer, or other large corporate chains, refused to establish presence in these redlined areas. These neighborhoods are neglected, dismissed, and are seen as disposable to many neighbors. The neighborhoods that often received D ratings were populated with a high percentage of people of color, immigrants, and blue collar families. These communities were never given the opportunity to grow to their potential, because they have been enclosed in a

system of unmovable barriers where there is no room for economic, or social success, now and in the future.

Not only are these communities being deprived and neglected of things such as proper educational resources, food access, clean water, and economic prosperity, people are also being forced out of their homes in order to make room for what many people like to incorrectly call economic change and prosperity, or developing “pro-urban” and “inner city chic” neighborhoods (London et al, 1986). These redlined communities are now experiencing gentrification and displacement. Gentrification is a process where middle or upper class people enter into a poor community, where they renovate homes, build on properties, and introduce high class businesses which drive up the cost of living in these areas. Original residents of these communities are being displaced due to a new, increased cost of living, that they can no longer afford. Upper and middle class people are looking for some sort of “rural ideal”: where they “flock to the suburbs as a compromise between the rural lifestyle (they) seek and the need to be near employment and services in the city” (London et al, 1986). Upper and middle class people who often unconsciously partake in the act of gentrifying a low class neighborhood, often believe they are doing a service to these areas by providing them with better economic development. Areas of urban cities whose neighborhoods are often at an optimal location within the city are often the most popular locations for gentrification to occur. With the influx of people moving to urban settings for professional development opportunities, many wealthy real estate and mortgage brokers are flipping homes, and selling them at a higher cost to those who can now afford them. These new residents do not experience the same food insecurity as former residents, because they have the privilege of owning a vehicle where they can access any commercial grocer in the city. Not only are the families that are original residents of these neighborhoods more susceptible to displacement, due to the increase in cost of living, it will be even more difficult for them to afford monthly rent, utility bills, and food for their families. If these families can no longer afford the house that they have been living in, as a result of the jump in rent prices, they will be annexed to a new area of the city, where they can afford rent, utility bills, etc. This puts these families at an even greater disadvantage when it comes to food accessibility.

Redlining and gentrification are taking effect in many metropolitan areas across the country. In Columbus, Ohio we can see neighborhoods like South Franklinton and South Hilltop (*Figure 3*), East and Northeast Columbus (*Figure 4*), South and East Linden (*Figure 5*),

Franklinton (*Figure 6*), and the Downtown, Short North, Arena District, and East Franklinton (*Figure 7*) all have been subjected to redlining since the middle of the 1930's and the rise of gentrification in the 1970's. All of these areas are redlined districts according to the HOLC redlining map, and have also experienced wide gentrification expansion, food insecurity, and other effects of environmental racism. This presence of food insecurity is likely to impact their shopping tendencies, frequencies, transportation styles, and accessibility to healthy and affordable foods (Kaiser et al, 2019).

Food Insecurity is often defined as “when people get to the point where they are skipping meals in order to save money, or in order to feed their children instead of their entire family” (Kaiser et al, 2019).

Kaiser surveyed households in these five zip codes in Franklin County to measure the effects of food insecurity in Columbus, Ohio. Of the 663 surveyed households, 449 households were reported as food secure, and 215 were reported as food insecure (Kaiser et al, 2019). Kaiser also examined 90 grocery and convenience stores with an 87 item “Thrifty Food Plan (TFP)” list, and a 55 item “MyPlate” list which were crafted with balanced, healthy, necessary items for healthy and accessible living. Only 4.4% of stores sold all 87 TFP items, and only 12.2% of stores provided a full

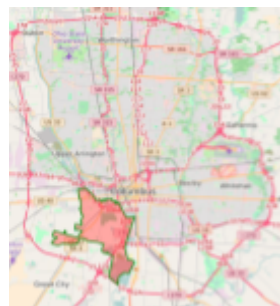


Figure 3 - South Franklinton and South Hilltop, Columbus, Ohio. Zip Code: 43223

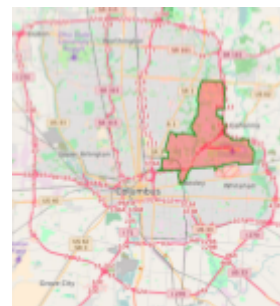


Figure 4 - East and Northeast Columbus, Ohio. Zip Code: 43219

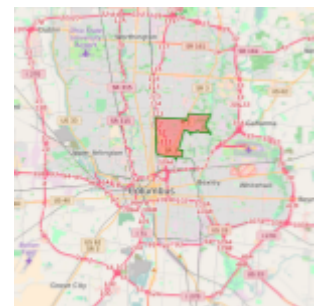


Figure 5 - South and East Linden, Columbus, Ohio - Zip Code: 43211

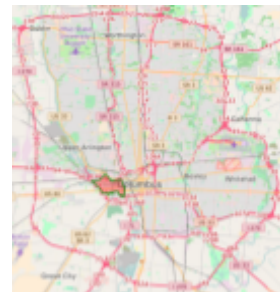


Figure 6 - Franklinton, Columbus, Ohio - Zip Code: 43222

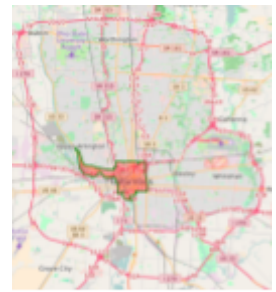


Figure 7 - Downtown, Short North, Arena District, and East Franklinton, Columbus, Ohio - Zip Code: 43215

Basket	Store type	Proportion of stores	Lower bound	Upper bound
TFP (87)	Convenience	0.000	0.000	0.000
	Partial Market	0.000	0.000	0.000
	Specialty	0.000	0.000	0.000
	Super/Grocery	0.082	0.016	0.147
MyPlate (55)	Convenience	0.000	0.000	0.000
	Partial Market	0.000	0.000	0.000
	Specialty	0.000	0.000	0.000
	Super/Grocery	0.224	0.125	0.324

Table 1 - Thrifty Food Plan, and MyPlate Basket Availability by Store Type - (Kaiser et al, 2019)

Basket	Store type	Proportion of stores	Lower bound	Upper bound
Fruit (7)	Convenience	0.000	0.000	0.000
	Partial Market	0.083	0.000	0.203
	Specialty	0.100	0.000	0.220
	Super/Grocery	0.776	0.676	0.875
Vegetable (11)	Convenience	0.000	0.000	0.000
	Partial Market	0.182	0.015	0.349
	Specialty	0.143	0.003	0.282
	Super/Grocery	0.775	0.676	0.875
Fruit (7)	Convenience	0.429	0.000	1.046
	Partial Market	0.393	0.182	0.604
	Specialty	0.586	0.389	0.782
	Super/Grocery	0.942	0.886	0.997
Vegetable (11)	Convenience	0.515	0.000	1.139
	Partial Market	0.298	0.100	0.495
	Specialty	0.623	0.430	0.817
	Super/Grocery	0.955	0.906	1.005

Table 2 - Sub-basket availability by store type - (Kaiser et al, 2019)

MyPlate basket. Over 20% of supermarkets filled the MyPlate basket, and only 8.2% of supermarkets filled all TFP items, and were more likely to fill each list completely. No specialty markets, partial markets, or convenience stores had all TFP or MyPlate items (*Table 1*, Kaiser et al 2019). Stores in low income, redlined areas were less likely to fill up more items on the list. Stores in high income areas were almost always likely to satisfy more than 90% of the items. Two specific “sub baskets” consisting of fresh fruit and vegetable grocery items were also analyzed. Super markets carried around 95% of both sub-basket types, and all other store types satisfied less than 63% of these healthy, whole items like common fruits and vegetables (*Table 2*, Kaiser et al, 2019).

Often, what forces people into the enclosure of a food apartheid, is the inability to travel anywhere else due to a lack of transportation. People living in low income, redlined neighborhoods often must rely on public transportation to get to the grocery store. Those living in food secure environments had a

78.6% likelihood of using their own car

for transportation to and from a

convenience store or grocery store,

where food insecure environments had

only a 51.4% chance of using their own

vehicles to go to the supermarket (*Table*

3, Kaiser et al, 2019). Food insecure

neighborhoods had a 23.8% likelihood

of using public transportation to access grocery stores, as opposed to food secure households

who had a 5.8% likelihood of using public transportation (Kaiser et al, 2019).

Not only do we see gentrification, food insecurity, and environmental racism in the United States, we also see it across the globe. In many European countries, we see gentrification occur in alternative ways, such as rental platforms like Airbnb. As tourism begins to rise in European nations, the demand for external renting services like Airbnb and Vrbo Skyrocket, causing wealthy property owners to upsell properties in historically lower income areas to tourists, to both raise the price of real estate in the city and to create a profitable income. Dutch bank ING (ING.nl, 2016) has concluded that the presence of platforms like Airbnb result in price increases, and may call for bigger mortgage loans for apartments and houses with

	All participants (n = 663) %	Food secure (n = 449) %	Food insecure (n = 214) %
My Own Car***	69.7	78.6	51.4
Getting a Ride w/Someone You Know**	9.7	7.6	14.1
Public Transportation***	11.6	5.8	23.8
Biking	3.0	2.2	4.7
Walking**	12.0	9.2	17.8

May not add to 100% because other places were mentioned, not included in this analysis (e.g., Farmers' Market, Produce Stand).

May not add to 100% because other places were mentioned, not included in this analysis (e.g., Farmers' Market, Produce Stand, Community Meal, Food Pantry).

* $p < .05$ (χ^2 statistic), ** $p < .01$ (χ^2 statistic), *** $p < .001$ (χ^2 statistic)

Table 3 - Participant behaviors and perceptions of food environment (Kaiser et al, 2019)

Airbnb-potential (Aalbers et al, 2018). Airbnb has also suggested a push for ‘touristification’ of certain areas and neighborhoods resulting in both housing price inflation, and displacement. Airbnb not only increases the buying demand of properties, but also the prices. An average homeowner, and Airbnb landlord in Amsterdam can charge an average price per night of 130 euros. With a 60 day rental period time, this will allow them to make an average of more than 650 euros a month. This can allow a home buyer to pay a theoretical interest and repayment mortgage of 95,000 euros over time (ING.nl, 2016). This kind of mortgage is not easily attainable, and is a large risk for people who live at a below average income. Therefore, this allows for people of higher income to monopolize the tourism industry, and force low income locals to find new housing to make way for the rising international tourism market. This also disadvantages young people who are trying to start their life in a city but cannot attain a loan because they do not meet the requirements due to an increase in housing prices.

As a result of this increase in tourism and larger profits within the travel industry, there

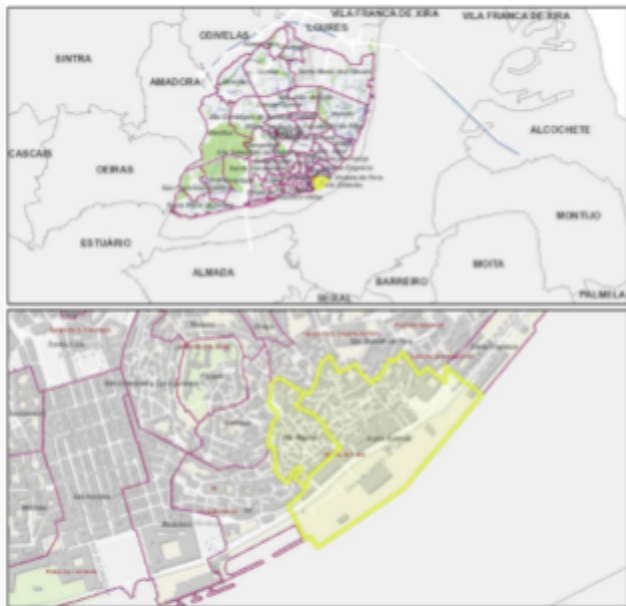


Figure 8 - Lisbon and Alfama. (Madeira et al, 2021)

has been an increase in real estate investment and the migration of new, high income property owners to the country of Portugal. The historic, low-income neighborhood of Alfama, in Lisbon, Portugal (*Figure 8*), is a prime example of the ‘airbnbification’ that is happening in many European cities. The Great Portuguese Recession from 2008-2014 caused the national GDP to drop by an average of 3% (Sequera et al, 2019). As a consequence of this change in gross domestic product, the Portuguese government resorted to an increase in the adoption of tourism and Urban rehabilitation to overcome this economic crisis (Sequera et al, 2019). This additionally liberalized the housing rental market in Portugal as a result of an

increase of urban touristification and upward pressure to real estate market, causing lower income residents to be expelled from their neighborhood and removing residents who are “no longer able to afford to live in touristified urban streetscapes” (Sequera et al, 2019). Although Alfama has an average of 3,300 inhabitants, almost 35% of the current Alfama real estate is

targeted towards tourist accommodation through platforms such as Airbnb (Sequera et al, 2019). This touristification of historic Portuguese neighborhoods like Alfama is displacing generations of locals, similar to the relocation of minority populations in the United States.

As economies, cities, and tourism continue to grow, practices that create food insecurity, food apartheid and geographical discrimination practices continue to grow. Urban farming can help to ease the effects of these discriminatory practices and can help provide equal access to food to those who have been subjected to redlining, gentrification, or regional displacement from their communities and homes. However, urban agriculture does not only reduce the effects of redlining, food insecurity, and environmental discriminatory practices within urban communities, there are also immense climate benefits to the development of urban agriculture. With rising levels of global greenhouse gas emissions, urban agriculture can serve as a way to decrease wasted products, recycle food scraps, and reduce the amount of resources that are wasted on the agriculture industry as we know it to exist today.

Climate Change and Greenhouse Gas Emissions - Circular Economies

Not only is our global society faced with the effects of environmental racism,

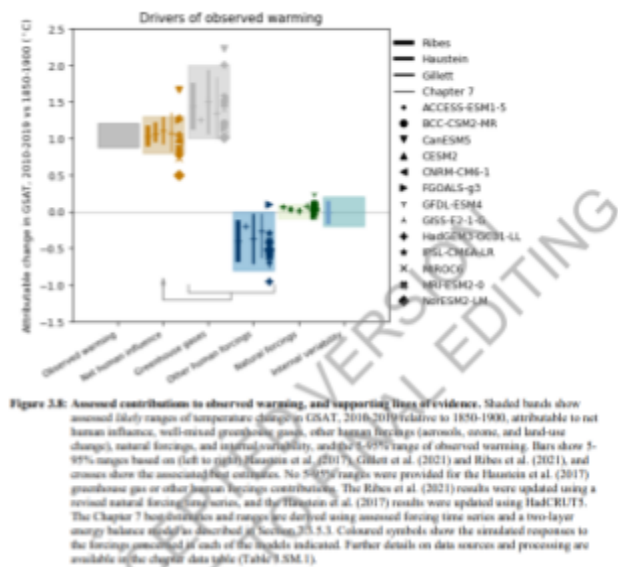


Figure 9 - Assessed contributions to observed warming, and supporting lines of evidence (Eyring et al, 2021)

gentrification, food insecurity, and severe income inequality, we are also facing the effects of a warming climate, rising greenhouse gas emissions, and the destruction of natural land. Warmer global temperatures, urban heat islands, and rising sea levels are all effects of climate change that can disproportionately impact low income and marginalized communities, similarly to the effects of food insecurity and redlining. Every six to seven years, the Intergovernmental Panel on Climate Change (IPCC) releases an assessment report of the current standing of climate change, natural resources, and environmental policy changes around the world. Data published by the IPCC in AR6 shows that the leading causes of global temperature rise and observed warming are greenhouse gas emissions, and overall net human influence (Figure 9). These other factors that are included in 'net human

influence' are influences like the expansion of large scale agriculture, and the loss of natural forest cover. We can see that greenhouse gas emissions have caused an increase of temperature ranging from about 1.1°C to 2.0°C over the past decade. (Eyring et al, 2021). One of the greatest ways greenhouse gas emissions can be reduced globally is by following in the footsteps of nations that have adopted environmentally conscious policies to reduce their personal greenhouse gas emissions. Working group III of the 2021 IPCC report provides further information on the current environmental standing of regions and nations around the world, and provides avenues of ways in which we can decrease environmental harm around the world. Each region can be evaluated differently to show their individual progression on greenhouse gas emissions (*Figure 10*). We can see that over the course of 10 years, from 2010 to 2019, Europe and North America have decreased their emissions from 10% to 8% of global emissions (Europe - Part A: *Figure 10*), and 14% to 12% of global emissions (North America - Part A: *Figure 10*) (Eyring et al, 2021).

Portugal is a nation within the European Union who performs exceptionally well in comparison to other European nations when it comes to greenhouse gas emissions. Being a smaller country within the European Union with a population of around 10.3 million people, Portugal only generates about 1.8% of the EU's total greenhouse gas emissions. In addition, when considering the amount of greenhouse gasses released per capita, Portugal averages less than the European Union as a whole; "Portugal emits 6.7 tons CO₂ per capita, compared to the EU average of 8.4 tons CO₂ per capita (2019)" (*Figure 11*, European Parliament, Climate Action in Portugal: Brief, 2019) Portugal is one of the lowest ranking countries in the European Union when it comes to greenhouse gas emissions, along with nations like Spain, France, and Italy. On the other hand, countries such as

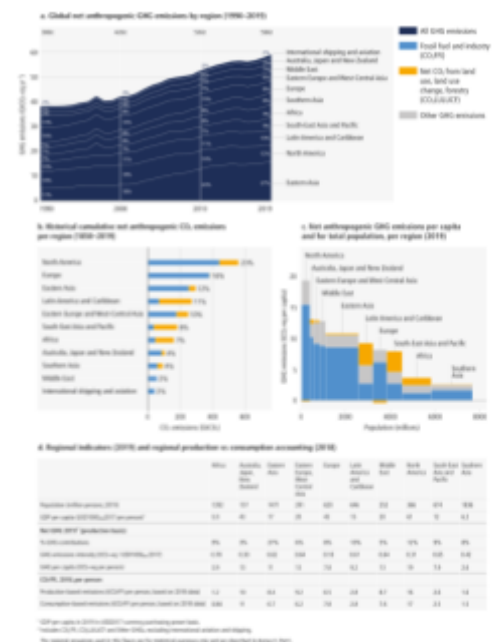


Figure 10 - Regional Greenhouse Gas Emissions, and the regional proportion of total cumulative production based CO₂ emissions from 1850 - 2019 (Eyring et al, 2021)



Figure 11 - Total Greenhouse Gas Emissions (CO₂) per inhabitant in 2019

Norway, Ireland, Germany, and the Czech Republic are some of the leaders in greenhouse gas emissions in the EU.

Portugal has enacted many environmental policy initiatives which have been a significant driver in reducing their national greenhouse gas emissions. Portugal's National Energy and Climate Plan 2021-2030 (NECP 2030, European Union, 2019) is the main climate plan that addresses both energy productivity and climate change within Portugal. One of the main components of the NECP report is the Circular Economy Action Plan (PAEC). The Circular Economy Action Plan (PAEC) discusses how circular economies can aid in reducing national waste, and greenhouse gas emissions. The EPA defines a circular economy as “an economy where wasted resources are made into products, designs materials to be less resource intensive, and recaptures waste as a resource to manufacture new products” (United States Environmental Protection Agency). The European Green Deal highlights the significance of transitioning Europe's economy into a more circular economy, in order to become a fully carbon neutral economy by 2050 (European Commission, 2022). Increasing the life expectancy of materials, results in multiple benefits. Not only can this increase the circularity and efficiency of materials, it can extend product lifetimes, reduce material losses, promote the recirculation of materials, and can provide a substitution method for greenhouse gas intensive materials (European Environment Agency, 2020).

Circular Economy business models are being increasingly used in countries throughout Europe and around the world on four different levels; products, companies, networks, and policies (Geng et al, 2019. Nature.com). Companies are creating new products across the world that are designed to reduce wasted products, and use these materials to create something new. Networks of companies are becoming linked together to produce these items sustainably, and at a larger scale, while international policies are implemented in order to support sustainable circular economy markets. Regardless of the scale, circular economies are all effective in reducing global waste. By minimizing the amount of fossil fuels being used and extracted regularly, and prioritizing natural resources, and by utilizing existing, wasted products to produce energy within our community, circular economies can significantly reduce greenhouse gas emissions and increase economic development and innovation of the global community.

A common, well known example of a circular economy model is the use of composting. By taking wasted food scraps and turning them into soil, to produce new goods, we are reducing

waste, emissions, and providing a new form of economic profit. Although the circular economy model seems to be a very broad way of promoting sustainability, and economic prosperity world wide, they can be implemented with simple steps such as using a composting bin in your backyard. Circular economies can be implemented around the world, with a wide array of new perspectives and ideas, creating the model into something unique.

The Local and Global Impacts of Urban Farming

Urban farming has a role to play in finding solutions to food insecurity, social and environmental inequity, and excessive greenhouse gas emissions. Often referred to as Urban Agriculture, or Urban Food Systems, Urban Farming is the process of cultivating, and distributing food in urban areas, by using unused plots of land, to provide local communities access to healthy ecosystems, sustainable growing practices, and whole foods. Urban Farming can help maximize natural resources, cut down on harmful agricultural practices, and provide food security, job opportunity, community development, and educational opportunities to those who need it most. Urban farming can also be an avenue for the implementation of a circular economy, in the form of businesses of individual products.

Urban Farming has a plethora of important, interdisciplinary impacts that help develop urban communities and decrease the harms of environmental injustice. Agriculture is one of the leading causes of greenhouse gas emissions, internationally. From CO₂ emissions produced by livestock, to fertilizer and chemically contaminated lands, to algae blooms and chemical run off, to fuel consumption from excessive transportation, the agriculture industry could benefit from adaptation and reinvention. Food consumption across the world has also risen exponentially, due to exponential population increases over the past several decades. The agriculture industry as we know it today will soon lack any uninhabited, healthy land to grow substantial crops. This provides an opportunity and a motivation to turn empty plots of urban land into places where we can sustainably produce the same goods.

The production and supply of food accounts for 20-30% of greenhouse gas emissions world wide. Urban agriculture and urban food systems can help reduce these influxes in emissions. Not only does the development of urban agriculture benefit the preservation of natural lands that would be taken up by traditional agriculture practices, the development of urban food systems can allow for a decrease in transportation efforts, packaging, and life cycle of fresh

foods. Food processing, packaging, retailing, cooking, disposal, digestion, and waste water treatments cause negative environmental impacts, including a spike in greenhouse gas emissions. (Kulak et al, 2023) There is a significant decrease in the amount of tools, machinery, transportation costs, chemical and fertilization costs, when using more sustainable farming practices such as urban farming. By cutting down on the amount of machinery needed to operate, chemical fertilization needed, and transportation necessary, this alone can help lower global greenhouse gas emissions. Urban food production can also reduce the amount of resources and energy required to transport goods to market (*Figure 12*, Kulak et al, 2023) as opposed to current large scale agriculture (*Figure 13*, Kulak et al, 2023). Switching from traditional agricultural practices, to urban agriculture, can down greenhouse gas emissions significantly across the world.

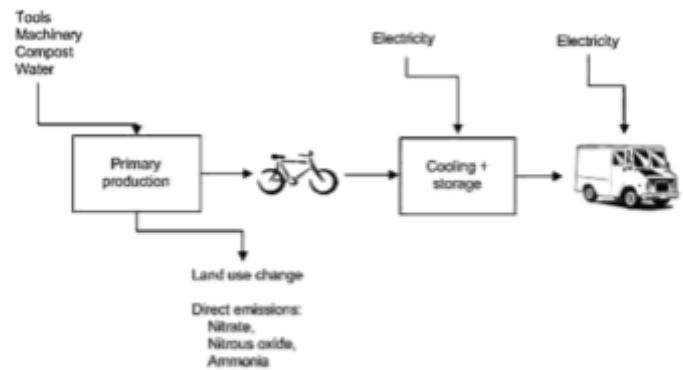


Figure 12 - Urban agriculture, Alternative food supply system and analyzed resource flows (Kulak et al, 2023)

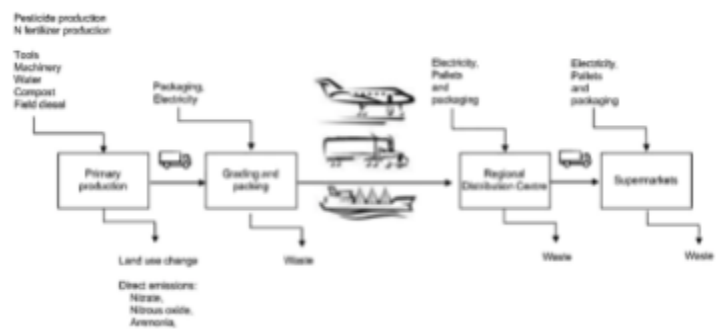


Figure 13 - Large scale Agriculture, Alternative food supply system and analyzed resource flows (Kulak et al, 2023)

Not only was urban agriculture developed to create a more sustainable environment and food production process, and decrease greenhouse gas emissions, it was also created to provide access to those living in food insecure areas, and provide opportunity for healthy, and reliable living. With an influx of people moving to urban areas, as a result of an increasing desire to live close to booming economies, job opportunities, and city life, people living in poverty were placed into corners of rapidly developing cities, lacking avenues for growth. Global urban populations have expanded from representing 15% of the global population, to 50% of the population (Deelstra et al, 2000). Given that the global population just surpassed 8 billion people on November 15th, 2022, we can expect to see this trend of urban migration continue over the coming decades. Urban food systems are needed more in developing cities in order to make room for all of the resources these people will need as the city continues to expand. Urban populations consequently require a majority of the food of the world, if they house the majority

of people in the world. For example, the greater metropolitan area of London, England, only houses 12% of the British population, but requires an equivalent of 40% of Britain's food production land for its intake (Deelstra et al, 2000). The amount of environmental supplies, energy, production, and processing that goes into getting food on the shelves, into stores, and restaurants is not sustainable for the future. Not only can urban agriculture provide urban communities with access to healthy, locally grown food, it can also foster a sustainable model of growth. Composted, and recycled materials can be used to reduce waste in our urban communities, and create it into something more sustainable for the neighborhood. By reducing the amount of waste urban communities are producing, this can also reduce greenhouse gas emissions.

According to the World Health Organization, there are three main pillars to food security; food availability, food access, and food stability. Food availability desires to provide households that live in isolated, food insecure neighborhoods, have a consistent avenue for accessing quality food. Food accessibility means that organizations are working to lower prices of organic foods, and find ways to allow households to reach these resources, without extensive transportation costs. Food stability aims to provide communities with constant access to healthy foods, at an



Figure 14 - Four Main Pillars of Food Insecurity (World Health Organization (WHO) & Food and Agriculture Organization (FAO), Integrated Human Studies)

affordable cost. However, the Food and Agriculture Organization adds another pillar to the WHO's existing three pillars of food availability, food access, and food stability. This fourth pillar is food utilization (*Figure 14*). Providing communities with food utilization allows food insecure households to learn how to make healthy changes in the lives of their families, with the affordable access to healthy foods that they have been given through the work of community organizations.

Urban farming was established to serve as one avenue of tackling rising greenhouse gas emissions, food insecurity, and environmental racism and inequality in the world. However, not all organizations approach urban food systems the same way. Issues of food insecurity, environmental injustices, climate change, and rising greenhouse gas emissions are such large issues, that there is no singular answer to all of these problems. Below I will use three main case studies of organizations, nonprofits, and businesses whose mission is to reduce the effects of

climate change, and food insecurity with urban food systems. These organizations each focus their mission on one pillar of food security, or one avenue of sustainability, in order to keep their mission direct and effective. I will examine the day to day function, overall mission, and effective outcomes of these three organizations in order to illustrate how effects both environmental racism and climate change can be reduced through the implementation of urban agriculture in local communities.

Case Study I - Nãm Urban Mushroom Farm, Lisbon, Portugal

Nãm Urban Mushroom Farm, located in Lisbon, Portugal, is an example of an urban farming system that focuses on circular economies and reducing the effects of climate change.

Nãm is an urban farm that collects wasted coffee grounds from a 15 km radius of their location



Figure 15 - Marvillla, Lisbon (XREI.com/marvillla)

in Marvillla, Lisbon (Figure 15), and recycles these coffee grounds to create healthy soil to grow Mushrooms. These mushrooms are then sold back to restaurants and markets within the same 15 km radius to promote economic growth, decrease food waste, and provide access to affordable healthy foods to urban Lisbon neighborhoods. These mushrooms take about 6-8 weeks to fully cultivate, with two separate cultivation phases.¹ After this time is completed, then the mushrooms are ready to be harvested and sold at local markets, and sold to restaurants near the city.

Founder Natan Jaquemin, started Nãm in 2018 in the small basement of a building in the historic plaza of Largo do Intendente, looking to create a business that had an inspirational mission to farm produce in a way that was sustainable, green, and innovative. Nãm is a prime example of a circular economy. These coffee grounds are recycled, and restored into the compound that is used to grow sustainable mushrooms. In 2019, Jaquemin partnered with Delta Cafés, Portugal's greatest market leader in coffee sales, to help his business to grow into what it is today. Nãm transformed an old, abandoned car dealership, attached to Delta Cafés headquarters in Marvillla, Lisbon, to be the center of farming and production. Delta Cafés provides Nãm with an average of 3 tons of coffee grounds per month from surrounding cafes,

restaurants, and shops for their growth, producing an average of 1 ton of mushrooms per month, and 4 tons of natural fertilizer. This alliance and partnership of Delta Cafés and Nãm Urban Mushroom Farm is beneficial for both parties involved. Nãm is supplied with a larger quantity of inputs (coffee grounds), to then maximize their outputs (mushrooms), and therefore can provide a greater quantity of goods to the nearby community.

Delta Cafés invests in projects like Nãm to help further their personal sustainable development goals, and the sustainable development goals set by the European Union and the European Commission. This idea is called Corporate Social Responsibility (CSR), “a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis” (European Commission, 2011). This is one way that the European Commission motivates large companies with a significant presence on the global market to reach climate goals effectively within their own organizations. The way that global climate goals are going to be reached the most effectively is through larger corporations moving towards sustainable development, and investing in businesses whose missions revolve around these goals. It is also beneficial for their own brand to pursue sustainable development. This is referred to as Cause Related Marketing (CRM). Cause-related marketing (CRM) is considered one of the effective strategies to communicate the company's effort in its social responsibility, to strengthen its reputation and to enhance the brand image (Baghi et al. 2008).

Nãm Urban Mushroom Farm is not the only company that Delta Cafés has invested their sustainable development initiatives in. Delta Cafés has developed their own sustainable development initiative called “Sustainable Development in the Origins”. This, according to Delta Cafés, is a mission that “strives to promote the training of local workers, to incentivize environmentally responsible practices, specifically, the conservation of the soil, the sustained management of crop farming, the saving of water and the use of renewable energy, as a means of ensuring the quality of life of future generations is not undermined” (DeltaCafés.pt). With this in mind, several initiatives have been developed to further Delta Cafés own sustainable development goals. Delta Cafés has supported the training of local workers and contributed to the development of local communities, a small coffee farmers, in East Timor, Angola, Brazil and São Tomé, with the purpose of promoting environmentally friendly actions, including the rational cultivation of soil, the sustainable development of planting, water conservation and use

of renewable energy sources (Lindon et al., 2010). They have also sponsored Um Café por Timor, whose mission aims to build up local infrastructure, reconstruction and equipment of schools, provision of equipment for the processing of "green" coffee (Lindon et al., 2010). Not only does Delta Cafés sponsor individual projects and businesses, they also invest in local research surrounding climate goals. The "Rui Nabeiro - Delta Cafés" Biodiversity Chair, created in 2008, resulted from the partnership between Delta Cafés and the University of Évora. Its main area of action is research on environmental and climate changes and its impact on biodiversity at local, regional and global levels. Delta Cafés contributed to this initiative with 100,000 euros per year for a period of five years (Cátedra "Rui Nabeiro – Delta Cafés" Biodiversidade, 2013). These initiatives were developed to further the sustainable development goals of Delta Cafés which is important for the international development of sustainable development goals.

Since the launch of Nãm Urban Mushroom Farm, production and sales have nearly quadrupled as a result of the partnership with Delta Cafés, allowing Nãm to expand their production to a factory in Famões, Lisbon. Nãm's mission and business structure can arguably fulfill 3 of the 4 ways that a circular economy can be enacted (Geng, et. al. 2019); products, companies, and networks. They can create new products, fresh mushrooms, from wasted coffee grounds within the city. They formulate their own business model through establishing their own company. They also network immensely with other companies – the partnership with Delta Cafés is a great way for larger corporations to introduce their business into sustainability, by partnering with smaller organizations to help fulfill their mission.

Although circular economies are more popular in Europe than they are in the United States at the moment, more businesses and nonprofits in the United States have begun shifting towards this concept. Over the past 30 years, environmental practices like basic composting, which is one form of a circular economy, have been skyrocketing in the United States. Technologies have evolved to be more efficient, affordable, and effective in order to perfect this industry. Composting is one way that agricultural practices in the U.S., specifically urban farms, can take steps to become more circular, and ensure that we are minimizing the waste we produce. Composting is an easy, accessible, and flexible way to achieve waste reduction in your own home, or on a larger scale, like Nãm does on a day to day basis. However, you don't necessarily have to do your own composting in order to use it as an effective method for waste reduction in

your own household, or in your businesses and organizations. Often, external businesses are used solely for composting efforts.

Organizations like Price Farm Organics (PriceFarm.org), located in Delaware, Ohio, is an example of a way that individual homeowners or municipalities can get involved in reducing waste, even if they do not have the resources to do so. Price Farm Organics is a composting business who dedicates their time to producing organic soils and mulches through sustainable waste recycling practices. A great way for new or current small scale farmers or home growers to become more environmentally friendly, and take steps to reduce their own personal greenhouse gas emissions would be to take advantage of products from businesses like Price Farm Organics. These materials are very beneficial for crops, and provide a natural and sustainable growing medium that can help to replicate a circular economic model. Although these methods are not necessarily reasonable for large scale agriculture practices, they can encourage the development of smaller, urban agriculture organizations to emerge, in order to gradually move away from large scale agriculture development over time. This is different from the composting methods that Nãm Urban Mushroom Farm uses – Nãm composts only a singular product into their mixture. Even if an organization doesn't have one focus waste product like Nãm, general composting is a great way for individuals and small businesses to reduce their own waste, and engage in circular waste reduction methods.

Nãm Urban Mushroom Farms mission focuses primarily on the availability and accessibility of healthy, and sustainable grown food to Lisbon residents. Not only does Nãm sell their products to Lisbon restaurants, they also take their products to local farmers markets. Nãm also has a small pop-up shop in Cascais, Portugal, where they have one shipping container of actively growing mushrooms, a small stand for local sales, and access to the rest of the local market (*Figure 16*). This location was inaugurated on June 7th, 2022, as the first step in the expansion of Nãm. In the coming years, Nãm not only aims to be selling, distributing and growing in cities around Portugal, but also around the world. This will allow them to reach



Figure 16 - Map of Cascais (In Transit from Lisbon), (viajesyvacaciones.es)

more people who are in need of access to locally grown food, but also continue to remove waste from local communities, and continue to make steps towards a zero waste, and carbon neutral goal.

Case Study II - Franklinton Farms, Columbus, Ohio

Franklinton Farms, an urban farming non-profit organization in Columbus OH, that aids vulnerable communities in Columbus, Ohio who have been victim to redlining, gentrification, and food insecurity. Franklinton Farms demonstrates how urban agriculture can help to provide accessibility, and availability, along with increasing stability in communities in the Greater Columbus area. This case study will first examine the history of Columbus, Ohio, and the neighborhoods where food insecurity widely exists, and the various statistics regarding the current standing of income, housing, and food accessibility in Columbus. Franklinton is one of these neighborhoods that are subjected to a high risk of food insecurity. I will then describe how Franklinton Farms provides equitable access to freshly grown produce to neighbors in the community of Franklinton, who often experience food insecurity.

Clear effects of environmental racism are visible in the community of Franklinton, which sits just north west of the intersection of Interstate 670 and Interstate 71 in Columbus, OH. Franklinton is a community that struggles each day with food inequality, disconnection, lack of transportation, and gentrification. Franklinton is a living and existing food apartheid in our society. Across the Scioto River from Downtown Columbus, Ohio, the neglected, unattended, affordable area of Franklinton was initially settled by some of the first freed enslaved people to arrive in Ohio after the passing of the Northwest Ordinance in 1787, to create their new life as free people (Franklinton Target Area Plan, 2020. columbus.gov). Due to its location in the low elevation ground of the Scioto River, Franklinton has been victim to multiple floods in the past century, causing many of its inhabitants to be displaced. The Flood of 1913 left family homes destroyed, and businesses starving for customers. The population of inhabitants continued to decline over the years. In 1959, another flood of a similar magnitude hit the neighborhood, causing repeated outcomes. This caused the price of housing to decrease, the desirability for business owners, and people of low income who have resided in this neighborhood for decades to be trapped in a declining, and neglected area of the city. In addition, the construction of route 315 in 1933 played an additional role in fragmenting Franklinton from the rest of the city. This

construction removed hundreds of homes and businesses in order to place the freeway, putting residents who lack ownership of cars at a significant disadvantage when accessing the rest of the city. According to the Franklinton Target Area Plan, “Franklinton suffered immensely in the following decades from a combination of population loss, crime, and overall decreased quality of life. The foreclosure crisis around 2008 also impacted the neighborhood, further reducing homeownership and increasing vacancy” (Franklinton Target Area Plan, 2020. columbus.gov)

The median household income of all of Franklin County is around \$56k/year. The median household income of Franklinton is about \$15k/year, which is \$41k/year below the average household in all of Franklin County (Franklinton Target Area Plan, 2020. columbus.gov).

Franklinton went from being one of the most prosperous, up and coming neighborhoods with 26,500 residents in 1950, to just over 8,000 residents today in 2023. Franklinton also has a significant majority of the population living in poverty – with one of the highest rates of poverty in Franklin County. Franklin County has 17% of its people living below the poverty line, whereas Franklinton has 52% of its people living in poverty (Franklinton Target Area Plan).

While the city of Columbus wants to ensure this area of the city becomes the thriving and successful neighborhood it has the potential to be, this also comes at a price for those who have resided there for decades. Gentrification is a very significant problem in Franklinton. As the city begins to renovate residential and office buildings and introduce luxury hotels and apartments, the original Franklinton residents are afraid that they are going to be pushed out of their homes.

Residents of Franklinton struggle with chronic poverty and experience severe economic, environmental, and social challenges. Franklinton Farms aims to provide the community of Franklinton with greater access to healthy foods, along with resources to help make these changes a lasting solution in their life. Franklinton Farms (FranklintonFarms.org) was originally founded in 2007 by local residents with a mission to provide the community of Franklinton with locally organically harvested fresh produce, at an affordable price. Franklinton Farms aims to “nourish neighborhood wellbeing and connection through farming, gardening and education” (FranklintonFarms.org). Franklinton Farms mission revolves around 4 main pillars – to “1) Create Access – by creating a farm and local food system that provides good food for all, 2) Increase Opportunity – by contributing to a local economy that offers good jobs and fair pay for our neighbors, 3) Improve Community Resilience – by caring for the land and improve the environmental strength of our neighborhood, and 4) to Supply Equity to the Franklinton

neighborhood – by collaborating to build a community that values and includes all people” (FranklintonFarms.org). When Franklinton Farms was originally founded, their original goal was simply to set up a small community garden for residents to farm and enjoy. Over the past 15 years, they have grown into a multi acre network of food production and distribution sites. Over time, they have expanded their network to countless community partners in order to grow their impact in the Greater Columbus Area.

The Franklinton Farms campus includes 12 food production sites, 12 high tunnels, fruit tree orchard, berry patch, microgreen room, and a learning garden. In order to create sustainable farming practices, Franklinton Farms utilizes local natural resources through rain collection and drip irrigation to save water usage waste and costs, in addition to the use of hand tools and solar



Figure 17 - Franklinton Farms, High Tunnel System

power to improve the resilience of the farm. They also place a high value on the quality of soil used at Franklinton Farms. In order to produce healthy foods, you must use healthy soil to grow them. Franklinton Farms uses “compost, cover crops, and integrated pest management, in place of chemical fertilizers and pesticides” (FranklintonFarms.org). The use of the high tunnel system (*Figure 17*) allows for Franklinton Farms to maximize their produce growth year round. During the summer months, high tunnels are used to harness sun rays to create an isolated micro climate for growing produce like tomatoes and peppers in the summer, and greens and roots in the winter. The high tunnel system allows for products to be grown at the same rate year round, without seeing a dip in food growth in the colder months, preventing families from getting the food they need in the middle of the winter. In fact, the high tunnels are very beneficial towards

growing some more seasonal vegetables, and allows for year round farming which is essential for increasing food security.

Franklinton Farms’ main goal is to provide people of low income access to affordable, fresh produce. The largest barriers that people of low income have to find fresh food is affordability, and accessibility. To combat these issues, Franklinton provides various kinds of food packages based on an individual household's needs, with subsidized pricing to local

residents of the Franklinton area, and those who are covered by the Supplemental Nutrition Assistance Program (SNAP). Franklinton Farms has various options for how customers can receive their food, providing residents with various pricing assistance discounts. For customers purchasing through the online order system Franklinton Farms offers a price reduction of 50% for Franklinton residents who genuinely cannot afford the full price, and an extreme discount for those on SNAP and using EBT cards (food stamps). A full price breakdown of different vegetables like bunched greens, bagged greens, herbs, and root crops, for each purchasing category is found on the Franklinton Farms website (*Figure 18*, FranklintonFarms.org).

Customers can purchase items directly online to be picked up in Franklinton with subsidized pricing for residents who qualify. Franklinton Farms also offers a way for supporters to pay for another person's produce orders to reduce the burden on Franklinton residents. The weekly harvest pack is another way for residents to purchase produce from Franklinton Farms. The weekly harvest pack is a fixed package of assorted items from the farm, depending on what items are being harvested during that season, and can be ordered and delivered to individual homes by a Franklinton Farms employee. The weekly harvest pack is also available for subsidized pricing: prices ranging from \$4-\$22 per week for the full package (FranklintonFarms.org). Customers can also come to the Franklinton Farms campus and harvest produce on their own from the U-PICK Garden, free of charge. Franklinton Farms also sells produce at the Worthington Farmers Market every Saturday morning throughout the year. However, the Worthington Farmers market prices are not subsidized, because the population of Worthington does not experience food insecurity. Although Worthington is not the targeted population for Franklinton Farm's mission, they travel to the Worthington Farmers market to sell to local, middle class residents to help support their regular income, so that Franklinton Farms can afford to provide discounts to less advantaged customers, and still make a profit to keep their doors open.

Franklinton Farms strives to be an organization that is continuously providing the people of Franklinton with opportunities to overcome food insecurity. As a growing organization of 15



The image shows a pricing table for Franklinton Farms. The table lists four categories of produce: Bunched Greens, Bagged Greens, Herbs, and Root Crops. For each category, it provides the price for SNAP, Neighbor, and Full payment methods. The SNAP prices are significantly lower than the others, reflecting the 50% discount mentioned in the text. The table also includes a note about the SNAP pricing being for those using EBT cards and a note about the Neighbor pricing being a 50% discount for Franklinton residents or those who genuinely cannot afford the full price. The table is decorated with images of various vegetables like kale, spinach, and tomatoes.

	SNAP*	Neighbor*	Full*
• Bunched Greens - Kale, Collards, Chard, Mustard Greens, Bok Choy	\$0.88	\$1.75	\$3.50
• Bagged Greens - Lettuce Mix, Power Greens Mix, Spinach, Arugula	\$0.75	\$1.50	\$3.00
• Herbs - Cilantro, Dill, Mint, Sage, Thyme, Oregano, Chives, Basil	\$0.63	\$1.25	\$2.50
• Root Crops - Carrots, Radishes, Potatoes, Beets, Sweet Potatoes	\$0.88	\$1.75	\$3.50

*SNAP PRICING is for those using EBT cards. Text 434-446-1381 to get the coupon code.
 *NEIGHBOR PRICING (50% off) is reserved for Franklinton residents or those who genuinely cannot afford the full price.
 *FULL PRICE is based on actual cost to pay for growing the produce (farmer compensation, sustainable and organic agricultural practices, etc)

Figure 18 - Franklinton Farms Price Breakdown (SNAP/EBT, Neighbor, Full) (franklintonfarms.org)

years, Franklinton Farms' mission is still not complete. Rebecca Gimblett, connection coordinator for Franklinton Farms, expresses the hopes and desires for the future of Franklinton Farms, and how their team sees the organization growing in the coming years, to continue battling environmental racism in Franklinton. Gimblett shares that she has many visions for the growth of Franklinton Farms in the coming years. She expresses how one of the main goals of their staff is to open an individual market at the Franklinton Farms campus to have residents walk to the market to get their produce individually (Gimblett, November 2022). Due to the fact that the main source of access to produce for Franklinton residents is through the online ordering system, or through the weekly harvest packs, a good majority of these customers are finding these offers through websites, and online ad campaigns. However, people living in low income homes may not have access to a computer or other kinds of technology daily. By opening an in person market, this allows for families to come to the farm in person, to pick up their produce at a subsidized cost, just as the online ordering system, and the weekly harvest packs provide. These families can purchase as much or as little as they want, and can walk away with freshly grown produce, right in the center of their home community of Franklinton. Another goal for their organization in the coming years is the launch of a Franklinton Farms Food Truck. Gimblett expresses that the vision for this food truck revolves around breaking the barrier of unreliable transportation for Franklinton residents, and to increase access and awareness about their mission (Gimblett, November 2022). This truck would be present at community events, schools, after school programs, and various church and organization gatherings, both with prepared fresh foods for customers, and fresh produce for discounted purchase. This hopefully would increase accessibility to fresh produce for Franklinton residents who need it the most, and would spread awareness about the mission of Franklinton Farms to communities outside of Franklinton.

Franklinton Farms also desires to expand and connect with other urban farms in the Columbus, Ohio area in order to spread the wealth of their mission to other neighborhoods in the city besides Franklinton. Franklinton is not the only community of Columbus, Ohio that experiences severe food insecurity and environmental racism. Gimblett shares that one of Franklinton Farms goals is to increase their impact in the community of Hilltop, Columbus, which is located just west of Franklinton. This area of Columbus is often where Franklinton residents relocate to when they are forced from their homes due to gentrification in Franklinton. Ideally, Franklinton Farms wants to assist every area of Columbus who experiences these effects

of food insecurity – but unfortunately, that is an unreasonable goal for a local non profit to achieve. In order to increase their impact in the city of Columbus as a whole, Franklinton Farms is an active member of The Community Growers Network. The Community Growers Network helps to join together nonprofit organizations from all over the city, with similar missions, to help and make battling environmental racism a unanimous effort. Franklinton Farms is partnered with several organizations throughout the Greater Columbus area such as Southside Family Farms (SouthsSideFamilyFarms.com), the Bronzeville Growers Market (BronzevilleGrowersMarket.com), the Mamie Mack Community Garden, The Garden Club Project (TheGardenClubProject.org), Southeast Gardens and Urban Farms (SEUrbanFarm.org) and Kimball Family Farms. Other local organizations like the Four Seasons City Farm (FourSeasonCityFarm.org), the Franklin Park Conservatory (FPConservatory.org), and the Highland Youth Garden (HighlandYouthGarden.org) are also a part of this network of organizations, but have less interaction with Franklinton Farms. As of the first day of 2023, Gimblett shared that they had officially hired two new employees to tackle local partnerships - a volunteer coordinator and an apprentice coordinator. These two new hires for Franklinton Farms will be tasked with working with other growers within the Community Growers Network, but in specific collaboration with Southside Family Farms (SouthsSideFamilyFarms.com) (Gimblett, November 2022). This is a great way to expand the overall impact of Franklinton Farms mission throughout the whole city of Columbus, not just within the minute community of Franklinton.

Case Study III - Spice Field Kitchen, Cleveland, Ohio

The largest barrier that many do not recognize exists is the lack of knowledge in millions of American homes on proper ways to prepare, cook, and eat healthy foods. Growing sustainable produce and transporting it to residents is the first crucial step in creating a world without food insecurity – but it isn't enough to completely break down the systemic barriers that stand in the way of food equality. What happens when a family who has been living in poverty their entire lives, surviving off of frozen meals, and boxed goods, with no access to fresh produce, now has access to foods they have never prepared themselves? Other non-profits dedicate their mission entirely to the education of children and families on healthy eating, and food security.

Spice Field Kitchen (SpiceFieldKitchen.org) is an organization located between Cleveland, Ohio, and Akron, Ohio, whose mission is to educate children and families on healthy

eating and food security. Spice Field Kitchen's primary mission of education, and utilization of food is just as important to reducing the existence of food insecurity through other pillars such as accessibility and availability, which are the primary missions of Nãm Urban Mushroom Farm and Franklinton Farms. Although Franklinton Farms and Nãm Urban Mushroom Farm dedicate some of their mission to the education of local youth and adults on health and security, this pillar of utilization is not the foundation of their mission. Their educational programs are significant in the lives of their students, but it is difficult to grow large educational initiatives when the foundation of the mission is rooted in alternative pillars of food security.

Founder, Chef Ben Bebenroth, created Spice Field Kitchen to "cultivate the connection between nutrient-dense foods, sustainable agriculture practices, and health and wellness" (SpiceFieldKitchen.com). Spice Field Kitchen strives to provide agricultural, environmental and culinary education that is integrated into everyday life for people of all ages. Bebenroth is also the founder of Spice Catering, Booms Pizza, and is the owner of Spice Acres in Cuyahoga Valley National Park, where Spice Field Kitchen is located. Although Spice Field Kitchen is not originally located in an urban area, Spice Acres sits in Cuyahoga Valley National Park, which is halfway between both the greater Cleveland area, and the greater Akron area. According to Bebenroth, this location choice was intentional in order to make an impact in both the Cleveland and the Akron communities, serving two of the largest metropolitan areas in Ohio at once (Bebenroth, November 2022).

In order to educate people about how to prepare their food and make a lasting, healthy change in their household, Spice Field Kitchen has a licensed K-5, state verified, educational program to teach in partnered schools across Northeast, Ohio. A K-5 Spice Field Kitchen partnership entails licensed educator Steven Baker, to travel to these schools once every week, and each day provide a different lesson on how to turn some of our favorite household items into healthy, nutritious meals for the whole family. Each week, new foods are introduced, and new meals are demonstrated, while incorporating recurring and familiar ingredients from previous lessons to get children to repeatedly recognize fresh vegetables over time. According to Bebenroth, they are not attempting to force kids to "become self actualized eaters all at one time" (Bebenroth, November 2022). The process of exposing young kids to healthy foods is gradual, and is the most effective when it is repeated year after year.

With over 7,200 total student impressions as of 2022, Spice Field Kitchen is currently in its fifth year of initiating partnerships with various school districts in the Cleveland and Akron areas. Their current partnerships are with elementary schools such as Pleasant Valley Elementary School within the Parma City School District, Tremont Montessori, and High Schools such as St. Martin De Porres High School, the Welsh Academy of St. Ignatius, and Strongsville High School. As of the beginning of the 2022-2023 school year, Parma City Schools is Spice Field Kitchens longest standing partnership at five years, with all other schools in their second year of partnership. Bebenroth shares that they hope to introduce a program into the Cleveland Metropolitan School District in the coming years (Bebenroth, November 2022).

A way for a lesson to stick with students is to adapt something that they may see every day, and introduce fresh produce into it. For example, one lesson may revolve around how to make store bought ramen packets more nutritious. One way this can be done is by chopping green onions, and cracking an overeasy egg over the dish. These two simple steps can elevate a store bought meal that might be a familiar and comfortable item for many low income households, into a more nutritious and easy meal. All worksheets, tests, and quizzes are provided by Spice staff, and instruction will vary from in-school demos, to trips to Spice Acres in Cuyahoga Valley National Park. Spice Field Kitchen also provides online cooking demos in the evenings, that are a way to get parents involved in the demo as well and learn how to prepare and elevate these meals for their children. For online evening demonstrations, recipe bags are sent home with the children from school with all of the ingredients properly portioned and ready to be prepared during the demonstration. This helps to increase the likelihood that these practices that are being taught are replicated in the home by parents, siblings, grandparents, etc (Bebenroth, November 2022).

Spice Field Kitchen is working to educate children across Northeast, Ohio on the benefits of healthy eating, and how to replicate these habits at home. Although there are various levels of high school involvement with Spice Field Kitchen, Bebenroth explains that they want to focus the heart of their program on Kindergarten through 5th grade students. This may seem like what should be the alternative approach to many outsiders examining the work of Spice Field Kitchen. Although these programs can be adapted for a more mature audience, Bebenroth explained that when he created Spice Field Kitchen, he wanted to target a young, elementary crowd so that these children can build healthy habits in their life before it is too late to turn their bad habits

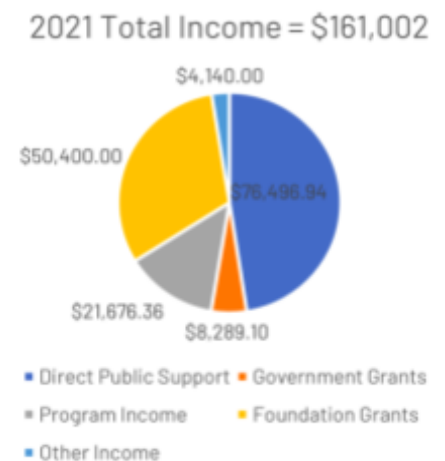
around. Bebenroth expressed that his reasoning behind this choice to focus on early childhood education is connected to a common habit building metaphor. Bebenroth shared that he believes “your mind is like a ski slope. The more you ski down the same path, the harder it is to stray away from the path that you are on and go down a different path.” He explained that children who are living in a food insecure household, and are only exposed to store bought, chemically processed, boxed foods, are already building this habit of unhealthy eating unintentionally throughout their childhood (Bebenroth, November 2022). If children continue to eat overly processed and chemically modified foods, and then are exposed to healthy eating and cooking at the late high school age, it would be extremely difficult to turn these habits around into a routine. However, if you introduce these concepts to children in the first grade, and then continue to instill it in them until they reach the fifth grade, healthy eating is now a part of their routine, their cravings and their daily choices.

When examining the development of early childhood psychology, it is important to build good habits at a young age, so that they stick with the child throughout their adult life. In a study of perceived recollection of frequent exposure to foods in childhood, and its association with adulthood liking, 670 college students from the University of Arizona were surveyed on their current liking of various foods, and their liking of those foods when they were a child. The effects of perceived recollections of exposure to foods in childhood were measured by asking college students (subjects) and their parents to retrospectively report subjects' perceived frequency of consumption of foods in childhood (Wadhera et al, 2015). ‘Exposure’ in this study means the repeated consumption of a certain product. Subjects were asked to select one of three options concerning frequency of consumption of a certain food item: “I ate this frequently” (frequently eaten), “I ate this rarely” (rarely eaten), or “I never tried this” (never)” (Wadhera et al, 2015). The foods that were used to survey subjects in this study were 15 dairy products, 23 fruits, 22 vegetables, 15 proteins, 16 high carbohydrates, 14 high fats, and 27 high fat/high carbohydrate foods. Subjects reported currently disliking most vegetables and meats that they perceived they never tried or ate rarely during their childhood. These foods are typically rejected by younger children because of ‘neophobia’, the fear of something new, which typically peaks between 2 and 5 years of age (Cooke et al, 2003). There were some foods for which there were no differences in current liking based on childhood frequency of consumption. These tended to be sweet foods, such as ice cream, frozen yogurt, milkshake, M&Ms, and desserts, such as

mousse, pudding, and fruit tart (Wadhera et al, 2015). Overall, what contributed most to a lack of consumption, and a dislike of foods currently was a lack of consumption of these same foods during childhood. On average, children show a preference for novel food when exposed to that food eight to ten times (Bertino et al, 1986). This is the main reason that Bebenroth structures the mission of Spice Field Kitchen towards impacting the education of K-5 students. It is important to subside aversions to common healthy foods, if the child is not being exposed to them on a day to day basis at home. It is easy to not have aversions to common sweet, and over processed foods, which are common in the diet of children living in a food insecure home. Once these aversions are ingrained in the habits of young children, they are almost impossible to break. Spice Field Kitchen attempts to get ahead of the development of these habits, and introduce healthy eating and healthy food preparation to families living in food insecurity.

Bebenroth stresses the importance of utilization in resolving the issue of food insecurity. Realistically, a family who has lived their whole life in poverty will have limited knowledge on how to prepare the healthy foods that can be provided to them through non-profits and community gardens. In order to make a lasting change in the lives of people who suffer from food insecurity, we need to educate the youth living in poverty, so that they can help build up healthy habits in their households and their own lives. With these kinds of education programs, like Spice Field Kitchen, we can bridge the gap between food insecure families and healthy eating habits to create a more food secure world. In addition to in class lectures and cooking activities, Spice Field Kitchen can implement an on campus learning garden where students can learn where their food comes from, how to grow it, and the sustainable practices that go into growing fresh produce.

One hurdle that organizations like Spice Field Kitchen must overcome is how to provide these educational services to the schools, neighborhoods, and districts that need them the most, but have the fewest resources. One major way that many of these programs, such as Spice Field Kitchen, are funded is through thousands of dollars in grants. In 2021, over 150 thousand dollars of grants were funded to Spice Field Kitchen through organizations such as The Martha Holden Jennings Foundation, The Cleveland Foundation,



(Figure 19) Spice Field Kitchen - 2021 Total Income Breakdown (2021 Annual Report - SpiceFieldKitchen.org)

Wells Fargo, The Garden Club of Cleveland, RemotEDx, and the Truist Foundation (SpiceFieldKitchen.org). In addition to foundation grants, a large sum of Spice Field Kitchen's 2021 Total Income (*Figure 19*) comes from Direct Public Support, and Program Income. However, even with the substantial amount of grants that are given to Spice Field Kitchen and its annual income, it is still not enough to cover a whole year's curriculum for all school districts enrolled in Spice curriculum. A small portion of the cost comes from the school districts, which makes up the total Program Income. In order to give full access to school districts in low income areas, who may not have the same opportunities and resources as more affluent districts, a larger portion of the grant money is funneled towards the schools who cannot afford this program but need it the most. In order to reach a district like Cleveland Metropolitan Schools using Spice curriculum, with class sizes over five times larger, and even more families living near poverty, there would need to be a drastic increase in the amount of grant money funded to these kinds of programs and schools.

Educational initiatives, while not the primary focus, are a part of the functions of Nām Urban Mushroom Farm and Franklinton Farms. Both Nām Urban Mushroom Farm and Franklinton Farms have started their own educational initiatives in order to break barriers amongst food apartheid's. Nām offers school programs to young students where they learn how to grow their own mushrooms from recycled coffee grounds in their own home using the DIY Grow Kit. The educational program at Nām is designed and taught by director Carolina Goncalves (Goncalves, July 2022). Schools will have Nām come to their classrooms, or take trips to the farm to learn about the growing process, and will get to experience it firsthand through experimenting with the DIY Grow Kit.

Franklinton Farms has established the Patrick Kaufmann Memorial Learning Garden for students to come and learn about how to grow their own food, where their food comes from, and the reason why Franklinton Farms grows their produce. They also have a partnership with Franklinton Preparatory High School where students can participate in the Franklinton Farms Apprenticeship Program. If selected for this program, students will spend time at the farm each week learning about growing, harvesting, and cooking fresh foods with the Franklinton Farms education team. Franklinton Farms also offers an educational partnership to Franklinton residents called the Victory Garden Program. Sponsored by The Ohio State University, Buckeye Institution Supported Agriculture Program (OSU Buck ISA), The Victory Garden Program

works to provide Franklinton residents with access to ways that they can implement healthy living styles into their own homes. If homes are accepted into the Victory Garden Program, Franklinton Farms will provide families with year round mentorship in how to grow their own food, prepare it, and the materials to get their own garden started. Franklinton volunteers and employees will visit the homes that are accepted into the program, construct a raised garden bed in their backyard, and provide them with the seeds, winter covers, barriers, and anything else they may need to grow their own food successfully. Of course, with only a limited amount of funding from OSU Buck ISA, there is a limited number of homes that can be accepted to this program. There are over 30 houses in the Franklinton Community that have built these gardens in their backyard, with the assistance of Franklinton Farms. This is a great way to teach the neighbors of Franklinton how to continue on the journey of healthy eating past the first step of accessing freshly grown food.

Education about food sustainability and food utilization is an important part of reducing food inequality. For some organizations like Nām Urban Mushroom Farm and Franklinton Farms, where the purpose of their mission lies with providing access to healthy foods and growing foods sustainably, education tends to take a back seat in the overall picture of the organization. Both Franklinton Farms and Nām Urban Mushroom Farm express that they want to grow their education initiatives, in the coming years, but it may take more employees, more time, and more resources to develop it fully. While they don't revolve the entirety of their mission around education, the programs developed within Nām and Franklinton Farms are still effective. However, organizations like Spice Field Kitchen, who dedicate the entirety of their mission to the fulfillment of educational programs, are extremely effective in changing healthy food habits in young children and teaching families from around Northeast Ohio how to prepare healthy meals for their families. This is essential to fulfilling the fourth pillar of food security, and providing full knowledge of utilization to food insecure residents in low income communities. If organizations like Nām Urban Mushroom Farm, and Franklinton Farms can provide these residents with the proper access and availability to healthy foods, then organizations like Spice Field Kitchen can come and provide knowledge on utilizing these resources and all can provide ways to stabilize vulnerable communities who experience food insecurity.

Section IV - Limitations to Urban Agriculture

Although organizations like Nãm Urban Mushroom, Franklinton Farms, and Spice Field Kitchen are significantly important in resolving food insecurity and effects of climate change and rising greenhouse gas emissions, there are many limitations to these kinds of local organizations. One limitation is that the primary sustainer of these organizations are government funded grants, and partnerships with large corporations. Nãm Urban Mushroom Farm, although very successful, likely would not have the same growth or output that they produce today without their partnership with international coffee provider, Delta Cafês. The output and overall production of Nãm would be significantly less without the partnership with Delta. Delta Cafês provides, on average, 3 tons of coffee waste per month, which allows Nãm to produce on average 1 ton of mushrooms, and 4 tons of natural fertilizer (nammushroom.com). This amount of output would be severely impacted without the corporate partnership with Delta Cafês, which would limit the impact that Nãm can have within the city of Lisbon, when it comes to both the reducing of greenhouse gas emissions, and the local access to fresh produce.

The same limitation applies to non-profit organizations. Nonprofits like Franklinton Farms and Spice Field Kitchen are primarily funded through grants, given by larger organizations or government entities in the greater Cleveland and greater Columbus areas. These grants pay for the rent of properties, expansion of programs, salary for organization staff, and the overall functional budget of the organization. Without these partnerships or grants, it would be extremely difficult to make an impact in the communities that these organizations serve, or grow their organization to reach more citizens, and provide the necessary resources for impacted communities to grow and advance in the areas where they lack success and development. In addition, the amount of philanthropic donations and grants that are given to non-profits determine the amount of impact these organizations can have. If the amount of grants an organization received in a given year is less than the year before, then they won't be able to supply the full number of clients they did in the previous year. This impacts the organizations trust in the community, and the dependance community members have on these non-profit organizations. If an organization only receives a certain amount of donations that year, and it is not enough to sustain the programs they have put in place in previous years, they may have to pull back some of their programs in order to stay within the granted amount of money. In addition, all of these organizations have plans for the future. Nãm wants to expand to other cities

within Portugal, and eventually to other countries, such as Spain; Franklinton Farms wants to hire additional staff members to help expand their impact within Franklinton; Spice Field Kitchen wants to introduce their program in more school districts across Northeast, Ohio. However, these expansions cannot be completed without the money and the resources to do so. Therefore, the expansion of these organizations relies on the growing support from larger companies and organizations within the community, who support the mission of these non-profit organizations.

There are also significant limitations to the amount of impact urban farming organizations can have due to the limited amount of resources they are provided in an urban setting. For example, one advantage of large scale agriculture is that there is “infinite” room to grow, and therefore, large scale farmers can

outproduce any food supply that urban farmers create. Therefore, the amount of output for urban agriculture is limited to the amount that can be stored in the plots of urban land that are utilized for food production. Some additional constraints regarding land use and size are the price of rent for urban land plots, the restraints urban land can have on the quantity of food you can produce at an urban site, and the investment needed in order to retain the contract (*Table 4*). Another limitation of urban farming is that “urbanization has a negative effect on the crucial resources, such as water quality from urban runoff and air pollution” (Likitswat 2021). A majority of urban farms utilize tap water as a way to feed their crops because it is “clean and does not clog the irrigation system and is available in all seasons” (Likitswat 2021). However, this results in large costs towards city water distributors in order to pay for the clean, irrigated water they need transported to the site. This could cause costs

Resources	Operation	Opportunities	Constraints
Land	80% ownership	+ Low cost on land deposit + Can explore a variety of programmes depending on the size of the land parcels	– Changing context toward urbanism can have both positive and negative effects on the farm – Land price could be very expensive as compared to the profit from urban farming
	20% rental	+ Fast cash business model + Need to consider the right programmes and high market position value	– The rental fee could cost more depending on the landowner and the contract – Investment on a permanent structure could be wasted for a short term contract
Water	80% tap water	+ Clean and does not clog the irrigation system + Available in all seasons	– Needs stabilisation process if the chemical level (chlorine) is too high for watering plants – High cost and not matching quality of water for irrigation
	15% canal water	+ Free of charge water + Suitable quality of water for irrigation with some nutrients	– Difficult to control the quality in all seasons – Might have to switch to portable water if dealing with a drought or highly salinised water – Need to pump or transport to the site depending on the location – The use of a canal in the urban context as an urban catchment for runoff could lead to contaminated and poor water quality
	5% pond	+ Can be recyclable if planning for the right system + Can control water quality on site	– Requires large space for both retention and settlement ponds – Might not be suitable for contaminated land and porous ground for retaining freshwater
Greenhouse	95% steel structure, net wall, and flexible plastic sheet roof	+ Affordable cost + Flexible for part-by-part maintenance + Plastic can be reused for the other purposes in the farm after being taken out from the greenhouse	– Structure could be destroyed by strong winds or storms as it is light-weight – Net and flexible plastic sheet needs to be replaced within 2-5 years
	5% steel structure, net wall, and polycarbonate sheet roof	+ Polycarbonate roof can be used for a long term + Structure can be permanent	– Polycarbonate roof can trap more dust and thus needs to be cleaned often to keep the transparency quality for photosynthesis inside the greenhouse – This greenhouse will cost more than a regular greenhouse – There will be least waste from the greenhouse, as the material is durable for more than 10 years

Table 4 - Land, water, and greenhouse operation (Likitswat 2021)

to spike for farm owners. The other percentage of urban farmers utilize canal water, or pond water. Since urban agriculture is often located in the heart of busy urban areas, there is an increased likelihood that the water being used has been contaminated through the effects of urban runoff if canal water is being utilized for irrigation. In addition, these forms of water access are not available year round, which can impact the efficiency of urban farms in each season.

Although urban agriculture is intended to be an innovative way to grow fresh produce, there can also be issues with the structures that urban farms depend on. Nãm, for example, uses old shipping containers to serve as the home for the mushrooms while they are growing. Although this is a unique and innovative use of wasted materials, not all urban agriculture sites have the room to house such large objects for their crops – nor are these containers suitable for all kinds of produce. If other urban farms are utilizing any sort of artificial growth container or mechanism, 95% of the time, these will be a steel structure, a net wall, or a flexible plastic sheet roof (*Table 4*). Although these are affordable, flexible, and a way to reduce the amount of plastic waste we see, there are some limitations with these structures. There is a small risk that these structures may not last through tough winters and storms, in addition to their short life line of anywhere between 2 - 5 years. Although urban farming can be an innovative solution to the global problems of food waste, greenhouse gas emissions, and food insecurity, there are many barriers that urban farmers have to overcome in order to get their organization to be efficient, impactful, and resilient to fluctuations.

Section V - Conclusion

Environmental racism and the effects of climate change have disproportionately large impacts on low income and marginalized communities compared to wealthy, white communities. Effects of discrimination such as redlining are rooted in our history and continuously impact urban communities today. Food insecurity is an issue that affects communities and cities all over the world. These communities are also the most likely to be victims of environmental disasters and other effects of environmental racism. Organizations similar to Nãm Urban Mushroom Farm, Franklinton Farms, and Spice Field Kitchen have been established across the world to combat issues of environmental racism, food insecurity, and climate injustice. However, none of these organizations look the same. They don't target the same communities, they do not share the

same primary mission, and they target different combinations of the pillars of food security. Each organization has a different set of goals, and a different mission to achieve those goals.

Although there are limitations on the impact that these kinds of organizations can have within their community, there are also ways that they can maximize their efficiency. All of these organizations prioritize various parts of the environmental justice movement – Nām focuses on sustainability and the concept of the circular economy and waste reduction; Franklinton Farms focuses on community impact and helping redlined and struggling communities have access to healthy, affordable foods; Spice Field Kitchen focuses on the value of education and attempts to teach children ways of eating that are outside of their comfort zone, and turn their habits into healthy and consistent ones. One way that these organizations may be able to maximize their impact and their efficiency, is by collaborating resources to battle different areas of the same social and environmental problems. Similar to the partnerships that Franklinton Farms has with other urban farms within the greater Columbus area, through the Community Growers Network, if these kinds of organizations were to come together in a common area, they would be able to maximize their impact and help to aid in resolving the effects of food insecurity, climate injustice, and environmental racism in a singular community. All of these organizations are different pieces to the same puzzle, and when they are put together, they can more effectively battle the environmental, economic, and social injustices we see in our society today

Urban farming is one of many possible tools to solving the multilateral issue of food insecurity. Food insecurity exists as a result of centuries of historical discrimination, and environmental injustice. Climate Change is accelerating at a rapid pace across the world as a result of decades of fossil fuel use, and the waste and extraction of natural resources. Although the presence of nonprofits are important, they are not going to solve these global issues entirely. However, they are an essential step to aiding the urban communities of our world, and aiding in the resolution of these issues on a local and community scale. Although these organizations cannot completely ratify these issues in our world, they can bring urban communities one step closer to the equity and equality they need to succeed.

Acknowledgements

This project *How Urban Food Systems Can Help Battle Climate Change and Environmental Racism, Simultaneously: A Case Study*, examines the environmental and social injustices that exist in our global community, today. We introduce and unpack an inspiring, multilateral, and innovative system of growth that can make lasting change in the lives of our planet, and the people who inhabit it. In the Summer of 2022, I had the opportunity to intern internationally at an organization called Nãm Urban Mushroom Farm, located in Lisbon, Portugal. I spent 8 weeks living, learning, and working in Lisbon as the Production and Sustainable Development Intern for Nãm Urban Mushroom Farm. During this time, I was exposed to the completely new and exciting concept of urban farming, that I quickly grew an encompassing fascination with. I spent my days with Nãm assisting in the mushroom growth process, traveling to schools to give interactive lessons on how to grow your own mushrooms from coffee waste, interacting with Nãm staff and Lisbon customers at local markets, and seeing the growth and prosperity that lies with environmental ingenuity in Portugal.

Upon my return to the United States in August of 2022, I decided to take this interest and fascination and turn it into a research project of my own. I wanted to examine the history, the policy, the evolution of Urban Farming, and to explore how it is being replicated across the world. Through my research, I uncovered what seems to be a continuous effort of problem solving, innovation, and social impact that sits within what seems to be such a simple idea. Just one small idea, expanded, can solve multilateral social and environmental problems in our world, and change the lives of thousands of people world wide. Urban farming can help provide solutions for problems such as the influx of greenhouse gas emissions, excessive food waste, a lack of environmental and health education, food and income inequality, redlining, environmental racism, and many more. What seems like a simple idea on the surface, can tackle so many of our world's leading injustices each day – which is why I chose to pursue this research. In order to figure out how Urban Farming organizations are effective in battling issues like environmental racism, food insecurity, and excessive greenhouse gas emissions, we must first understand what these injustices are, and how they display in the United States, and internationally.

ENDNOTES

¹ Nam Mushroom Cultivation Process. After the collection of coffee waste from all nearby Delta Cafés locations, the grounds are delivered to the Famões production facility. The coffee grounds are first combined with straw and soil to make the base mixture for growth. This mixture is then heated at a temperature of around 170 degrees Fahrenheit for about 3-4 hours, to prevent any unwanted bacteria or contamination. After this mixture is heated, it is combined with bits of mycelium, which is the network of fungi that cultivates in order for mushrooms to grow. After the substrate is combined with the mycelium, this mixture is filtered into vertical, 10 liter bags, and hung up on a shelf to then be moved to the first stage of growth: Incubation. These bags of substrate will spend 3-4 weeks in the incubation period, awaiting for the cultivation of the mycelium in complete darkness. After the mycelium has cultivated within the bags, they are then moved to the fruitification chambers, where they will spend another 3-4 weeks growing. After they have spent 3-4 fruitifying into Oyster and Shiitake mushrooms, then they are harvested, and distributed.

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