

The Multiple Benefits of Urban Agriculture: Contexts and Contributions of a Modern Food Movement

Camille Oldani

Abstract. Urban agriculture has emerged as a solution to food insecurity and other issues faced by underserved communities in urban areas. This study compares four urban food initiatives to highlight differences in implementation and success across different agricultural practices. The study also examines the varying levels of support for these initiatives in the United States and Cuba. The comparison shows that different initiatives within the urban food movement meet a unique intersection of multifaceted societal needs beyond the main goal of hunger alleviation. The main intersecting social needs that urban food initiatives can address are food accessibility, public health, and sustainable development. Moreover, different forms of governmental or non-governmental support for these initiatives influence their success and the scope of their outreach. Broader implications of this study include the importance of utilizing urban food not only as a remedy to hunger and food insecurity problems but also as a way to address public health and sustainable development goals in cities. The main findings imply a necessity for local governments to include urban agriculture initiatives in sustainability and food security plans for cities to encourage sustainable development, health, and increased food access for city residents.

I. Introduction

In a global society that experiences pervasive rates of food insecurity and environmental degradation, urban agriculture has become an increasingly popular form of food production that can meet the needs of underserved communities in urban populations. Food production systems, especially urban food movements, have been shaped by the historical, social, and environmental contexts of their time. Today, hunger is understood through measurements of “food insecurity,” defined by the Food and Agriculture Organization of the United Nations as the “situation when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life” (Roser, 2020, p. 18). Across the world, one in four people—1.9 billion

people globally—are reported to be moderately to severely food-insecure (Roser, 2020). In the United States alone, 11 percent of the population was food-insecure in 2018 (Roser, 2020). Field agriculture is still the largest form of food production in the United States and in most countries worldwide, yet it remains a highly unsustainable system that has failed to serve billions of people who are undernourished. According to the Food and Agriculture Organization of the United Nations, in 2014, one-third of the world’s food—1.3 billion tons—was wasted as 800 million people were simultaneously reported to be “hungry” (Food and Agriculture, 2014). Urban agriculture is an alternative method of food production that can provide multifaceted solutions to urban communities facing high rates of food insecurity. The urban food production movement is evolving quickly and takes many forms, from

community gardens to multi-million-dollar vertical farming industries. With sufficient resources and planning, urban agriculture can provide efficient, sustainable solutions to alleviate hunger and reduce environmental degradation in areas with high rates of food insecurity.

Existing literature on urban agriculture examines the different types of urban food initiatives rising in popularity around the world and the various benefits these initiatives can provide to specific communities. This literature explains instances in which urban food initiatives can improve mental and physical health, community development, and food accessibility to underserved areas. However, the current literature does not compare or contrast the different types of urban food initiatives, the multifaceted effects of these initiatives, or their varying successes in reducing food insecurity among vulnerable populations. Furthermore, the literature fails to analyze which types of urban agriculture are most aligned with governmental goals and societal needs, and which forms of outside support are necessary to facilitate a successful urban food movement. Therefore, addressing this gap in research on intersectional effects and analyzing the factors that enable these initiatives to be viable allows urban populations to maximize the benefits of urban agriculture. This information can be utilized to assess the efficacy of different urban food initiatives and to predict which forms of urban agriculture are most appropriate for addressing varying social needs.

This paper will review the literature on urban agriculture in terms of its effects on food accessibility, public health, and sustainable economic development. The last section of the literature review will discuss research on the implementation and forms of support provided for urban agriculture. Then, the paper will discuss the background and context of four different urban food initiatives: the organopónicos movement in Havana, Cuba; the Nashville Food Project in Davidson County, Tennessee; the Restorative Justice Garden at the Missouri Department of Corrections; and AeroFarms in Newark, New Jersey. The intersectional goals and achievements of all four programs will be evaluated. Then, the outcomes of these initiatives will be compared and

contrasted to provide a better understanding of the contexts that give rise to the initiatives and the situations in which their benefits are most efficiently delivered to the intended communities.

The research questions addressed in this study are as follows: Which intersectional approach to urban food initiatives is being utilized by each program, and how does the approach work in terms of recruitment and effects? Furthermore, how does each urban food program connect with a specific social and cultural context? Lastly, what forms of support enable a program to be viable, and how can these initiatives be aligned with government goals?

II. Literature Review

This literature examines different implementations of urban food initiatives in cities around the world and analyzes these initiatives' influence on public health, economic disparity, and sustainability. Research on urban agriculture emphasizes how the necessity for food in urban areas can be addressed by intersectional, multifaceted solutions. Specifically, these studies survey urban farming initiatives that address societal needs through the intersection of food accessibility and public health, and food accessibility and development. This review will focus on the overlapping effects of urban food initiatives and hence include only studies that address multiple social issues.

Preceding an introduction to the literature, it is important to define central terms used in the topics discussed. Urban food initiatives as discussed in this research are based on the principles of "urban agriculture," which refers to a wide range of agricultural ventures within city limits (Brown, 2019). These ventures include community gardens, school gardens, horticultural education programs, restorative programs, and "entrepreneurial gardens," where produce is grown for retail marketing (Brown, 2019). "Organopónicos" is a term used in this research to refer to a system of urban agriculture that originated in Cuba (Altieri et al., 1999). This agricultural technique uses completely organic methods, such as growing crops between low concrete planters filled with organic matter and soil and installing drip irrigation on the

surface of the beds (Altieri et al., 1999). “Vertical farming,” a term referred to in the AeroFarms case study, is the urban cultivation of produce and grains within a high-rise building or an urban center, with multiple floors designed to accommodate different kinds of crops. Another method used in the AeroFarms case is “aeroponics,” the process of growing plants by feeding their bare, suspended roots with a fine nutrient mist (Thomaier et al., 2014). Finally, AeroFarms uses “Zero-Acreage Farming,” also known as ZFarming, to describe urban farming projects that exist in and on urban buildings, including open rooftop farms, rooftop greenhouses, and indoor farming (Thomaier et al., 2014).

Urban agricultural initiatives are used to alleviate hunger in areas known as food deserts. The term “hunger” has various connotations, but for research purposes, can be viewed through the sub-categorical terms of “food insufficiency,” defined as “an inadequate amount of food intake due to lack of resources” and “food insecurity,” the fear of not having access to enough food (Brown & Jameton, 2000, p. 20). In the 1990s, an estimated 2.4 million to 5.5 million children under the age of 12 were reported to be hungry each year (Brown & Jameton, 2000). “Food deserts” are defined by the United States Department of Agriculture as urban residential areas that are further than a quarter-mile distance from a supermarket that shelves healthy food choices. In rural areas, this parameter is 10 miles (Brown & Jameton, 2000). Food deserts contribute significantly to the social determinants of health and are more prevalent in low-income neighborhoods of color (Alkon & Agyeman, 2011).

A. Food Accessibility and Public Health

There is a dynamic relationship between urban food initiatives and community organizing for public health in urban areas. The literature examines community gardens, prison gardens, and garden-to-school lunch programs on their impact on restorative justice efforts and community development, as measured by improvements in physical and mental health (Pudup, 2008).

There is an established connection between prison garden programs and increased nutritional health and mental health in prison populations

(Pudup, 2008). Prison gardens can increase inmates’ physical activity, provide healthier food options, and develop their professional skills. Prison garden programs are inexpensive to operate and have proven effective in increasing self-esteem and decreasing the effects of mental illness in prisoners (Jenkins, 2016).

Another example where the connections between gardening and public health are recognized is the school garden. School gardening programs have been connected to increased nutritional awareness and healthy food choices in young children (Libman, 2007), and the programs have also reduced food insecurity within underserved public schools in certain communities (Laird, 2013).

B. Food Accessibility and Sustainable Economic Development

This section reviews studies of food initiatives that address economic disparity in urban communities, either by producing food for underserved communities or by providing employment in economically depressed areas. Existing studies combine environmental justice, sustainable agriculture, critical race theory, and food studies to highlight the ways that racial and class inequalities permeate the food system, from production to distribution to consumption (Allcott et al., 2019). Allcott et al. discuss the tendency of high income populations to eat more nutritionally balanced diets than low income populations in the United States. Food deserts are also most prevalent in low income neighborhoods. Allcott et al. establishes a “meaningful nutrition-income relationship: households in the top income quartile buy groceries that are 0.56 standard deviations more healthful than the bottom” (Allcott et al., 2019).

Another strand of the literature on gardening and food access examines alternative urban food approaches in other countries that successfully meet the economic needs of underserved populations. For example, studies of Cuban’s agricultural revolution recount the immense harvests of fresh produce sourced throughout the city from Havana’s urban gardens, which have yielded enough food to feed the city’s entire population (Altieri et al., 1999).

An additional concept addressed in this

literature is the effect of urban food initiatives on sustainable development in cities. Urban food initiatives explore alternative methods for farming within urban landscapes. Al-Chalabi (2015) examines the feasibility of vertical farming in cities to address population growth in urban centers across the world. The study examines how relevant stakeholders view vertical farming and addresses the current barriers and opportunities surrounding the implementation of vertical farming in the U.S. (Altieri et al., 1999).

C. Implementation and Forms of Support

This section of the literature discusses the different methods of implementation and varying levels of support for urban food initiatives. Research on farm initiatives in cities identifies an interconnectedness between public health and community food production across all locations studied and creates room to examine the potential of these urban food initiatives to be further adapted and developed by the community and by governmental actors (Egli, Oliver, & Tautolo, 2016).

There is an increasing trend of health professionals, urban planners, environmentalists, community organizers, and policymakers that value urban agriculture as a mechanism to support economic development, green spaces, and increased food access for urban populations. Brown and Jameton (2000) report that current funding for urban agriculture projects in the U.S. comes from various sources, including government agencies, foundations, entrepreneurs, and philanthropic donors. In 2020, the USDA announced it would designate \$3 million for urban agriculture grants through its new Office of Urban Agriculture and Innovative Production. The USDA states the grants are intended to develop urban food initiatives and innovation in sustainable agriculture (USDA, 2020). This funding for urban food initiatives is directed toward “program planning projects,” which support various stakeholders such as farmers, government officials, and schools to initiate projects that target areas of food access, education, or economic and urban development. Funding is also directed toward “implementation projects,” which “accelerate existing and emerging models of urban, indoor, and other agricultural practices that serve multiple

farmers” to improve food access and support new technologies and innovations in urban food production (USDA, 2020, para. 5). Occasionally, funding for urban food initiatives is also given through grants or loans from the Health and Human Services Community Development block grants or other independent funders (Brown & Jameton, 2000). In 1997, the Community Food Security Act was created by the USDA to give grants to nonprofits that focused on increasing food access in impoverished areas (Brown & Jameton, 2000). Studies also heavily emphasize the importance of involving the community in decision-making, including aspects such as intervention design, site and product selection, distribution models, and the need to reconsider the problem of access in rural areas (Ramirez, Diaz, & Valdez, 2017).

D. Assessment of Gaps

The existing literature on urban agriculture examines the effects of individual initiatives on communities but fails to trace larger trends in the implementation and varying successes of urban food initiatives in their goals of meeting societal needs. Furthermore, the literature does not adequately determine how international successes in large-scale urban food production can be applied to underserved communities and food deserts in the United States.

III. Research Methods and Results

The four initiatives discussed in this paper address the issue of food accessibility in urban environments. The information for each of these case studies was collected from scholarly journals, online news articles, government websites, and direct program websites. Each of these initiatives also addresses additional food-related issues through different intersectional approaches. The organopónicos movement in Havana, Cuba served as a leading example of sustainable urban farming for the world by utilizing innovative sustainable farming techniques to feed the population with government support (Rapid Transition, 2019). The Nashville Food Project is a nonprofit that operates several different methods of urban food production and donates nutritional meals to vulnerable

populations in Davidson County, Tennessee (Nashville Food Project, 2020). The Restorative Justice Garden is a program run by the Missouri Department of Corrections that equips prisoners with professional skills in volunteer-run gardens that produce food for local charities (Missouri Department of Corrections, 2020). AeroFarms is a business startup in Newark, New Jersey, that utilizes highly efficient vertical farming methods to grow affordable produce that is sold commercially throughout the state (Hughes, 2015). These cases all include mission statements related to food accessibility, but each program has a different approach to meeting its community's needs. In each case, the history and background of the program are provided along with the main findings and relevance to the three research questions.

A. Organopónicos in Cuba

i. Background

The first case focuses on urban food production and the organopónicos movement in Havana, Cuba. During “the Special Period” of the Castro administration, Cuba’s economy spiraled downward as the country lost 80 percent of its international trade in under three years (Atwood, 2017). The island’s 10.66 million inhabitants suffered a scarcity of practically every basic item they depended on for survival (Atwood, 2017). Among the most devastating absences in Cuba was the widespread lack of food: “The United Nations Food and Agriculture Organisation (UNFAO) estimated that the average Cuban’s daily calorie intake plunged from 2,600 in the late 1980s to between 1000 and 1500 by 1993” (Rapid Transition, 2019, para. 2). Growing food insecurity throughout the island forced Cubans to rethink high-input farming methods in order to feed the population (Atwood, 2017).

ii. Main Findings

The solution to the food production problem in Cuba emerged from a unique type of urban organic farming in Havana, termed organopónicos, or “organoponics.” Co-operatives were created to oversee the transformation of unused spaces and vacant lots within Havana into high-efficiency farming plots (Altieri et al., 1999). The rise of

an alternative food production system in Cuba consisted of urban farms run on the organoponic principles of diversification, recycling, local resource use, and the elimination of chemical pesticides and synthetic fertilizers (Altieri et al., 1999). Cuban organopónicos utilizes organic substrate obtained from crop residues combined with recycled household waste and animal manure (Altieri et al., 1999). An organoponic garden uses recycled materials such as wood, stone, bricks or concrete. Poor quality soil is amended with the addition of organic matter, which increases its levels of nutrients and moisture (Altieri et al., 1999). To establish reliable soil nutrients, a program operated by the Cuban government began facilitating the production of compost, green manure, vermicompost, bio-fertilizer, and liquid fertilizers for use in the organoponic gardens (Rapid Transition, 2019). This government program also “links gardeners to sources of manure, such as livestock production units, crop and household wastes, and even agro-industrial residues such as coffee husks and sawdust” (Rapid Transition, 2019, para. 5). Cuba’s subtropical temperate climate, combined with drip irrigation methods, crop rotation, “integrated pest management,” and oxen-pulled plows, allowed urban gardens to yield vegetables in every season of the year, with “yields of up to 20 kg per square meter” (Rapid Transition, 2019, para. 6). In comparison, mixed stand small-scale agriculture in the United States generally produces an annual yield of only 2.44 kg per square meter (Rabin, Zinati, & Nizsche, 2012).

Cuba is unique in that it accounts for only 2 percent of the Latin American population but is home to 11 percent of its scientists (Altieri et al., 1999). As a consequence, the response to the challenge of food scarcity was met by Cuban farmers, botanists, engineers, and intellectuals across many other realms, who dedicated their expertise to experimenting with alternative agricultural technologies to reinstate agricultural productivity (Altieri et al., 1999). In 1996, urban farms in Havana produced 8,500 tons of fruits and vegetables, 4 million dozens of flowers, 7.5 million eggs, and 3,650 tons of meat, enough to sustain Cuba’s population during the Special Period without foreign food imports (Altieri et al., 1999).

By the mid-1990s, Havana contained 25,000 urban allotments run by cooperatives and families that produced food for the city's population (Altieri et al., 1999). The grassroots movement was initially sustained by community organizations, such as the Cuban Women's Federation and the block committees, who supported urban gardens by providing access to land (Altieri et al., 1999). However, the organopónicos and urban food movement quickly caught the attention of the Cuban government, which began acting to incentivize self-sufficient food production as the solution to Cuba's hunger crisis. In 1994, the Ministry of Agriculture and the Provincial Office of Poder Popular created the Urban Agriculture Department to provide services and material resources for urban garden operations throughout Cuba (Altieri et al., 1999).

iii. Research Question Evaluation

Cuba's organopónicos movement is an approach to urban food initiatives that meets the intersection of the issues of public health, urban development, and food accessibility. In terms of public health benefits, food gardens in Havana take up 8 percent of the land and produce 90 percent of its fruits and vegetables. This has helped to supplement Cubans' calorie consumption, which had fallen to a mere 1000 per day. Cubans now have a calorie consumption comparable to average citizens of the UK (Brown, 2019). Additionally, there is evidence that the extra physical exercise that urban gardeners get from working their land, in addition to the increased time spent outdoors in the open air, provided additional benefits to their health (Rapid Transition, 2019).

In respect to urban development, organic food production has significantly reduced fuel costs in Cuban agriculture: "The fuel cost per tonne of organic vegetables offers enormous savings: \$0.55 per tonne, compared to a fertilizer cost of \$40 per tonne under conventional agriculture, representing a total saving of \$39.5 million. The cost of pest control is also reduced—from \$2.8 million to US\$300,000—by using biological control agents and biopesticides" (Rapid Transition, 2019, para. 8).

The urban food movement in Cuba has also been viewed as a pioneering example of sustainable

self-sufficiency in the face of widespread food-insecurity. The organopónicos movement emerged from the severed tie between Cuba and the Soviet Union and the standing United States trade embargo, which gave rise to the need for an alternative food system to feed Cubans lacking imported goods or fertilizers to supplement their diets (Koont, 2008).

In addition to pioneering techniques in sustainable food production, principles of the organopónicos movement have become funded by government initiatives to continue urban food production in Cuba into the present day. The Urban Agriculture Department was created by the Ministry of Agriculture in response to the success of the grassroots movement of organoponic farming in cities (Koont, 2008). There was a major alignment between the success of the urban farming movement and the government's desperate efforts to solve the hunger crisis. As a result, the Urban Agriculture Department was created to enable organoponic farms and gardens to continue producing food by helping farmers to secure land use rights in cities and by providing material supplies and resources for these farmers (Koont, 2008). The decentralization of land access by the government has allowed for a rapid sustainable transition of vacant lots and unused spaces into urban farms and gardens (Altieri et al., 1999). Not only does this solution meet the food accessibility needs of Cuba's citizens, but it also significantly reduces costs of production for the government and secures a sustainable, self-sufficient method of feeding a country without heavily relying on limited resources and imports.

B. The Nashville Food Project

i. Background

The second case discussed in this study is the Nashville Food Project (TNFP), an urban agriculture nonprofit based in Davidson County of Nashville, Tennessee, U.S. In 2012, Davidson County reported that 17 percent of residents are moderately food insecure, while 20 percent of the population participates in the Supplemental Nutrition Assistance Program. Concurrently, around 25 percent of available food in Davidson county fails to reach food-insecure residents each year, instead ending up in landfills (DeVillie, 2012).

The poverty rate in Davidson County in 2019 was 16.9 percent (Data USA, 2020).

TNFP addresses food insecurity in Davidson County by producing, preparing, and distributing food to low-income and homeless populations via community meals and food trucks (TNFP, 2020). TNFP has three service-oriented components. First, the organization owns and operates a system of “production gardens” in the greater Nashville area. The three production gardens supply over 25,000 servings of organic fruits and vegetables and also host a variety of perennial fruit trees, bushes, herbs, and flowers. Volunteers with the organization facilitate the operation of the and maintenance of the production gardens by turning soil, planting seeds, weeding, and harvesting fresh produce. The ingredients produced by the Nashville Food Project’s production gardens are shared with over 30 local nonprofits and community groups to help feed local residents. Second, the nonprofit operates two industrial kitchens in Nashville where volunteers wash, prepare, and cook ingredients sourced from the production gardens. The food prepared in these kitchens comes from both the production farms and “food recovery efforts.” Third, TNFP distributes prepared meals via food trucks, community groups, and local poverty-disrupting nonprofits, to a geographically and racially diverse group of neighborhoods each week (TNFP, 2020).

ii. Main Findings

The nonprofit relies on donation partnerships with local grocers, farmers, markets and restaurants to supply ingredients for daily meals (Justus, 2012). These donations, known as food recovery efforts, mitigate the necessity for food in underserved communities and the widespread food waste that takes place in restaurants, grocers, and other organizations on a daily basis (TNFP, 2020). TNFP prepares daily three-course meals with fresh and local foods and even hosts celebrity chefs and community fundraisers to ensure the quality of the food produced in the organization’s kitchens meets their goals of diminishing the effects of nutritional deficiencies in Davidson County’s food deserts (Justus, 2012). TNFP also collaborates with 26 poverty-reducing organizations, including the Young Men’s Christian Association and the Young

Women’s Christian Association, to distribute its meals to local populations experiencing food insecurity (Nashville Food Project, 2020). Additionally, TNFP supports a variety of service programs in schools, job training sites, ESL classes, and emergency shelters (Justus, 2011). The gardens also serve as demonstration sites for volunteers, staff, and community members to exchange knowledge about growing, cooking, and enjoying food (TNFP, 2020). TNFP adds that “these garden spaces function as outdoor classrooms, urban sanctuaries, and community centers for the families and individuals who grow in them...we provide land, water, shared tools, and educational opportunities to deepen existing knowledge or skills” (TNFP, 2020, para. 1).

iii. Research Questions and Evaluation

TNFP takes an intersectional approach to urban food programming that addresses both food accessibility issues and public health needs. This approach includes not only the production and distribution of meals to underfed communities within Nashville but also the education of communities involved in the organization’s three community gardens (TNFP, 2020). Furthermore, the organization works to ensure that meals provided to those with low food accessibility are nourishing and healthy, which helps to lessen the nutritional deficiencies suffered by many residents living within Davidson County’s food deserts (Stout, 2015). In 2019, TNFP shared over 5,000 nutritious meals and snacks each week with the city’s most vulnerable residents, including elderly and low income populations (National Benevolent Association, 2019). The community engagement that is fostered by the Nashville Food Project’s production, preparation, and distribution phases has led to an increased community awareness of the methods of organic food production (Justus, 2012). TNFP also brings together community members from different racial and socioeconomic demographics through its diverse outreach in every phase of its urban food production process. TNFP’s support for school programs, English as a Second Language classes, and job training also strengthens the intersectionality of the organization’s approach to urban food programming as a solution to

overlapping problems associated with poverty, hunger, and resource disparity in cities (TNFP, 2020).

TNFP's urban food programming is connected to a historical and social context of widespread resource and wealth inequality in Davidson County, which often falls along socioeconomic and racial-ethnic lines (Reicher, 2019). An important aspect of Nashville's struggle with food insecurity is its rapid population increase, which peaked at a nearly 2 percent annual growth rate from 2012 to 2015 (World Population Review, 2020). Although population growth in Nashville and Davidson County has been slowing in recent years, it is estimated that an average of 83 people per day still moved to the region between July of 2017 and July of 2018 (Reicher, 2019). The increased population in Nashville has brought associated problems of resource inequality, gentrification, and displacement of low-income residents (Reicher, 2019). These issues tend to decrease the socioeconomic status of marginalized communities, which increases the likelihood of vulnerable citizens living in a food desert or struggling to afford nutritious foods.

TNFP receives support from foundations, congregations, and corporate donors who financially contribute to TNFP's mission to alleviate hunger in the Nashville area (TNFP, 2020). TNFP is an independent 501(c)3 organization that relies on donations from individual donors and fosters "mutually-beneficial partnerships" with corporate and foundation contributors. Among these donors are First Tennessee, Enterprise, Wells Fargo, Vanderbilt University, Sprouts, and Whole Foods (TNFP, 2020). Although TNFP does not receive government funding, its initiatives do align with several of the city's sustainability goals for 2020 (Livable Nashville, 2017). Namely, the city of Nashville's most recent draft of sustainability strategy aspires to reduce food waste by 10 percent and recommends an increase of "work with the local philanthropic sector to encourage strategic, environmentally-focused giving" (Livable Nashville, 2017, head. 4). With further coordination, the work done by TNFP could be recognized by the local government as a method of meeting the city's sustainability goals. In turn, funding sourced from

government actors could enable TNFP to expand its outreach and production capabilities in Davidson County.

C. Restorative Justice Garden

i. Background

The Missouri Department of Corrections hosts urban food initiatives in the form of Restorative Justice Garden programs in several prisons across the state. In these programs, prisoners volunteer to work in community gardens located in prison yards (Missouri Department of Corrections, 2020). In the Restorative Justice Gardens inmates learn career skills and food production techniques that empower them with professional opportunities in sectors such as farming, food science, and horticulture (Ellgren, 2019). While working at the Restorative Justice Gardens, inmate volunteers construct and maintain irrigated gardens that yield fruits and vegetables that are donated to organizations that feed urban Missourians from low socioeconomic backgrounds. The program gives inmates a chance to gain job skills in the realm of horticulture that can connect them to future employment opportunities upon their release (Missouri Department of Corrections, 2020). According to inmate Jonathan Leaks of the Southeast Correctional Facility in Charleston, Missouri, the positive experience of working in the Restorative Justice Garden program is "what redemption looks like" for many of the program's participants (Missouri Department of Corrections, 2020, head. 3). Moreover, the Restorative Justice Garden provides volunteers with connections to educational opportunities like the horticultural apprenticeship program at the high-tech greenhouse at Amanzi Farms in Sikeston, Missouri (Ellgren, 2019). The apprenticeship at Amanzi Farms offers a "paid opportunity for low-level offenders to nurture a career in horticulture" (Ellgren, 2019, para. 2).

ii. Main Findings

Alongside their mission to empower inmates with professional skills, the Restorative Justice Garden program also addresses hunger needs in the surrounding communities of Missouri (Jackson, 2013). The Restorative Justice Gardens across the state donated a record of 163 tons of food to local shelters in 2013 (Jackson, 2013).

According to a report by the Columbia Tribune, the Northeast Missouri Correctional Center in Bowling Green was the department's top producer in the 2013 harvest, with over 62,000 pounds of produce donated. The second-largest donation contributed 49,100 pounds, the third over 47,400 pounds. Additionally, the Moberly Correctional Center donated 5,000 plants to local food pantries. The Restorative Justice Gardens are in operation at 20 of the 21 adult institutions in Missouri's state correction system as well as three of the community supervision centers (Jackson, 2013).

The impact of the Missouri Department of Corrections Restorative Justice Garden programs indicates the garden's positive effect on inmates' mental and physical health. The food donations sourced from these gardens also have a significant effect in addressing the hunger needs of Missouri citizens with poor access to food (Jackson, 2013). In terms of the program's effect on prisoners' well-being, inmate volunteers James Kain, Toby Dunlap, Josh Rupe, and Floyd Jones from the Boonville Correctional Center's Restorative Justice Garden praise the program's positive impact on their "motivation, physical fitness, mental health, memories, and faith" (Polanksy, 2018, para. 11). Many of the benefits described by inmate volunteers at this garden are derived from the practice of giving back to the community through the program's high-volume food production and donation to local organizations (Polanksy, 2018). Inmate Floyd Jones remarks his love for "the freedom the garden affords him in a place where freedom is scarce" (Polanksy, 2018, para. 7).

According to the Department of Corrections Twitter site, prison inmate volunteers and staff work to produce up to 163 tons of produce a year to donate to food banks, shelters, senior centers, schools, and other organizations throughout the state. The Southeast Correctional Center in Charleston, Missouri produced 163,000 meals harvested by prisoners from their garden program in 2019, an amount sufficient to feed 477 children in Missouri for one year. The same program raised over \$11,000 to fund future garden programming in 2019 (Missouri Department of Corrections, 2020).

iii. Research Question Evaluation

By using prison gardens to benefit both inmates and the community, the Restorative Justice Garden program addresses the intersection of food accessibility, development, and the health of prisoners, which is often overlooked. The Restorative Justice Garden donates all of the food yielded from prison gardens to hunger-alleviating organizations that increase food accessibility for vulnerable populations in Missouri (Jackson, 2013). The program also helps with inmates' job-preparedness by equipping volunteers with professional gardening, landscaping, and horticultural skills for life post-incarceration. Job training through the Restorative Justice Gardens fosters greater development for the disproportionate number of convicts residing in the state of Missouri (Missouri Department of Corrections, 2020).

The demographics of Missouri's population are significant in their contribution to the historical and social context of the State Department of Corrections' urban food production initiative. Missouri has an incarceration rate of 859 per 100,000 people (including prisons, jails, immigration detention, and juvenile justice facilities), a rate that has increased dramatically over the last 40 years. Missouri's rate of incarceration stands out as one of highest in the world, surpassing the overall rate of incarceration for the United States and many other wealthy democracies across the world ("Prison Policy Initiative," 2018). The Restorative Justice Gardens arose in part to prepare Missouri's disproportionately large prison population for more successful lives post-incarceration (Missouri Department of Corrections, 2020). Missouri's high incarceration rate coincides with a high rate of food insecurity. The Missouri Hunger Atlas, issued by the Missouri Interdisciplinary Center for Food Security, reports that in 2019, "nearly one in seven individuals lacked reliable access to sufficient quantity of affordable, nutritious food, with the most vulnerable populations including children and the elderly" (Rice, 2019, para. 2).

The Restorative Justice Gardens operates with the support of donations and "without the assistance of tax dollars" (Jackson, 2013). As noted above, the seeds and plants used in the prison gardens are donated to the institutions from independent

sources (Jackson, 2013). A 2018 report by the Department of Health and Senior Services urged the government to fund a greater number of hunger-alleviating initiatives to offset the pervasive rates of food insecurity among the elderly population in Missouri (Bax, 2018). Although state government actors have advocated for increased funding for urban food initiatives like the Restorative Justice Gardens, there has not been any action on the part of the government to expand the scope of these initiatives through government funding or support.

D. AeroFarms

i. Background

AeroFarms is a startup company that develops, owns, and operates indoor vertical farms at several locations in the United States and across four continents (AeroFarms, 2020). AeroFarms produces food via highly efficient vertical farming practices that utilize aeroponics, LED lights, and reusable organic cloth substrate to produce crop yields that are 390 times higher per square foot than traditional outdoor agricultural methods. AeroFarms was originally founded by Edward Hardwood in 2004 in the Finger Lakes area of New York (“New \$30 Million,” 2015). In 2015, the company later moved to Newark, New Jersey, where it now hosts its global headquarters and the world’s largest indoor farm, sized at 70,000 square feet (AeroFarms, 2020).

ii. Main Findings

AeroFarms demonstrates several environmental benefits of vertical farming, including a 95 percent decrease in water usage compared to traditional farming, a yield 390 times higher than field-farmed harvests, and a 98 percent reduction in the greenhouse-gas emissions that are typically associated with transportation of food from traditional farms (AeroFarms, 2020). Furthermore, the company can grow certified non-GMO produce year-round at commercial scale without the use of pesticides, producing up to 2 million pounds of food per year at its headquarter farm located inside a former steel mill in New Jersey. AeroFarms locates its vertical farms along major distribution routes near population centers to reduce transportation costs and emissions (AeroFarms, 2020).

The urban location of these vertical farms allows consumers who would not normally have access to high-quality products to buy AeroFarms’ vegetables in produce sections of local grocery stores and/or via the company’s prepaid food delivery service, without the environmental cost of transportation (AeroFarms, 2020). AeroFarms also operates a 50 square foot “school farm” at the Phillips Academy Charter School in Newark, where “students gain access to fresh, healthy food that can be hard to find in parts of their city, along with a deep connection to how food is produced and why methods matter,” (AeroFarms, 2020, head. 5). The company claims to have a commitment to community through its support of Fair Wages and Local Hiring (AeroFarms, 2020). Margaret Anadu of Goldman Sachs Urban Investment Group praises AeroFarms’ vertical farming practices, claiming they will “help boost the local economy, promote healthy food options locally, and support environmental sustainability...the project will also create high-quality, accessible local jobs...an important step in the continued revitalization of the Ironbound neighborhood” (“New \$30 Million,” 2015, para. 8).

iii. Research Question Evaluation

The technology and sustainability initiatives at the AeroFarms startup address the intersection between food accessibility and development. In terms of food accessibility, AeroFarms is innovating more resource-efficient and strategically placed urban food production centers that decrease environmental harm and increase food accessibility at cheaper prices for urban residents of New Jersey (AeroFarms, 2020). In terms of development, AeroFarms has been praised for its creation of new job opportunities and their utilization of empty warehouses in Newark is a form of sustainable innovation that has reinvigorated the city’s economy and made use of abandoned spaces in the city (Hughes, 2015).

There are significant historical and environmental contexts surrounding AeroFarms’ mission and primary operation in Newark, New Jersey. As AeroFarms’ website recognizes, “25 percent of the world’s land is now highly degraded, with soil erosion, water degradation and

biodiversity loss. Arable land is a precious resource and as soil health depletes, so does the nutrition of our food” (AeroFarms, 2020, head. 4). In response, AeroFarms has developed vertical farming methods where crops are grown using less than 1 percent of the land required for traditional agriculture. They are given nutrients through a fine mist that reduces water consumption and ensures food can be grown year-round (AeroFarms, 2020). Considering the rapid growth of the human population along with the rapid degradation of land associated with the consumption of resources necessary for traditional agriculture, vertical farming may address many of the environmental limits and unsustainable problems associated with field-grown food production.

Furthermore, AeroFarms’ methods have a significant link to the local economy and history of its headquarters located in the Ironbound section of Newark, New Jersey. Starting businesses in Newark can be significantly cheaper than in other parts of the United States, largely due to a history of environmental pollution in the city—especially in the Ironbound neighborhood. The Ironbound is an urban neighborhood of Newark with a legacy of ethnic diversity and a heavy influence from the presence of the metalworking industry in the area during the 19th and 20th centuries (Lasky 2017). The endorsement of 30 million dollar AeroFarms project in the Ironbound neighborhood has been seen by many as a step toward providing increased access to nutritious food for urban residents in the area (Hughes, 2015).

AeroFarms is partnered with RBH Group, LLC, a financing and real estate development operation based in New Jersey with a mission of fostering urban redevelopment throughout the United States (“New \$30 Million,” 2015). AeroFarms’ projects are also funded by 10 large financial partners, including Goldman Sachs Urban Investment Group, Prudential Financial Inc., Ikea, ADM Capital, and Mission Point Capital Partners (AeroFarms, 2020). AeroFarms is the first and only agriculture company to be honored by the Ellen MacArthur Foundation for its focus on reducing wasteful practices and leaving a positive, sustainable impact on the environment (AeroFarms, 2020). In addition, AeroFarms is supported by governmental actors in the city of Newark and by the New Jersey

Economic Development Authority who are eager to see Newark revitalized as a hub for economic growth and sustainable innovation (“New \$30 Million,” 2015).

IV. Summary and Discussion

With respect to the issue of intersectionality, the three issues addressed in the organopónicos movement were food accessibility, development, and public health. All of the cases studied in this research addressed an intersection of at least two of these three issues. For instance, the Missouri Department of Corrections Restorative Justice Gardens program addressed the issue of food accessibility through food donations to local charities and other hunger-alleviating organizations, but it also addressed the issue of economic development by preparing prisoners with job skills. Because of the program’s dual functions, it meets the intersection of food accessibility and development.

Historical and social context also has a significant influence in each of the cases discussed. In comparison of all four case studies, the social necessity for alternative modes of food production gives rise to the creation of these urban food initiatives. Food accessibility is the common social problem that each case addresses in some part of its mission. For instance, in the AeroFarms case, the location of the company in Newark addressed the social need for economic stimulation and sustainable business in Newark and also provided a cheap and healthy source of food for people in New Jersey residing in urban areas and food deserts. The history of environmental degradation and economic depression in Newark combined with a demand for nutritious and accessible food gave rise to local support for an environmentally conscious, urban, food business like AeroFarms. Similarly, the organopónicos movement was largely a success because it solved the pressing hunger crisis in Cuba while also providing sustainable development within the food production system by decreasing costs and increasing yields in Cuba’s agricultural system through the transition to organic farming methods. The social and historical contexts of each urban food program play a significant part in the

program's creation and success. These initiatives efficiently address more than just the necessity for increased food access in their respective locations. The social need for an urban food movement in the four case studies included in this research was met by a multifaceted urban food program that successfully addressed multiple intersecting issues associated with hunger.

Also notable in this comparison of cases is the contrast between high support from government agencies and non-government actors versus low or absent support. Those initiatives with government backing and/or financial support, such as organopónicos in Cuba and Aero-Farms in New Jersey, also operate on a larger scale with a greater impact on their surrounding communities. One explanation for this is that AeroFarms is a private, for-profit company, and organopónicos serves the community as a whole, while smaller-scale initiatives conducted by Nashville Food Project and Restorative Justice gardens operate as nonprofits which direct their services specifically towards marginalized communities. Because Nashville Food Project and the Restorative Justice Gardens are intended to serve specific niche communities within their urban settings, they might receive a lower amount of government aid and financial partnership. AeroFarms and the organopónicos are able to broaden the scope of their outreach in comparison to programs that receive funding from smaller stakeholders. Although all four initiatives were created in response to pressing social needs, the urban food initiatives that found ways to decrease the costs of agricultural production (like the organopónicos movement) or brought economic stimulation to an area (like AeroFarms) received more government support than the initiatives that did not provide direct financial benefits through their operation. These findings indicate a relationship between the economic viability of an urban food program and its ability to align with government goals and receive government funding.

Findings from this research suggest that social necessity alone is not a strong enough factor to guarantee the success of an urban food movement. Countless urban communities face high rates of food insecurity and an estimated 23 million people still live in food deserts across the United States

(Tulane, 2018). Although the social need for urban agriculture surely exists in these populations, only a portion of these communities have experienced successful urban food movements as a response to pervasive hunger rates. Although the ability of an urban food program to address multifaceted needs is an important aspect of its operation, urban food initiatives should consider aligning themselves with economic and government needs in order to expand their scope and receive more funding.

V. Conclusion

This study analyzes different urban food initiatives to understand how these initiatives arise amidst different social contexts and climates, and how these initiatives are specifically beneficial for urban populations with unique intersections of needs. Understanding the differences in implementation, context, and support for urban food initiatives may allow for a better systematic application of practices to best suit the needs of a community. The findings of this study indicate that the scope of urban food initiatives is affected by their social and historical context, implementation, and ability to meet an intersection of multifaceted social needs such as public health, development, and food accessibility. Furthermore, support for an urban food initiative is in part related to the program's ability to provide financial benefits to its community or government. For instance, the urban food movement in Cuba experienced widespread success compared to its counterparts in the U.S. due to the historical context of the Special Period and the intersectional relief the organopónicos movement provided during the nation's economic and food insecurity crisis. Although still in its beginning stages, the AeroFarms startup in New Jersey has also experienced significant support as an urban food program by fulfilling an intersection of economic and social needs in Newark by stimulating the economy in the Ironbound neighborhood and providing sustainable and affordable produce to the local residents.

This study gives rise to further unexplored areas of research on marginalized community stakeholders' goals and priorities in terms of food accessibility, health, development, and other social

issues associated with hunger. Future research with a community orientation could show how to align government goals with the priorities of the community so that urban food initiatives can more precisely and accurately meet the needs of urban populations besides providing access to nutritious and sustainable food sources. Another area of research to be further explored is how urban food movements operate in other countries around the world, and how urban agriculture's grassroots origins can be supported and expanded through governmental efforts. Further research on this subject should compare and contrast a greater number of urban food case studies in order to reach more generalizable conclusions about the best practices for urban food movements aiming to address intersections of food accessibility and other social necessities such as sustainable development and public health.

Urban food production as a form of restorative justice, sustainable development, and food security should be implemented on a wider scale by state and federal governments in the United States. Information on the positive effects of gardening for both inmates in prisons, students in classrooms, and vulnerable populations at large indicates that adopting urban food into more governmental policies will bring better results to the institutions in which these policies are adopted. Not only could adopting urban agriculture into policy enhance the wellbeing of communities, but it could also create a more resilient and sustainable environment, especially in highly resource-efficient forms of urban food production such as vertical farming and organoponics. Governments and cities can also benefit from urban food initiatives that reduce the costs of food production or increase economic development through their design and operation. These initiatives can be closely aligned with government goals while simultaneously meeting the needs of underserved and marginalized communities struggling with food insecurity. The multifaceted benefits of urban agriculture allow societies to simultaneously enhance the sustainability of production methods, increase food access and public health, and initiate development in urban areas.

Best practices surrounding urban

agriculture would be to integrate urban food production initiatives into a greater number of urban communities and to fund more research into alternative urban agriculture methods to enhance the efficiency and scope of these initiatives. Policies favoring urban food initiatives that meet an intersection of multifaceted needs might be more effective in alleviating the socioeconomic disparities experienced by vulnerable urban communities. With more attention to these factors, the urban agriculture movement will be better equipped to serve larger populations and could offset the negative effects of gentrification, homelessness, and poverty in urban communities. As this study illustrates, governments should adopt urban sustainability plans that support and fund urban food initiatives that are resource-efficient, economically beneficial, and meet the greatest intersection of needs expressed by the community.

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