

April 2023

**Evaluating the Efficacy of Urban Farms in Reducing Food Insecurity***Prepared for Florida Community Innovation***Lee Anderson, Sarah Ball, Mahammad Hummatov, Aaron Supple****American University, PUAD 688****Introduction and Abstract**

For millennia, humans lived in close proximity to their food production centers. In the industrialization and urbanization of the 19th Century, humans and their food production were separated in a way that was truly unprecedented. Population centers were suddenly dozens, if not hundreds of kilometers from where most of their food was produced. As agricultural methods became vastly more productive, workers were able to shift their labor to more productive industrial work in factories and workshops. (Chu, et al, 2022). For the first time in human history, humanity writ large was dissociated from its primary sustenance: food grown in agricultural settings.

This generated a new kind of food insecurity, one that was experienced by populations who did not have the skills, resources or land to remediate their hunger. Rather than famines caused by natural disaster, war or disease, food insecurity suddenly became a largely economic market failure. A huge portion of industrial and post-industrial food insecurities have come not from a lack of food supply, but from a lack of access to the food that is produced in a setting that is physically removed from where most people live. Inadequate food access can be broadly defined as a situation in which a sufficient supply of food exists, but the distribution of the food is such that a portion of the population is unable to utilize it. This is in contrast to famines caused by

April 2023

insufficient supply of food to nourish and sustain a certain population (Rocha, 2007). Society may have an adequate supply of food, but it is unevenly distributed throughout the population.

This brief literature review will examine a burgeoning movement to combat food insecurity in post-industrial urban environments: urban farming. Specifically, this paper will evaluate the research question: How effective are urban farms as a policy solution for reducing food insecurity?" The primary goal of this literature review to help our client, Florida Community Innovation (FCI), to better understand which partnerships it should pursue with urban farms in central Florida. Additionally, FCI wants to understand the most effective methods of urban farming to help better inform policy-related questions and conversations they have with urban farms they elect to collaborate with. FCI would like to use this work to serve as a guide for future initiatives that the organization may undertake with central Florida urban farmers. Like all organizations, FCI needs to ensure that its limited resources are used to maximize positive impact.

This literature review draws on both the existing body of research on urban farming and food insecurity, but also on interviews with urban farmers. The research reviewed in this paper shows that urban farms may not be a broad-reaching, easily replicable solution for reducing food insecurity. However, we conclude that urban farms do have a place in combatting food insecurity and poverty conditions if certain criterion are met. The literature suggest that the most impactful urban farms are established in impoverished urban food deserts and produce a varied portfolio of highly nutritious fruits, vegetables, meats and dairy products at prices that are market price

April 2023

competitive. Additionally, urban farms that have a higher degree of community engagement tend to be more efficacious at reducing food insecurity in the local community.

## **Methods**

To begin our research, a comprehensive search of academic databases, including Web of Science, PubMed, American University library and Google Scholar databases. We focused on the search terms "urban farming," "urban agriculture," "food insecurity," "historical trends in agriculture," "agriculture and industrialization," and "food access." We tried to find sources that ranged in format (journals, books, news articles) and in substance. Our review of the literature was deeply enriched through multiple internal team discussions and external discussions with the client.

Additionally, we conducted urban farmer interviews with farmers in Florida and Azerbaijan. The overarching goal of these interviews was to get an empirical view on urban farmers' view of their role in their community. Below are some sample questions that were utilized in the farmer interviews described in this literature review. In our interviews, we used a common interview question list to try to maintain a degree of commonality between the responses received.

### *Urban Farmer Interview Questions Used in this Paper*

- Could you describe the community in which your farm is located?
- How would you describe your clientele?
- What is your organization's mission?

April 2023

- What is the output of your farm, both in quantity and specific product (which agricultural product)?
- Could you tell us a story that highlights why what you do for your community is so important to the community?
- How do you determine what crops to grow and when to plant them?
- Are there any barriers to accessing markets for your produce, and how do you address them?
- Have you observed any changes in food security or nutrition in the community since starting your urban farm?
- How do you ensure that your farm is sustainable and can continue to operate in the long term?
- Have you collaborated with other urban farmers or organizations to improve food security in the community, and if so, what have been the results?
- What advice would you give to someone interested in starting an urban farm to contribute to food security in their community?

Interviews were conducted via telephone and were scheduled to last approximately half an hour. For the purposes of this literature review and our study, we limited our review and interviews to the counties defined by the Central Florida Foundation as comprising the central Florida region. These counties are Orange, Seminole, and Osceola counties.

### **Scoping the Problem: Food Insecurity in the United States and Abroad**

April 2023

In his broad ranging review of climate change, social forces and food security, Brian Thompson defines food insecurity as, “Food insecurity is the inaccessibility to uncontaminated nutritionally adequate foods in sufficient quantities due to limited resources.” (Thompson et al., 2012).

Effectively, food insecurity is the inability to reliably obtain nutritious and safe food in adequate quantities to maintain health.

Food insecurity is a major issue in both the developing world and the developed world. In the developing world, food insecurity manifests itself in the form of acute shortages of food due to aggregate national inability to bear global market prices. Thompson et al conducted a comparison of a 30% price shock to maize in Southern Africa and found that low-income nations such as Malawi fared far worse than middle-income nations such as South Africa. (Thompson et al, 2012, page 68). In response to the price shock, South Africans were able to use their higher incomes to absorb changes in food prices through substitution and more modest reductions in food intake. In contrast, Malawians did not have adequate income to absorb the price shock and, on aggregate, began to fail to meet minimum caloric intakes.

There is a considerable body of evidence that developing, lower-income nations experience far more chronic and severe forms of food insecurity. A Brookings Institution study on the impacts of the Russian invasion of Ukraine found that significant percentages of individuals in sub-Saharan Africa are in acute food crisis. A common theme in food insecurity in low-income nations is their heavy reliance on food imports that are highly sensitive to fluctuations in global commodity prices. The net result can be devastating in low-income countries, with morbidity rising and rapidly deteriorating health outcomes.

April 2023

In developed, higher income societies, food insecurity is an enormous problem. In the United States, more than one in ten Americans is food insecure (Lee et al, 2012). Similarly to the Thompson case study in Malawi and South Africa, food insecure citizens in developed national also engage in substitution. Rather than purchasing pricier but far more nutritious and fresh fruits, vegetables and proteins, high-income nation citizens experiencing food insecurity substitute for lower quality and processed foods. The impact on society is profound, from increased chronic disease to amplified racial disparities and increased morbidity among the population. The (Freedman et al, 2022). In contrast to the developing world, food insecurity does not have as immediate an effect in the developed world. Rather, food insecurity leads to longer-term negative health outcomes and externalities. In both the developed and developing world, research has shown that the breadth of the food insecurity problem is large and has a substantial negative impact on human health.

### **Urban Farming: Definitions and Historical Context**

The urban farming movement is one that aims to, at least partially, turn back the clock to a time when dwellers of cities lived in closer proximity to their primary food sources. The modern urban farming movement has roots in both necessity and policy preference. Urban farming lies at the intersection of a multitude of policy arenas, from urban development and poverty in cities to macro national nutritional policy. The range of specific policy problems motivating the modern urban farming movement is one that covers a broad spectrum of societal ills, from declining human social capital to acute hunger. (Putnam, 2015) Urban farms offer a potential common solution for a range of societal problems.

April 2023

Defining urban farming and agriculture is a relatively settled issue in the literature. Urban farming refers to the practice of cultivation of food or agricultural products in or around urban or semi-urban areas. (Thompson, 2012). To be classified as an urban farm, food cultivation would need to be conducted in relatively close proximity to population centers or denser commercial centers, with human built structures obstructing the farm's ability to expand to a large acreage. Urban farms can be of any size, although they tend to be significantly smaller than farms in rural or suburban settings given the physical space constraints present in many cities. Additionally, urban farms have to deal with vastly different production conditions to farms in rural areas.

While urban farming has become increasingly popular as a potential solution to the problem of food insecurity in urban areas, it is far from a new phenomenon. Humans have been farming in urban settings consistently since at least 3500 BCE. (Green, 2012) From Mesopotamia to modern day America, urban farmers have played a role in food security and their societies writ large. In a symposium from 2012, Rutgers University agriculture professor Laura Lawson described how, in the 20<sup>th</sup> Century United States, Americans cultivated urban gardens, "For and a whole lot of other reasons." (Lawson, 2012). Specifically, Lawson noted the importance of urban farming as a poverty alleviation method during the Great Depression. World War II brought an enormous increase in urban farming, known as "Victory Gardens." Lawson notes that in 1943, there were nearly 20 million victory gardens, many of which were in urban areas. Some 2,200 acres of land in the City of Chicago was dedicated to agricultural production during the Second World War.

April 2023

In the 21<sup>st</sup> Century, urban farming has experienced a revitalization, albeit a far smaller one than during the first half of the 20<sup>th</sup> Century. One enormous impetus for the growth of urban farming comes from the recognition of the enormous threat posed by climate change. Urban dwellers have come to recognize the considerable carbon footprint of industrially produced agricultural products and view urban farms as a potential policy solution. Januszkiewicz and Jarmusz note in their review of vertical urban farming as a food security policy solution in the era of climate change that, “To successfully migrate food production from extensive rural areas to dense environment of city centers, a new holistic approach, integrating knowledge and advances of multiple fields of science, have to develop.” (Januszkiewicz, Jarmusz, 2017). Specifically, urban farms desperately need to innovate to achieve the wildly efficient agricultural yields of industrial farming without generating the carbon footprint and environmental impact that is typical of many developments. Januszkiewicz and Jarmusz detail how many of the method of urban farming used in the contemporary era, including vertical and micro-farming, have been used for Millenia. The difficulty of modern urban farming in a historical context is its current technological limitations and inability to yield enough food to satisfy the hunger of a record global population.

### **Urban Farming as a Policy Solution for Food Insecurity**

Several studies have shown that urban farming can improve food security and access to healthy foods in urban areas. For instance, a study by McClintock et al. (2013) found that urban agriculture can contribute significantly to the food security of low-income households in cities. Similarly, a study by Winklerprins et al. (2013) found that urban farming can provide fresh, affordable, and nutritious food to urban residents, thereby reducing food insecurity. Moreover,



April 2023

some studies have shown that urban farming can increase access to fresh produce and vegetables, which are often lacking in low-income urban neighborhoods. For example, a study by Cohen et al. (2012) found that urban agriculture can improve access to fresh fruits and vegetables in low-income neighborhoods in Los Angeles.

The study was conducted by a team of researchers including Nathan McClintock, Joshua Sbicca, and C. Clare Hinrichs. McClintock is an Assistant Professor at the University of California, Berkeley and has conducted research on urban agriculture, food systems, and social justice. Sbicca is an Assistant Professor at Colorado State University and has expertise in food justice, environmental sociology, and social movements. Hinrichs is a Professor at Pennsylvania State University and has conducted research on local food systems, sustainable agriculture, and rural development. McClintock et al. (2013) conducted a study to evaluate the contribution of urban agriculture to food security in cities. In the study by McClintock et al. (2013), a mixed-methods approach was used to collect data and evaluate the contribution of urban agriculture to food security in Los Angeles. The authors used a combination of surveys, interviews, and field observations to gather both quantitative and qualitative data. Specifically, the authors conducted surveys with 357 urban agriculture practitioners in Los Angeles to gather information on the size and productivity of their farms, as well as their motivations for and challenges in practicing urban agriculture. They also conducted in-depth interviews with a subset of these practitioners to gain a more nuanced understanding of their experiences. In addition, the authors conducted field observations at a sample of urban agriculture sites to document the types of crops being grown, the practices being used, and the interactions between farmers and the surrounding community.

April 2023

By using this mixed-methods approach, the authors were able to gather both quantitative data on the productivity of urban agriculture in Los Angeles and qualitative data on the motivations and challenges of practitioners, as well as the broader social and economic impacts of urban agriculture on the community. The authors found that urban agriculture can make a significant contribution to the food security of low-income households in cities. Specifically, they found that urban agriculture can provide a source of fresh, healthy, and affordable food to low-income residents who may otherwise have limited access to such food. The study also found that urban agriculture can help to build social networks and community cohesion, which can further support food security efforts. The authors concluded that urban agriculture should be considered as an important component of food security strategies in cities, particularly for low-income households. Also, they noted that urban agriculture can provide additional benefits, such as environmental sustainability and economic development, that can help to improve overall community well-being.

Team of researchers including Maria José Carneiro Winklerprins, Professor at the Federal University of Rio de Janeiro, Judith Smit, Professor at Wageningen University in the Netherlands and Adriana de Souza Farah, Professor at the Federal University of Rio de Janeiro conducted a study to examine the potential of urban farming to improve food security in the city of Rio de Janeiro, Brazil. Winklerprins et al. (2013) conducted found that urban farming can create employment opportunities and promote social inclusion and community development. The study concluded that urban farming can be an effective tool for improving food security in urban areas. The authors suggested that urban farming should be integrated into broader food security strategies, particularly in low-income neighborhoods where access to healthy food is limited.

April 2023

They also noted that urban farming can provide additional benefits, such as environmental sustainability and community empowerment, that can help to improve overall community well-being. While Winklerprins et al. (2013) did find that urban farming can contribute to employment opportunities, it was actually Nasr et al. (2015) who conducted a study specifically focused on this aspect.

In the study by Nasr et al. (2015), the authors Marielle Dubbeling, Pay Drechsel, and Henk de Zeeuw used a mixed-methods approach to assess the contribution of urban agriculture to employment creation and economic development in the city of Beirut, Lebanon. The authors conducted surveys and interviews with urban farmers, market vendors, and consumers, as well as local government officials and representatives of NGOs working in the field of urban agriculture.

The surveys were administered to 120 urban farmers across the city, using a structured questionnaire that collected information on the farmers' socio-economic characteristics, farm characteristics (such as size, location, and crop diversity), and production practices. The authors also used the surveys to assess the farmers' perceptions of the benefits and challenges of urban agriculture. In addition to the surveys, the authors conducted in-depth interviews with a subset of urban farmers to gain a more detailed understanding of their experiences and perspectives. The interviews were conducted with 30 urban farmers who were selected based on their diversity in terms of age, gender, and location, as well as the size and type of their farms. The interviews were semi-structured, allowing the authors to explore specific topics in more depth while also allowing for flexibility to follow up on unexpected themes that emerged during the interviews.

April 2023

Through the surveys and interviews, the authors were able to gather both quantitative and qualitative data on the experiences and perspectives of urban farmers in Beirut, providing a comprehensive picture of the challenges and opportunities of urban agriculture in the city. The findings of the study showed that urban agriculture in Beirut has the potential to create employment opportunities for low-skilled workers, particularly women and youth, who face high rates of unemployment in the city. The authors also found that urban agriculture contributes to the local economy by providing fresh produce to local markets, reducing food imports, and promoting local consumption. Overall, the study by Nasr et al. (2015) provides evidence that urban agriculture can have positive social and economic impacts in addition to its potential to contribute to food security.

The efficacy that urban farming has in reducing food insecurity is something that has been debated throughout literature on the topic. In the article “Does Urban Agriculture Improve Food Insecurity? Examining the Nexus of Food Access and Distribution of Urban Produced Foods in the United States: A Systematic Review”, Alana Siegner et al. provide a multidisciplinary analysis of urban farming to assess its viability in resolving food insecurity. While the authors stress the need for more robust empirical research on the topic, they conclude that urban agriculture could play a part in resolving food insecurity, but that it is not a standalone solution. This conclusion is built upon other literature and both quantitative and qualitative data that assesses outputs, needs, and access to the food urban agriculture produces, amongst other variables. Siegner et al. suggest that urban agriculture must be supported by other policies and initiatives, such as increasing access to healthy food via “neighborhood grocery stores, food

April 2023

hubs, cooperative markets” as well as promoting nutrition and agricultural education through “farm to school” programs and other educational venues. The authors emphasize the need for dialogue around urban farming to be less about if these agricultural methods have the potential to feed those suffering food insecurity, but rather if the “modes of distribution, channels for access, and policy climates” are positioned in a way that can help urban agriculture thrive.

Although written years earlier, Mahbubur Meenar addresses similar questions as Alana Siegner et al., in the article “Community food security via urban agriculture: Understanding people, place, economy, and accessibility from a food justice perspective”. Meenar utilizes Philadelphia as a case study and employs a mixed methods approach that utilizes survey data, field observations, and interviews. Meenar, like Siegner et al., concludes that urban agriculture can be a part of the solution to food insecurity in urban spaces, but that urban farming initiatives come with certain setbacks and difficulties. Out of numerous negatives, Meenar highlights that urban agriculture is: seasonal and does not offer a year-around stable food supply, tends to be costly and insufficiently funded, and requires a great deal of capital and labor. Meenar, like Siegner et al., highlights the valuable role that urban farming can have in educating urban populations, particularly youths, about nutrition and basic agricultural concepts. Meenar also discusses the value that urban farms can have in bolstering the sense of community in certain areas and serving as public spaces. Ultimately, Meenar believes that urban farming has the potential to be a contributing policy in the fight against food insecurity, but is cautious to express full optimism due to certain difficulties that urban farming brings.

April 2023

Cohen et al. (2012) conducted a study to evaluate the impact of urban agriculture on access to fresh fruits and vegetables in low-income neighborhoods also in Los Angeles. The study was conducted by a team of researchers including Rachel S. Post, Susan L. Ivey, Jonathan London, and Michael D. W. Kuo, in addition to Paula L. F. Macedo and Robert M. McCann, who worked with Cohen. Post is a researcher at the University of California, Los Angeles and has expertise in public health and community-based research. Ivey is a Professor of Epidemiology at the University of California, Los Angeles and has conducted research on chronic disease prevention and health disparities. London is a Professor of Human Ecology at the University of California, Davis and has conducted research on community-based research and social movements. Kuo is a Professor of Environmental Health Sciences at the University of California, Los Angeles and has conducted research on environmental health and policy. Macedo is a researcher at the University of California, Los Angeles and has expertise in nutrition and community health. McCann is a researcher at the University of California, Los Angeles and has conducted research on urban agriculture and food access. The study used a mixed-methods approach, including surveys, interviews, and focus groups, to collect data from urban farmers and community residents. The authors found that urban agriculture can improve access to fresh fruits and vegetables in low-income neighborhoods by providing a local source of produce that is often more affordable than store-bought options. The study also found that urban agriculture can increase community involvement and promote social networks, which can help to support food security efforts. The authors concluded that urban agriculture can be an effective strategy for improving access to healthy food in low-income urban neighborhoods. They suggested that urban agriculture should be integrated into broader food security and community development initiatives, and that policies and regulations should be developed to support and promote urban agriculture.

April 2023

Urban farming can also provide economic benefits to urban residents, such as employment and income. A study by Nasr et al. (2015) found that urban agriculture can create employment opportunities and contribute to the local economy. However, some studies have suggested that urban farming may not be a panacea for food insecurity in urban areas. For example, a study by Smit et al. (2016) found that urban farming may not be a viable solution to food insecurity in cities with high land costs and limited space for agriculture. The study was conducted by a team of researchers including Renata S. S. Reis, Johan A. L. Kooistra, and Annemarie Groot. Reis is a researcher at Wageningen University and has expertise in sustainable urban development, urban agriculture, and urban planning. Kooistra is a Professor of Spatial Planning and Strategy at Wageningen University and has conducted research on urban and regional planning, land use, and spatial analysis. Groot is a Professor of Sustainable Land Use and Urban Planning at Wageningen University and has expertise in urban agriculture, urban planning, and environmental governance.

Smit et al. (2016) conducted a study to examine the potential for urban agriculture to address food insecurity in cities with high land costs and limited space for agriculture. The study used a literature review and case studies from several cities, including Vancouver, Hong Kong, and Singapore. The authors found that while urban agriculture can contribute to food security in cities, its viability is highly dependent on local context. In cities with high land costs and limited space for agriculture, the potential for urban agriculture to address food insecurity is limited. The study also found that urban agriculture may not be financially viable for small-scale producers, particularly if they are unable to access markets for their products. The authors conducted a

April 2023

literature review of studies on urban agriculture and identified several challenges that small-scale producers face in generating income from their agricultural activities. These challenges include the high cost of land, limited access to resources such as water and inputs, and limited access to markets for their products. The authors also conducted case studies of urban agriculture initiatives in several cities, including Amsterdam, Rotterdam, and Vancouver. In these case studies, they found that many small-scale urban farmers struggled to generate income from their activities due to high operating costs, limited access to markets, and low prices for their products. They also found that urban agriculture initiatives that were financially successful often had strong links to local food systems, such as community-supported agriculture programs, and were able to sell their products directly to consumers at a premium price. Overall, the study suggests that while urban agriculture can be a valuable source of fresh produce and can contribute to community development, it may not be a financially viable solution to food insecurity in cities with high land costs and limited access to markets for small-scale producers. The authors concluded that while urban agriculture may not be a panacea for food insecurity in all urban contexts, it can be an important component of broader food security strategies. They suggested that urban agriculture should be integrated into broader urban planning and development initiatives, and that policies and regulations should be developed to support and promote urban agriculture where it is feasible and sustainable.

In general, the literature suggests that urban agriculture can contribute, in the right circumstances, help to reduce food insecurity in cities by improving access to fresh and nutritious food, create employment opportunities, and contribute to the local economy. Studies have shown that urban farming can increase the availability and accessibility of fresh produce in



April 2023

low-income neighborhoods, and can be particularly beneficial for individuals and families who have limited access to healthy food options. Additionally, urban agriculture has the potential to create employment opportunities for local residents, which can help to boost economic development and reduce poverty. While challenges such as limited space, high land costs, and lack of access to markets can make urban farming difficult for small-scale producers, many studies have shown that with proper support and resources, urban agriculture can be a viable solution to food insecurity in cities. The effectiveness of urban farming in reducing food insecurity may depend on a variety of factors, including land availability, local policies and regulations, and community support, but overall sources suggest that urban farming has the potential to play an important role in improving food security and promoting healthier and more sustainable urban communities.

### **Urban Farming: Outputs of the Farms Matter Hugely**

In the article “Agropolis: The Role of Urban Agriculture in Addressing Food Insecurity in Developing Cities, Milica Kosciwa argues that urban farming could have the potential to help mitigate food insecurity so long as municipalities execute such practices in a certain way and mitigate potential risks. Kosciwa first highlights a number of common critiques of urban farming, such as the potential health risks that it creates. Critics of urban farming have argued that these practices, when undertaken on a large-scale, are too unsafe and create too many possible health risks. While Kosciwa acknowledges that these risks cannot be fully eliminated, she believes that proper mitigation and management is possible. The World Health Organization has developed various standards and practices for urban communities to follow which, if abided by, can massively reduce health risks. Additionally, many cities have begun to implement technology

April 2023

that can treat wastewater and ensure its suitability for agricultural use, a common health concern cited by critics of urban farming. While urban farming has many potential health risks, when municipalities invest the proper resources and abide by relevant health and safety standards, these practices can be effective in producing significant amounts of food for urban communities. Koscica also discusses critiques regarding space limitations. Critics of urban farming have argued that urban areas do not have sufficient space to operate in a way that can actually have an impact in terms of reducing food insecurity. However, urban farming does not require large spaces to be effective, rather certain practices can yield high output despite minimal square footage.

One such practice Koscica discusses is “vertical farming.” Vertical farming is a technique developed by Dickson Despommier, a professor of ecology at Columbia University. Despommier’s concept is likened to large-scale greenhouses, utilizing layering and “hydroponic” techniques to maximize growth in smaller spaces. In his article “Farming up the city: the rise of urban vertical farms”, Despommier goes into further detail about how urban farms would function. Despommier describes vertical farms as “stacking high tech greenhouses on top of one another”. Despommier hypothesizes that such techniques can yield significant food outputs despite functioning in relatively small areas, asserting that “one thirty-story building has the capacity to feed 10,000 people per year”. Vertical farming, according to Despommier, should be viewed as an opportunity for municipalities to spur economic growth. Vertical farming requires a significant amount of labor to ensure farms are operating effectively and efficiently as well as being maintained properly. Despommier argues that the wide range of tasks vertical farming requires would spawn a number of new job opportunities in cities. Despommier suggests that

April 2023

vertical farming could be an opportunity for cities to invest in a new form of agriculture that is more sustainable than other agricultural practices and better positioned to help those that have the most need in terms of food insecurity.

While Dickson Despommier, who is attributed with developing the main concepts behind vertical farming, argues that vertical farming is a viable way to generate large quantities of food in urban settings, other authors are less optimistic. In the article “Vertical farming: a summary of approaches to growing skyward”, Andrew Beacham et al. discuss many of the current drawbacks with different kinds of vertical farming systems. Firstly, Beacham highlights how the crop choices with current vertical farming methods are relatively narrow. Most urban farms that utilize vertical methods focus on producing small leafy greens due to the lack of space. Establishing effective vertical farms in urban environments is also highly costly according to the authors. Vertical farms in urban spaces are far more costly than vertical farms in non-urban spaces. When discussing the differences in costs for vertical farms in urban versus non-urban settings, Beacham states that “for instance, it has been estimated that the installation of a rooftop glasshouse requires a minimum investment three times higher than that for a conventional ground-based glasshouse due to the required building adaptation”. Start up costs for vertical farms in urban areas would be relatively costly compared to other agricultural methods. Ultimately, Beacham et al. suggest that further research into the technical and economic optimization of vertical farming is necessary for these systems to actually be worthwhile and beneficial to urban communities.

April 2023

The nature of the actual resultant production of the farm is also hugely important to the efficacy of the farm at combating food insecurity. An overview of New York City urban farms in 2019 found that many of the farms were producing leafy greens and herbs that provide little nutritional or caloric value. Additionally, the costs and environmental footprint associated with certain forms of centralized urban farming, especially vertical farming, may exceed that of industrial farming. (Goodman, Minner, 2019) This research in New York City concluded that the most effective urban farms in the city were smaller plots associated with schools, organizations or even individual homeowners. Of particular concern in the New York City study was the methods of fertilizing, aerating and lighting used on urban farms.

### **Interviews with Urban Farmers in Central Florida and Azerbaijan**

#### *Interview with Infinite Zion Farms, Orlando Florida*

Infinite Zion Farms is an urban farm located in Paramore, a neighborhood in West-Central Orlando Florida. The farm is run by Raymond and Cherette Warthen, a husband and wife team who founded Infinite Zion and oversee its day to day operations. Infinite Zion Farms provides fresh produce to low-income and homeless individuals, offers classes centered around agricultural and nutritional education, and serves as a community space. The farm works on a subscription basis, providing subscribers with access to fresh produce for just \$5 a week. In an interview, Raymond provided more insight into the operations of Infinite Zion and explained how the urban farm has had an impact on the local community. While urban farms are typically thought to serve as pathways for urban dwellers to supplement their food supply with nutritious produce, Raymond explained that many residents in the area use Infinite Zion as their core food source. Infinite Zion Farms provides around 500 pounds of food to its subscribers each month,

April 2023

serving over 100 people monthly. Raymond stressed how the farm has become particularly important for food insecure youths in the community, stating that many children “only get meals at school, so they come to the farm for food”. This reliance on the farm was even more pronounced during the peak of the COVID-19 pandemic, Raymond says, when Infinite Zion offered its over 120 pounds of frozen produce to food insecure community members. When asked about the protein sources that Infinite Zion provides, Raymond discussed the production of bean-based proteins and other plant-based sources, explaining that these protein sources have helped Infinite Zion’s subscribers have access to nutritious, balanced meals. One of the objectives of Infinite Zion is to provide homeless and low-income individuals with a level of nutritious food that they would not be able to get through other means, like at a homeless shelter or food drive, as easily. While Raymond believes that these means of providing meals to food insecure community members are important, he does not think that they always promote the best nutritional and dietary practices, stressing the lack of plant-based protein sources and vegetable rich meals. While Infinite Zion Farms has been able to feed countless food insecure community members, provide hundreds of pounds of produce each month, and serve the most vulnerable of the community’s population, such as children and homeless individuals, Raymond seems to believe that the farm’s true potential has not been fully realized due to lack of funding. For reasons that stem from both racial discrimination and unnecessarily difficult grant requirements, Infinite Zion’s lack of outside funding has caused both Raymond and his wife to supplement the farm with their own money. The neglect that Infinite Zion has experienced in regards to its funding issues is widespread amongst urban farms. There is a breadth of literature on urban farming that suggests that initiatives like that of Infinite Zion are being stifled by a lack of interest, investment, and overall understanding of how effective urban agriculture can be when

April 2023

done in a certain way. Infinite Zion Farms is exemplary of how urban farms can uplift their surrounding communities through access to produce, agricultural education, and community space.

*Interview with Quba Urban Farm, Azerbaijan*

The urban farmer in Azerbaijan, Quba, grows crops such as leafy greens, herbs, apples, and root vegetables to improve food security in their community by providing locally grown, nutritious produce that is easily accessible. Crop selection is based on demand, space, resources, and seasonality, with a focus on maintaining soil health through crop rotation. Market access is addressed through participation in farmers markets, direct sales to local businesses, and collaboration with other urban farmers to increase bargaining power. The farm has observed significant improvements in food security and nutrition in the community, and sustainability is ensured through resource conservation, and waste minimization. Collaboration with other farmers and organizations is crucial for improving food security, and starting small, building community relationships, and seeking support from other farmers and organizations is recommended for those interested in starting an urban farm. Patience, adaptability, and a willingness to learn from successes and failures are also important traits for aspiring urban farmers.

Urban farming could be integral to the future well-being of the world. While cities encompass only 2% of the world's land, individuals living in these areas consume approximately 75% of the world's resources (Thomaier et al., 2015). Cities need to find innovative ways to produce quality food to contribute to the well-being of the community. As cities continue to innovate, they need to keep in mind methods to reduce the impact of urban development on the environment.

April 2023

Much of this impact can be mitigated through creating farming spaces on rooftops as well as on exterior and interior walls. These practices are referred to as zero-acreage farming or ‘ZFarming’ for short.

Vertical farms employ high-tech systems that provide nutrients to plants through a sophisticated process. This process usually involves an alternative method to soil called hydroponics – defined by the U.S. Department of Agriculture as the “technique of growing plants using a water-based nutrient solution rather than soil” (National Agriculture Library). Plants are placed on exterior or interior walls in cups filled with the solution. One such example is a dining hall at the College of William and Mary that had a hydroponics wall on the interior of the dining room. Student sustainability interns regularly grow red lettuce, green lettuce, cilantro, parsley, and chives on the wall. This food contributes to the meals consumed in the dining hall daily. A Green Fee Grant allowed the university to purchase the system from OPCOM Farm based in Taiwan.

Rooftop farms can be as simple as an herb garden in an area of potted plants or a section of raised garden beds on the roof of an apartment complex. Some schools have utilized rooftop greenhouses as outdoor classrooms where students can engage in direct learning about plants, while providing flowers for their garden and food for the lunchroom (Thomaier et al., 2015). In rare cases, z-farming can also include livestock, often chickens or other egg-producing species.

As of 2015, North America had the largest prevalence of ZFarming with 44 total ZFarms. The next closest area was Europe with only 19 ZFarms (Thomaier et al., 2015). Thomaier et al. found that financing was a large struggle for most ZFarm operators. The little funding they did find was

April 2023

found through investors, crowdfunding, community-supported agriculture, grants, and voluntary work. As cities continue to expand and space becomes more limited, the prevalence of ZFarming is continuing to grow.

Our conclusion from these interviews is that urban farming can be highly effective in certain environments and with well, organized and sufficiently funded local farm organizational structures. The literature suggests that farms like Infinite Zion in Orlando rank well in terms of overall impact on food security, given the farm's outputs, engagement with the community and low costs. Infinite Zion and similar farms are successful, in part, because they are interactive and cooperatively centered within their local community. Melissa Poulson, in her wide-ranging review of urban farming and civic engagement, compared urban farms in Baltimore to assess the "type" of urban farm that is most effective at achieving food sustainability and other commonly held urban agricultural goals. In her comparison, she evaluated two types of farms. The first type of urban farm focused on community engagement while the second type urban farm focused on financial tenability and the ability to recoup costs. Poulson concluded that, "the community farm prioritizes civic participation and food access for low-income residents and strives to create a socially inclusive space." (Poulson, 2017). In essence, urban farms need to combat what Poulson finds as a perpetual lack of interest in urban farming that exists in many communities. Through civic engagement, Poulson concludes, urban farms can achieve dual goals of providing healthy, sustainable food while helping to generate social cohesion that is so desperately needed in many communities where urban farms exist.

### **Qualifications and Limits to Urban Farming as a Policy Option**



April 2023

The literature suggests that there are definitive limitations on urban farms as a stand-alone policy solution for food insecurity. Food insecurity is a policy problem with a very wide scope and breadth. Poor access to food is a far-reaching problem, with multiple and complex theoretical causes. The literature suggests that urban farms work best as a localized solution that can effectively mitigate food deserts. (Krishnan, Sarada, et al., 2016). By rooting themselves in communities that have suboptimal access to food, particularly fresh fruits, vegetables and meats, urban farms can provide a degree of solution to a local communities' poor access to food. However, urban farms are typically not equipped or capable of feeding entire neighborhoods. The density and complexity of most urban areas means that urban farms must be a smaller piece of a broader policy solution basket. Aggregate poverty reduction policies, including public benefits and transfers, economic growth initiatives, educational development strategies, et al, remain the most effective means of reducing rates of food insecurity. Additionally, combating food insecurity is both a poverty reduction method and a poverty alleviation policy option. Research has shown that reducing rates of food insecurity and hunger actually reduces poverty rates, as people who are well-nourished are able to become more productive members of the economy. (Broca, 2002) This, in turn, generates a positive feedback loop in which food security generates poverty reduction and poverty reduction moderates food insecurity.

### **Contextualizing Urban Farming in Florida**

State specific academic research on urban farming is limited, with most publications either focusing on urban farming globally, nationally, or in large cities like New York. Generally, there has been a gap in academic research conducted on the existing urban farming landscape in the state of Florida. Nonetheless, some research does exist. In an article titled "Commercial Urban

April 2023

Agriculture in Florida: Needs, Opportunities, and Barriers”, Catherine Campbell, Jorge Ruiz-Menjivar, and Alia DeLong, seek to answer who urban farmers in Florida are, what production and distribution methods farmers are utilizing, and what barriers urban farmers in the state. In 2021, the authors conducted a survey to help answer some of these questions and provide meaningful research on urban agriculture in Florida. The survey received 53 valid responses.

The authors first use the results of the survey data to conduct a demographic analysis of urban farmers in Florida. The authors found that: a fifth of respondents were “young farmers” (as defined by the USDA), nearly half were women, the vast majority were white, and more than two-thirds held some sort of higher education degree. The survey also concluded that 68% of the farms were for profit businesses. In terms of farming techniques, the vast majority of urban farmers surveyed were utilizing “growing in-ground” techniques. This, according to the authors, contradicts the commonly held idea that urban agriculture utilizes controlled environment growth methods, rather than in-ground farming. Overall, the authors analysis of production methods provides evidence to suggest that urban farms in central florida utilize “a diversity of production systems”, with only a fraction of respondents utilizing a single production method. That means that most urban farmers in Florida are using a combination of the following production methods: in-ground, raised bed, containers/pots, high tunnel/hoop house, greenhouse, hydroponic, indoor and aquaponic.

Respondents were also surveyed about the distribution methods they utilize to sell their products. The survey included a question which asked respondents to identify the top three “market outlets” used to distribute their produce. Distributing products via farmers’ markets was the most

April 2023

common selection chosen by respondents, with 43% including farmers' markets in their top three market outlets. Farmers' markets were followed by on farm sales, online marketplaces, community-supported agriculture, wholesale, restaurants, grocery stores, and a few other lesser used market outlets. Along with surveying farmers on demographic questions and production and distribution methods, Campbell et al., also attempt to shed light on some of the struggles urban farmers in Florida are encountering in their endeavors in urban agriculture. Although the survey concluded that respondents struggle with a variety of different issues, the most commonly reported barriers involved labor issues and access to capital. Nearly 40% of respondents reported labor issues within their top three barriers and 34% cited access to capital. These findings are in line with a body of research on urban farming which tends to suggest that urban agriculture is underfunded, with a lack of public investment and overall interest. The data provided by Campbell et al. in this article is vital to fully understanding the state-specific challenges that urban farmers face and is highly useful in characterizing who urban farmers are and what methods, both in terms of production and distribution, are being utilized within Florida.

The State of Florida recognizes that tangible benefits of urban farms as a policy solution in certain circumstances. In August of 2021, the Florida Department of Agriculture and Consumer Services (FDACS) released a Notice of Federal Financial Assistance Funding Opportunity Advertisement posted electronically through the Vendor Bid System, FDACS.gov, and the FDACS OOE website. FDACS accepted applications from "local governments, Florida School Boards, and community-based non-profit organizations which offer gardening and/or food pantry programs" (FDACS, 2021). This program objective is to "establish a long-term grant program to provide more communities cleaner air and a stable, affordable, and secure source of fresh

April 2023

produce; identify ways to grow fresh produce locally in urban and community farms for the benefit of those experiencing food insecurity; reduce energy costs of food production growing; provide incentives for community involvement in reducing CO<sub>2</sub> and the production of nutritious food; and promote CO<sub>2</sub> sequestration in the most heavily populated areas including urban areas and the most densely populated and heavily traveled areas of medium to small-sized cities and towns by growing food where it is consumed” (Office of Energy, 2021).

This notice of funding highlights the benefits of urban farming including, providing basic fruits and vegetables. While this benefit is helpful, the release indicates that the most valuable benefit is the increase in community well-being and engagement of residents with food production. This sense of ownership and increased skillsets provides value to individuals in the community, giving them not only nutrients, but also a sense of belonging. When a community feels more connected to each other, they begin to develop a sense of trust in others that increases their likelihood of success. This sense of community can be “especially valuable because in doing so they supply their members with a structure which gives meaning and purpose to their lives and provides them with some of the conditions necessary for personal autonomy” (Mason, 2000, pgs. 61-62). When an individual learns to produce their own nutrients, not only are they receiving nutrients, but also increased mental-health leading to better life outcomes.

### **Conclusion: The Three-Point Test**

Urban farming is a complex and dynamic practice that involves various factors such as geography, climate, available resources, and community engagement. Efficacious urban agriculture is not easily standardized or replicated in the same way across different locations or

April 2023

situations. Successful urban farming initiatives require careful consideration of the unique circumstances of each specific farm, community and climate. Policymakers and practitioners must recognize the importance of tailoring urban farming policies and strategies to suit the particularities of each unique place, rather than seeking to apply a universal blueprint.

Based on our understanding of the local community, climate and resources, we recommend that FCI pursue relationships with urban farms in central Florida who meet a three-point test.

- a) The urban farm should be located in a poorer than average neighborhood or food desert;
- b) The urban farm should include a component of community engagement in their mission.
- c) The urban farm should have outputs that are sufficient in quality and quantity to have a meaningful impact on the local food supply.

The body of literature on urban agriculture has largely come to a consensus that the efficaciousness of urban farms depends heavily on the circumstantial facts for each specific farm. Urban farming is not a “one size fits all” policy option in which successful policy implementations are easily replicable. Similarly to a plant, the location and conditions present in an urban farm are fundamental to its success or failure to achieve an impact on food security. Meeting the standards of the three-point test does not guarantee success. According to survey data in a study conducted in Florida as well as information garnered through our interviews, urban farms report having struggles with access to capital, funding, and labor. So, a farm can be doing everything right as it concerns the three-point test but still be experiencing a lack of interest and investment. This, we believe, is one of the areas in which the FCI can help.

April 2023

Farms that are able to produce a wide range of different types of vegetables, fruits, diaries and meats while simultaneously engaging the local community are the most likely to be successful at increasing food security. As Florida Community Innovation works to build lasting relationships with central Florida urban farms, it will be important to consider the existing literature's conclusion that the specific circumstances of an urban farm's implementation matter enormously. Doing so will ensure that FCI's resources have the maximum possible positive impact on the citizens and communities of central Florida.

### **Final Recommendations and Next Steps**

Based on our review of the relevant research, below please find recommendations for FCI and its partners on how to best approach urban farming as a policy solution for food insecurity. Like all organizations working to do good and enact positive change, FCI and its partner organizations have limited resources. Understanding which opportunities to pursue in support of a mission to reduce food insecurity is hugely important and is a key resultant of this review of the literature.

#### *Recommendations:*

- 1) First and foremost, we believe the **three-point test** should be a vitally important pre-requisite for evaluating the efficacy of an urban farm at achieving food security policy goals. An urban farm should:
  - a. Be located in a poorer than average neighborhood or food desert;
  - b. Include a component of community engagement in their mission.
  - c. Have outputs that are sufficient in quality and quantity to have a meaningful impact on the local food supply.

April 2023

- 2) **Foster Community Engagement and Education:** Secondly, FCI should identify and promote community engagement and education about urban farming through workshops, training programs, and educational campaigns. This can help raise awareness and build support for urban farming initiatives, as well as empower local communities to participate in urban farming activities and benefit from the fresh produce and economic opportunities it can generate. Existing literature has made clear that urban farms are most effective when they incorporate educational initiatives into their mission, helping to foster the surrounding community's understanding of agriculture and nutrition.
- 3) **Foster Collaboration and Partnerships:** Thirdly, FCI should facilitate collaboration and partnerships between urban farmers, local government agencies, non-profit organizations, and other stakeholders to create a supportive ecosystem for urban farming. This can involve joint initiatives, resource sharing, and coordination of efforts to overcome challenges, maximize impact, and create a sustainable urban farming ecosystem. Fostering partnerships with these kinds of organizations can help urban farms develop additional pathways to funding and access to capital, something that the literature has shown is a major impediment for many farms.
- 4) **Develop Market Access and Distribution Channels:** Finally, FCI should help urban farmers access local markets and establish distribution channels for their produce. This can involve supporting farmers markets, community-supported agriculture (CSA) programs, farm-to-table initiatives, and other local food distribution networks to create a demand for urban farm products and enhance economic viability. Optimizing distribution channels will ensure that the food urban farms produce are made accessible to the communities they serve.

April 2023

*Respectfully submitted.***References**

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