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Department of Noragric

Urban Agriculture for Food Secure Cities? The Case of Cuba

Oda Rørvik Jansen

International Environment and Development Studies

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Abstract

During the last decades, urban and peri-urban agriculture initiatives have emerged in cities across the world as a response to increased urbanization, climate change, and food insecurity. In the case of Cuba, the rise of urban agriculture started as a response to the crisis that occurred after the fall of the Soviet Union. Due to food shortage and a failing agricultural sector the Cuban people, a population consisting of mostly urban settlers, implemented an urban food production system. This case is often represented as a success story in which urban agriculture saved Cuba in a time of crisis. Therefore, the objective of this thesis is to assess how urban agriculture has contributed to food security in Cuba. To do this, I will analyze food security outcomes using a six-dimensional framework (availability, access, utilization, stability, agency, and sustainability). The findings are based on a desk study of secondary sources. The paper concludes that although urban agriculture is an important element of the Cuban agricultural sector and certainly contributed to the increase in food security Cuba has experienced since the 1990s, the contribution should not be overestimated. Urban agriculture has diversified production in the agricultural sector through increased production of fruits and vegetables, but challenges related to poor soil quality, access to land, instability, and the organization within the sector continue to create obstacles for urban farmers. Urban agriculture is not the only reason Cuba has experienced improved food security but acts as an important supplement to food imports and rural agriculture.

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Introduction

Despite many global efforts to reduce hunger, food insecurity is still an issue in all regions of the world. At the same time, an increasing proportion of the global population is now living in cities and urban areas. This has raised concerns about urban food security (Moustier et al., 2021, p. 3), in particular of poor households who are the most vulnerable. Because urbanization has implications for nutritional outcomes, employment, and poverty rates (Moustier et al., 2021, p. 3), urbanization and food security are closely linked. Moreover, our food systems are currently facing complex challenges such as population growth, climate change, and increased pressure on natural resources and ecosystem services (HLPE, 2019, p. 25). On top of it all, the COVID-19 pandemic exacerbated the food security status of millions of people (FAO, 2021, p. vi). In 2020, between 720 and 811 million people faced hunger, over 150 million more than in 2019, and almost 2.37 billion people did not have access to adequate food (FAO, 2021, p. vi). Thus, the need to rethink our food systems is more evident than ever (HLPE, 2019, p. 25). Various initiatives such as urban agriculture have emerged as a response to this issue, both in cities of the Global South such as Maputo in Mozambique and cities in the Global North like for instance Boston in the United States (Khan et al., 2020, p. 7).

Around half of the human population now live in cities (Moustier et al., 2021, p. 2). Historically, urbanization is positively correlated with income per capita, but due to increasing social inequalities that cause poverty and high unemployment rates, food insecurity has become a rising issue in urban areas (Moustier et al., 2021, p. 3). Urban food consumption is now associated with a triple burden of malnutrition; undernutrition, micronutrient deficiencies, and overweight/obesity increasing all at the same time (Moustier et al., 2021, p. 3). Typically, this problem is not due to a lack of food availability but rather a lack of economic resources to acquire sufficient and nutritionally adequate food intake or a consequence of poor dietary choices. For instance, in times of increasing food prices (or a decline in disposable income), a common response among poor households is to turn consumption towards cheaper sources of calories, which often implies food items with lower micronutrient content (Zezza & Tasciotti, 2010, p. 271). In the Global South, urban food consumption is also increasingly dependent on imports and produce from rural areas (Moustier et al., 2021, p. 3). Consumption is often characterized by limited consumption of

fruits and vegetables, also among those who experience rising incomes, who tend to eat more animal-source foods and processed foods high in calories and fat (Moustier et al., 2021, p. 3). Hence, urbanization has implications for food security outcomes of all urban dwellers but particularly in the poorest households. These concerns amongst others have raised an interest in food being grown locally within cities (Górna & Górny, 2020, p. 85).

Generally, urban agriculture (UA) is thought to provide local fresh foods with low transportation costs but also other multi-functional benefits across the economic, social, and environmental spheres (Artmann & Sartison, 2018, p. 1). For instance, UA jobs are becoming an important source of employment in Africa (HLPE, 2019, p. 34), where around 40 percent of urban citizens are involved in jobs related to UA (Khan et al., 2020, p. 5). Growing food in cities can therefore be a source of employment, and utilizing vacant spots for gardening in otherwise crowded and built-up areas that often cover fertile land can help to reduce pollution and restore soil quality (Khan et al., 2020, p. 5). Organic waste from households such as paper, fruit peels, and plant remains can be recycled into compost that can be used in UA to improve soil quality and reduce the need for chemical fertilizers (Khan et al., 2020, p. 6). In times of crises such as COVID-19, which significantly disrupted the food supply chain and caused an increase in food prices, UA can ensure the supply of certain foods. For instance, Wuhan municipality started to cultivate vegetables on 20,000 hectares in February 2020 to provide residents with vegetables (Khan et al., 2020, p. 6). However, the extent of the potential contribution of UA to food security in developing countries has been criticized by some authors due to constraints related to access to land, water, and financial resources to invest in productive areas (HLPE, 2019, p. 34).

To explore this topic further, this thesis aims to answer the following research question; how has UA contributed to food security in Cuba? The idea behind this thesis came from an interest in green cities and a wish to learn more about the potential and shortcomings of UA in general and particularly in relation to food security. I chose Cuba as a case because of its reputation as a pioneer within UA as well as the unique circumstances and character of the story. In light of rising global instability, caused by the COVID-19 pandemic and other socioeconomic crises currently happening, I find it interesting to examine how UA worked (and not worked) as a part of a response to a crisis. The following paragraphs will consist of a section explaining the conceptual framework and key concepts of the paper, an elaboration on the case study, a methods section, and an analysis and discussion part followed by a conclusion.

Conceptual Framework and Key Concepts

An elaboration on the conceptual framework and key concepts is needed to provide clarity and understanding throughout the paper. To analyze the contribution of UA toward food security in Cuba, I will use food security as a conceptual framework. I will first explain this framework before defining other relevant concepts.

Food Security

The definition of food security has changed and evolved over time. When the concept gained prominence in the 1970s, the understanding was centered around the supply and availability aspect of food, because hunger was seen simply as a result of lack of food availability, and unstable food prices as a result of uneven food supply (Clapp et al., 2021, p. 2). Consequently, the measures to deal with food insecurity were to expand and intensify production through technology such as in the Green Revolution (Clapp et al., 2021, p. 2). The way food security is defined, therefore, matters because it influences what types of food policies and measurements that are developed. Since then, the concept has been widened into a four-dimensional framework, including the pillars “availability”, “access”, “utilization” and “stability” (Clapp et al., 2021, p. 1). This was due to the recognition that even if there is a sufficient food supply, food security is not fully reached if people do not have economic or physical access to that food, nor if that food is not utilized in a way that adequately meets nutritional needs or the food supply is not stable (Clapp et al., 2021, p. 3).

More recently, Clapp et al. (2021) published a paper advocating for a six-dimensional approach, adding “agency” and “sustainability” to the four pillars. They argue that since we are still far away from achieving food security for all people, a further nuancing of the concept is necessary so that the complexities of food security can be understood, and policies and measures developed accordingly (p. 3). These additional dimensions were first proposed by the High Level Panel of Experts (HLPE) and the Committee on World Food Security (CFS), but are not yet formally agreed upon (FAO, 2021, p. 190). Still, they are gaining recognition and I will therefore define food security according to this six-dimensional framework. I will now explain these six dimensions and elaborate more on the two additional pillars since these are the least understood.

Figure 1:*Food Security Definition***IDENTIFYING SIX DIMENSIONS OF FOOD SECURITY
IN ITS CURRENT DEFINITION**

(HLPE, 2020, p. 10)

Commonly, food security is described as “a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO, 2021, p. 190), out of which the four-dimensional approach is derived from. As illustrated in figure 1, the two additional dimensions can also be identified within this definition.

The Food and Agriculture Organization of the United Nations (FAO) (2021) describes the four dimensions accordingly (p. 190). The availability dimension refers to whether food is potentially or physically present, and relates to the production of food, food reserves, markets, and transportation (p. 190). The access dimension refers to the access that households and individuals have to the available food (p. 190). This includes both economic and physical access (p. 190). Food security is not fulfilled if food is available but the people who need it do not have access to markets or lack the money to pay for it. The utilization dimension addresses how food is utilized in terms of maximizing the consumption of adequate nutrition and energy (p. 190). Elements of utilization such as dietary diversity, clean water, sanitation, food preparation, and intra-household distribution of food determine the nutritional outcome

of individuals (p. 190). If all the beforementioned dimensions are acquired, the next pillar to consider is stability. The stability dimension refers to the ability to obtain food over time and can relate to long or short-term stability (p. 190). If food availability, access, and utilization are not stable, for instance through having sufficient food during one weather season but not the next one, then food security is not likely to be fully reached. Other factors that can lead to instability could be tied to economic, social, political, or climatic causes (p. 190).

Agency, the new fifth dimension, is the capacity and power of individuals or groups to shape their own reality and to be able to influence governance processes (Clapp et al., 2021, p. 3). In terms of food security, this implies being able to decide what food you eat, what food is being produced, and how the food is produced, processed, and distributed (FAO, 2021, p. 190). To enable this, it must be possible to engage in the systems and processes that shape food policies. Agency is a concept that is crucial in food sovereignty movements and has gained particular attention in relation to addressing growing inequalities and power imbalances within food systems (Clapp et al., 2021, p. 4). Compared to food security, food sovereignty emphasizes people's right to define their food and agricultural systems (agency) and criticizes the food security framework for being too aligned with the neoliberal market framework (Escobar, 2019, p. 185). It argues that policies from governments and food corporations often legitimize "free" trade agreements in the name of food security and have created a food regime in which people and nations have become dependent on an international market that produces "cheap" food (Escobar, 2019, p. 185). This food regime often undermines agency through for instance allowing land grabbing, undermining of small-scale farmers, ecological exploitation, and other unequal practices to happen (Escobar, 2019, p. 185). The gap between food sovereignty and food security is thus reduced when adding the two dimensions, and as I consider the abovementioned aspects as important in discussions about food systems, I chose the food security framework despite the critiques against it.

The sixth dimension, sustainability, refers to "the long-term ability of food systems to provide food security and nutrition in a way that does not compromise the economic, social and environmental bases that generate food security and nutrition for future generations" (FAO, 2021, p. 190). Although one can argue that the definition of sustainability is vague and the term is often misused in many contexts, including sustainability in the food security framework is still important as it incorporates a consideration of the very ecological foundation that our food derives from (Clapp et al., 2021, p. 5). As Clapp et al. (2021) further elaborate, to be able to provide food security for people today as well as future generations,

our food systems need to respect the limits of ecosystems and at the same time contribute to restoring them (p. 5). There is also an increasing recognition that the dominant, industrial model of food production is not environmentally sustainable; it has caused soil acidification, eutrophication, erosion of plant genetic diversity, contamination of groundwater, increased greenhouse gas emissions, overuse of freshwater and the list goes on (p. 5). The sustainability dimension emphasizes the need to address these issues further so that initially we can enable our food systems to support us for a long time.

Food Systems

Because food security is often seen as an outcome of functioning food systems (Clapp et al., 2021, p. 5), an explanation of the food systems concept is also necessary to understand the broader context of this thesis. A food system “gathers all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities related to the production, processing, distribution, preparation and consumption of food, and the outputs of these activities, including socio-economic and environmental outcomes” (HLPE, 2014, p. 29).

Agroecology

Agroecology has evolved into a complex concept that is now both a science, practice, and social movement at the same time (Gliessman, 2018, p. 600). However, it is not within the scope of this thesis to delve into the various aspects of agroecology. Therefore, when I refer to agroecology in this text, I refer to an earlier and simpler definition of it, which is that agroecology is “the application of ecological concepts and principles to the design and management of sustainable agroecosystems, or the science of sustainable agriculture” (Gliessman, 2018, p. 600). Examples of such design and management will be given throughout the sections addressing agroecology.

Urban and Peri-Urban Agriculture

Finally, we have urban and peri-urban agriculture (UPA), which according to the Food and Agriculture Organization of the United Nations can be defined as “the growing of plants or animals within and around cities and associated activities such as producing and delivering inputs as well as processing and marketing of agricultural products” (Artmann & Sartison, 2018, p. 1). Examples include rooftop gardens, community and residential gardens, vertical edible green infrastructure, forestry, balcony and backyard gardening, aquaculture, beekeeping, etc. Hence, it is an umbrella term for various ways of producing food in urban

areas. Worldwide, 15-20% of food is produced in cities (Artmann & Sartison, 2018, p. 2). To simplify, I will use urban agriculture (UA) when I refer to UPA in this text.

In Cuba, UA is defined more or less the same as above; as small-scale agricultural practices near urban populations that use very little machinery or petroleum (Koont, 2011d, p. 29). However, the term “urban” is perhaps a bit of a far stretch. *The Grupo Nacional de Agricultura Urbana* [the National Group for Urban Agriculture], or GNAU, defines urban areas as all agricultural lands within a certain distance of cities and towns that have populations over 1,000 persons (Koont, 2011b, p. 29). Therefore, some areas that might look rural, or peri-urban at best, are defined as urban areas in Cuba.

The Cuban Background

History

The Cuban urban agricultural model started as a desperate attempt to acquire food in a time of acute food shortage caused by political instability (Altieri et al., 1999, p. 132). Before the collapse of the Soviet Union in 1989, Cuba imported 57% of its food supply (Altieri et al., 1999, p. 132), 63% of which came from the Soviet Union (Riera & Swinnen, 2016, p. 419). Totally, 84.6% of Cuba’s imports came from the Soviet Union and the Soviet Block, who also received 81.7% of Cuba’s exports at inflated and favorable prices (McNamara, 2017, p. 46). This export (mainly sugar cane products) heavily depended on Soviet fossil fuels and other agricultural inputs for the production (Riera & Swinnen, 2016, p. 419) as it was a highly mechanized sector with intense use of agrochemicals (McNamara, 2017, p. 46). Apart from this critical dependence on Soviet oil, other imports from the Soviet Union included 86% of Cuba’s raw materials (Riera & Swinnen, 2016, p. 419) and other staples such as cereals, beans, and rice (McNamara, 2017, p. 46). As a result, Cuba faced substantial consequences when these imports came to an end with the dissolution of the Soviet Union.

Implementation of Urban Agriculture in Cuba

The political and economic turmoil that followed in the 1990s led to a crisis in Cuba, commonly referred to as the “Special Period in Time of Peace”, or simply the “Special Period” (McNamara, 2017, p. 47). Daily caloric intake was reduced by 30% compared to the 1980’s (McNamara, 2017, p. 47), and the prevalence of undernourishment increased from 7.8% to 20% (Riera & Swinnen, 2016, p. 419). The lack of foodstuffs and consumer goods in the markets, which were normally highly subsidized, caused rapid growth in prices and at the

same time rations provided by the government were cut so that they covered only about half of the monthly food requirements of an individual (Riera & Swinnen, 2016, p. 420). Additionally, sanctions from the USA led to increased economic pressure and further complicated trade opportunities (Hamilton et al., 2014, p. 54). Ultimately, the Cuban population of 10.5 million people at the time, out of which approximately 69% lived in cities (McNamara, 2017, pp. 46-47), were forced to find a way to feed themselves. Initiatives of UA started to bloom, and the response spread across cities in Cuba (Altieri et al., 1999, p. 131). The system began as a grassroots movement consisting mostly of individuals utilizing vacant urban plots, gardens, and balconies to secure the food intake of their families, but soon the government too saw the potential of UA and the system expanded (Górna & Górný, 2020, p. 86).

The transition in the agricultural sector happened relatively fast. The Urban Agricultural Department, established in 1994 within the Ministry of Agriculture, led the reorganization (Górna & Górný, 2020, p. 86), working with the legislative council to change laws so that residents and gardeners could obtain legal access to unused urban spaces (Altieri et al., 1999, p. 134). People could now request the rights to cultivate a piece of urban land for food production (Górna & Górný, 2020, p. 86). GNAU was developed as a coordinating body with 28 sub-programs and members consisting of producers, agricultural specialists, and civil servants (Hamilton et al., 2014, p. 55). At the same time, the government enforced a new agrarian reform that led to the division of large (rural) state farms into smaller units in usufruct to workers (Górna & Górný, 2020, p. 86).

To help support this new system, the government provided extension services to respond to the needs of the producers, training programs, support for research and technology development, and otherwise helped farmers with their businesses by providing supply stores and technical assistance (Altieri et al., 1999, p. 134) (Leitgeb et al., 2015, p. 420) (Fernandez et al., 2018, p. 6). The various types of UA structures that emerged were run by private individuals, state institutions, or a mix of the two (Górna & Górný, 2020, p. 86). By 2001, food security was under control in Havana, the city that had faced the most severe food shortages, and Cuba has estimated that around this time 50% of the fruits and vegetables consumed in Havana came from the city itself (McNamara, 2017, p. 47). The previous system had largely depended on large-scale agricultural intensification, but Cuba had found a way to produce food without completely relying on inputs.

Agroecological and Organic Farming

By default, the new urban farming practices were organic to semi-organic due to the loss of agricultural inputs such as pesticides and fertilizers provided by the Soviet Union (McNamara, 2017, p. 47). Instead, productivity was sustained through organic and agroecological techniques such as integrated pest management (IPM) and organic soil management, which in addition to being low cost is environmentally friendly and based on local resources such as compost from household waste and animal manure (Altieri et al., 1999, p. 135). For instance, *organopónico* [organiponics], which is one of the most common types of urban farming practice in Cuba, is a container or raised bed in which plants are grown, wherein the soil consists of a high ratio of compost (Górna & Górnny, 2020, p. 86). These are located in areas where the soil is unsuited for agriculture, enabling the use of all vacant plots, whereas “intensive gardens” utilize the areas with high soil quality and adequate water supply by planting directly into the soil (Altieri et al., 1999, p. 133). The focus on agroecology has continued beyond the Special Period until today.

Cuba today

In 2019, Cuba ranked 72th out of 189 countries in the Human Development Index (WFP, 2021a, p. 3). Social protection programs during the last 50 years have turned out to be effective; poverty and hunger are almost eradicated (WFP, 2021a, p. 3). However, in 2020 Cuba encountered its worst economic downturn of the last three decades (WFP, 2021b, p. 2). The COVID-19 pandemic was partly to blame for this. The tourism industry was hit hard when Cuba suspended all commercial flights into the country, an industry accounting for over 10 percent of the gross domestic product (GDP) (Bastian & Garth, 2020). Subsequently, the total GDP of Cuba fell 11 percent in 2020 (WFP, 2021b, p. 2). As everywhere else, the pandemic has amplified preexisting social inequalities, and scarcity of food and other goods has led to multi-day queues in stores; the so-called *La cola del pollo* [the line for frozen chicken] has risen to the next level (Salas, 2020, p. 235). But the Cuban economy was already struggling before the virus found its way to the islands, partly due to sanctions imposed by the Trump administration and partly due to changing reforms in the Cuban economy (Salas, 2020, p. 235). Yet Cuba has a tendency of paving its way out of every challenge or crisis that is thrown at it (Salas, 2020, p. 236).

Generally, contentious political narratives continue to frame discussions about agricultural development (and discussions in general) in Cuba (Fernandez et al., 2018, p. 10).

This inevitably has implications for food security outcomes. For instance, the intrigues between Cuba and the US have significantly affected Cuba's economy, agricultural sector, and society at large (Fernandez et al., 2018). For these reasons and its unique history, Cuba is a very specific case. However, an analysis of the Cuban urban agricultural system's impact on food security is still relevant considering national and global crises that are currently happening and will continue to happen.

Methodology

To answer how UA has contributed to food security in Cuba, a desk study of secondary sources was done. For the empirical data and conceptual framework, I used peer-reviewed journal articles, online books, reports from intergovernmental organizations, and research papers. I also critically read some newspaper articles on Cuba to get an idea of what the situation is like today. The sources were attained through search engines such as Oria and Google Scholar, wherein I searched for combinations of terms like "food security", "Cuba" and "urban agriculture". I also used associated terms such as "urban horticulture", "urban farming", "food sovereignty", "agroecology" and "Havana".

While little research and information exist on the impact of UA in Cuba today, the development of UA in Cuba is well documented. Because many of the papers are relatively old, the findings are applicable between the beginning of UA to around 2014. Some of the papers were concerned specifically with UA in Cuba, whereas others had a section on the topic. Out of the reliable papers I found, nine of them framed UA in Cuba as a success and/or were mostly positive on the impact of UA on food security. Three of them were more critical of its contribution. Out of the papers I read, I ended up using eight of them. Information from WFP, HLPE and FAO was also used to supplement the discussion.

Additionally, I acknowledge that political affairs are of importance because it impacts UA and food security in various ways. However, that is outside of the scope of this thesis, and the governance system and the political sphere will therefore not be assessed in detail.

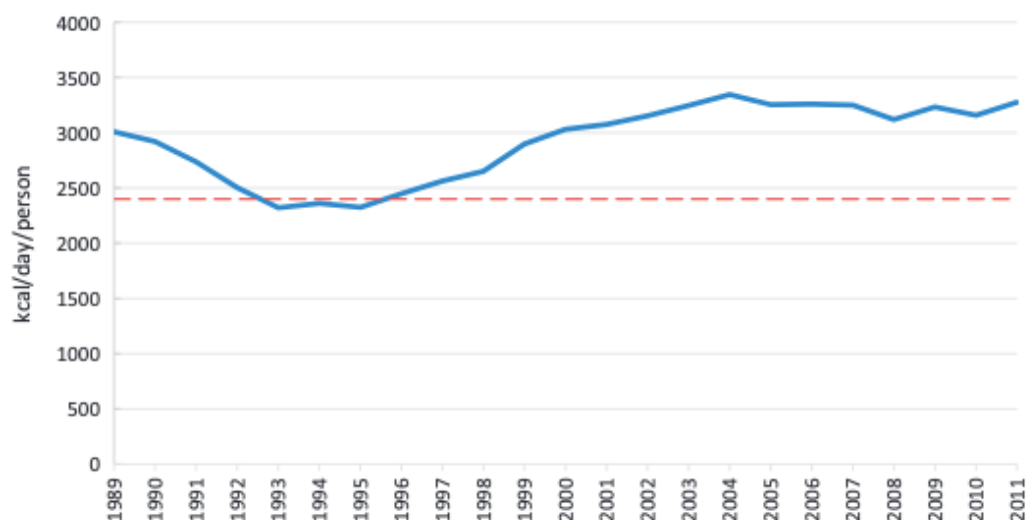
Analysis and Discussion

I will now analyze and discuss what has been found throughout this desk study. The objective is to answer how UA has contributed to food security dimensions in Cuba. I chose to combine findings and discussion/analysis so that I could discuss the findings after I present them to avoid too much repetition. Out of the papers I read, every article somehow expressed

that UA had contributed to some dimensions of food security in Cuba, but most also mentioned limitations and challenges in relation to this contribution. The findings are concerned with urban agricultural production, access to food, dietary diversity, political and climatic instability, participation in food systems, agroecology, and sustainability. A discussion on the findings within a global context will be presented in the end.

Availability and Urban Agricultural Production

Generally, food availability in Cuba improved from 1993 to 2003 and as illustrated by figure 2 the daily calory intake recovered to pre-transition levels with an average of 3,000 calories a day by the year 2000 (Riera & Swinnen, 2016, p. 424). The implementation of UA led to an increase in the production of fruits and vegetables (see figure 3), which replaced much of the sugar production (Riera & Swinnen, 2016, p. 424). In Havana, vegetable production increased from 21 tons to 254 tons from 1997 to 2003, and the fruit and vegetable production in Cuba was 250% higher in 2004 than in 1989 (Riera & Swinnen, 2016, p. 424). However, around this time, the bulk of the consumption came from sources other than UA; nearly 60% of the calories and 60% of the protein consumed originated from other sources, much of which was imported foods (Koont, 2011b, pp. 171-172). As for animal products, urban farms provided Havana's population with 7.5 million eggs and 3,650 tons of meat in 1996 (Altieri et al., 1999, p. 139), and projections for 2010 estimated that 20 million liters of goat milk and 540 million eggs were produced across Cuba (Koont, 2011b, p. 168).

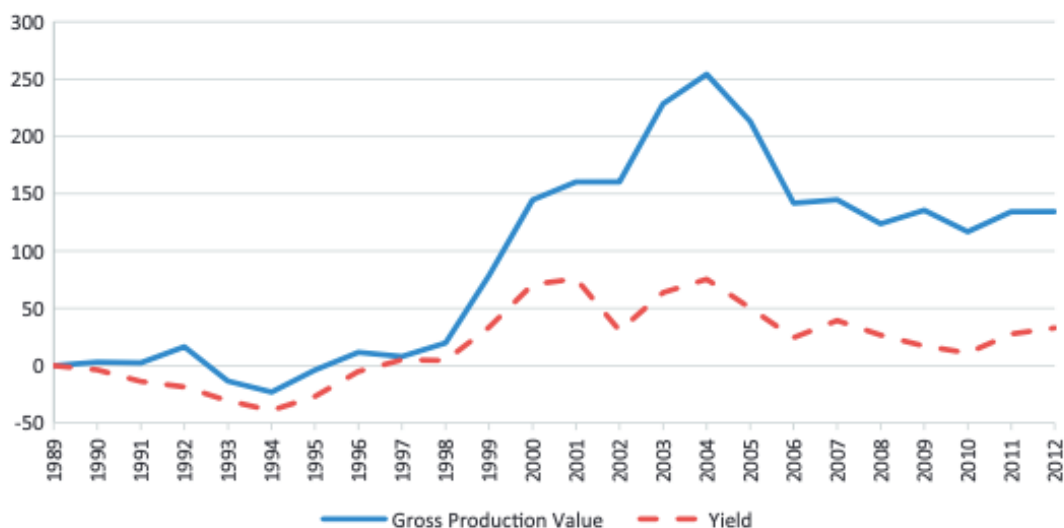
Figure 2*Food Availability in Cuba from 1989-2011*

Note. Daily calorie intake per person increased in Cuba between 1995 and 2011. From Riera & Swinnen (2016).

The role of urban agriculture has evidently played an important role in food security for Cuba since the 1990s. Even critics have had to appreciate some of these successes of UA (Koont, 2011b, p. 171). Phasing out parts of the industrial monocropping production that mostly produced sugar and other non-essential products, was arguably a change for the better. For instance, as illustrated in figure 3, UA considerably increased the production of fruits and vegetables (Riera & Swinnen, 2016, p. 423). As a result, production was diversified rather than being focused on a few export crops. The increased availability and access to fruits, vegetables, and medicinal plants from UA have partly contributed to improved nutrition and a more diverse diet in Cuba (Fernandez et al., 2018, p. 7) which is otherwise characterized by low use of vegetables, heavily compromised of meat, rice, beans, and root crops (Koont, 2011b, p. 171). However, the contribution is greatest in the fruit and vegetable sector, whereas the contribution of other types of foods such as animal products is relatively low (although not insignificant). Consequently, Cuba is still highly dependent on imports.

Figure 3

Fruit and Vegetables: Production and Yields in Cuba between 1989-2012



Note. An important note here is that much of the domestically grown food is sold on the unregulated black market, which could be due to farmers' interest in gaining higher profit or the failure of the state agency to pick up harvest (Fernandez et al., 2018, p. 13). Therefore, the production of UA could be higher than what these numbers imply. From Riera & Swinnen (2016).

Despite an increased focus on self-sufficiency, Cuba has overall heavily depended on food imports (Fernandez et al., 2018, p. 10). The percentage of food imports is debated and estimated numbers from the last decade range from up to 84% down to 40% (Fernandez et al., 2018, p. 11). Numbers from the FAO and other researchers indicate that the dependency ratio has declined slowly from the 1990s till 2013 and that the import rate now fluctuates around 40% (Fernandez et al., 2018, p. 11), but according to WFP Cuba imports around 70 percent of its food needs (WFP, 2021a, p. 3). According to the WFP numbers, import rates are slightly higher today compared to before the collapse of the Soviet Union. If this is the case, then it

would imply that UA has not led to increased agricultural production or self-sufficiency but has rather substituted some of the export monocrops. According to FAO, on the other hand, the dependency rate has declined, which could potentially be in part thanks to UA. In 2014, for instance, the Cuban urban agricultural sector produced around 50% of fresh produce for the country (Fernandez et al., 2018, p. 7). Either way, import rates remain high and are still crucial for food security in Cuba.

The availability dimension does not specifically distinguish between domestic production and imports in evaluating food availability; it can be supported with both imported or domestically produced food. However, import rates are relevant to mention because due to this high reliance on imports, Cuba's food availability is vulnerable in times of crisis as illustrated through this case and as the appearance of COVID-19 also revealed. Such dependence on the global market, particularly on essential items such as foodstuffs, fossil fuels, and feed for livestock, proved to have unfortunate consequences for Cuba when Soviet imports ceased. Domestic production of food is therefore an important component of a country's ability to ensure food availability in times of difficulties. Thus, the relatively low productivity of food production in areas other than fruits and vegetables, implies that UA is far from efficient enough on its own and needs support from both rural agriculture (Górna & Górný, 2020, p. 89) and food imports.

The high import rates can partly be explained by the biophysical limitations related to UA. For instance, due to Cuba's tropical climate, it is difficult to grow certain types of crops (Fernandez et al., 2018, p. 11). Extreme weathering causes rapid oxidation of organic matter which is important for the functioning of the soil (Altieri et al., 1999, p. 136). Hence, the production of cereals and grains, for human and livestock consumption, is limited due to the tropical climate and poor soil quality in Cuba. Because animal sources of food often require grains and cereals as feed for livestock, it limits the production of high protein products such as meat and dairy products. Cuba has therefore struggled to meet the daily protein intake recommended by FAO for food security (Fernandez et al., 2018, p. 13). Raising livestock also requires more space for production compared to plants, and cities simply cannot offer sufficient space for instance for grazing. As a result, raising large livestock such as cows or pigs is difficult (Koont, 2011b, p. 168). For these reasons, animal protein sources have generally been short in supply and heavily dependent on imports, resulting in a struggle for Cubans to ensure a balanced diet. These factors thus limit the ability of UA to produce food of appropriate quality and variety.

Urban food production relies on a suitable climate to grow food in, and it also relies on urban residents to engage in food production. The various agricultural reforms of the Cuban government, both in the '90s and more recently in 2008 and 2012, have encouraged people to apply for land to stimulate domestic agricultural growth (Fernandez et al., 2018, p. 4). Through access to land via usufruct rights, facilitating credits, decentralization, training services, and diversification of sales channels, the government has enabled urban food production to grow (Leitgeb et al., 2015, p. 421). UA has come to encompass about 14% of the total agricultural land of Cuba (Fernandez et al., 2018, p. 7). However, it still took 14 years after the fall of the Soviet Union for production in the agricultural sector to return to 1989 levels (Riera & Swinnen, 2016, p. 423), arguably a long time. Additionally, according to interviews of urban farmers, the system still suffers from time-consuming bureaucratic constraints for application to obtain land legally, in addition to obstacles related to clearing of land once the land is obtained (Leitgeb et al., 2015, p. 418). This indicates that UA is not reaching its full potential due to bureaucratic constraints that hinder some people from engaging in urban farming.

Constraints related to the organization and distribution within the food system have also been a challenge. Fernandez et al. (2018) write that many farmers have contracts with the state distribution enterprise, Acopio, which is responsible for the distribution of food for the population (p. 5). Acopio, despite attempts at improvement, has struggled to act as a reliable distribution channel, partly due to limited fuel and transportation that has resulted in failed pick-ups of produce (p. 5). Since then, Cuba has created new types of state markets (p. 5) and allowed producers to privately commercialize their surplus for instance through signing contracts with hotels and restaurants (Leitgeb et al., 2015, p. 422). Still, distribution and storage remain an issue. A report from 2017 estimated that about 57% of food produced in Cuba is lost before it reaches the consumers, namely 30% during harvest and post-harvest and 27% during distribution to local and regional areas (Fernandez et al., 2018, p. 5). To reach its full potential, farmers need to not only be able to produce food but also store it and distribute it to markets for sale. Thus, the contribution of UA to food availability seems to be limited by a flawed distribution and storage system, despite the government's attempts at improving it. UA could therefore have a greater impact on food security if the distribution channels were better organized.

Physical and Economic Access to Food

Even if food is available, it does not necessarily mean that people have access to it. In the Cuban government, access to food has been a highly prioritized concern (WFP, 2021a, p. 3). An example of this is the subsidized monthly ration of staple food that covers 40 percent of recommended food intake, which is provided to the entire population, in addition to a nationwide school feeding program in boarding and half-boarding primary schools (WFP, 2021a, p. 5). However, 50% of the monthly food basket is imported foods and it contains limited quantities of fruits and vegetables (WFP, 2021a, pp. 3-5). An approximate 2.5% of UA produce is distributed to various social purposes such as the food basket, hospitals, maternal homes, daycare centers, military units, and schools (Koont, 2011b, p. 169). Otherwise, most of the produce of UA is sold directly at market stands situated at the production units, often near a high density of people (McNamara, 2017, p. 51). According to numbers from 2004, around 60% was sold on the spot, 15% went to self-provisioning, and 10% to state markets, in addition to the percentage aimed at various social ends (Koont, 2011b, p. 169).

Access to UA produce is thus supplied through various distribution channels. Although the 2.5% distributed to various social ends is a rather small contribution, this ensures that fruits and vegetables are distributed to various groups in the Cuban society, including important institutions such as schools and hospitals. Otherwise, the production and sale of food in cities has greatly shortened transportation distance and created new sites where food can be accessed. On the other side, studies have shown that in Havana urban farms and provision sites are unevenly distributed and are concentrated in certain areas (Górna & Górný, 2020, p. 92). As a result, many residents must visit other neighborhoods or other parts of the city to buy basic food products (Górna & Górný, 2020, p. 88). The largest farms are often situated on the outskirts of the city due to the scarcity of available land in the city center. Since much of the produce is sold on the spot and the distribution system as discussed is partly ineffective, it indicates that food availability and access are highest around the city limits and that the physical access to food markets is partly unequal at least in Havana. However, without UA, these market stalls with fresh produce scattered around the cities, would otherwise not be there. Thus, although perhaps unevenly, UA has still significantly improved Cubans' access to local fresh produce.

The ability to access food is also determined by a person's economic position. Because urban farming is labor-intensive, it has boosted employment and contributed to the reduction

of the high unemployment rates in the 90s. The numbers vary, but one estimate is that UA has generated more than 300,000 jobs, in addition to having trained thousands of farmers, technicians, and government officials in agroecological farming (Fernandez et al., 2018, p. 7). In 2009, 1 in 3 workers in the agricultural sector, and 1 in 14 of all Cuban workers, were laborers of UA (Koont, 2011b, p. 174). UA has also allowed more women to participate in food systems. Gender inequality is still a persistent issue in Cuba despite effort and progress; on average, women work 14 hours more per week, mostly unpaid domestic work (WFP, 2021a, p. 4). In rural agriculture, fieldwork was considered a man's job, and only 25% of this work was conducted by women (Koont, 2011b, p. 173). In 1996, 43% of UA workers were women, compared to 70 percent of men in both urban and rural settings (Koont, 2011b, p. 173). As a result, UA has ensured income and increased economic access to food for thousands of men and women.

Nevertheless, the average Cuban income is low, and Cubans use a significant amount of their income on food; between 55 and 70 percent (WFP, 2021a, p. 5). Consequently, food affordability and price variability can have a big impact on a household. For instance, urban farmers from one interview said that the food they produce for their own consumption is very important because they save money by avoiding food purchases at the official markets that often have high food prices (Leitgeb et al., 2015, p. 421). This further emphasizes UA's important role in food security; by allowing people to avoid markets, UA can help reduce spending on food. Self-provisioning is therefore an important benefit for those engaged in UA. On the other side, people wanting to avoid markets points out the challenge concerning unpredictable Cuban markets.

Generally, non-subsidized markets are characterized by high prices and irregular supply (WFP, 2021a, p. 5). As a result, a black market has developed wherein a variety of goods such as meat, fish, seafood (Riera & Swinnen, 2016, p. 426), and agricultural inputs are traded (Leitgeb et al., 2015, p. 421). This implies that certain products are difficult to access in Cuba. For instance, urban farmers mention the lack of access to agricultural inputs as an obstacle (Leitgeb et al., 2015, p. 421). They also found it contradicting that the government aimed to increase food production while at the same time limiting farmers' access to inputs with high prices and scarce availability of inputs (Leitgeb et al., 2015, p. 421). Consequently, those farmers wanting to utilize inputs instead of other approaches must turn to the black market and/or expensive markets. Seemingly, lack of resources and bureaucracy makes it

more complicated for a farmer to perform urban farming. Eventually, this restricts access to food through UA.

Utilization and Dietary Diversity

Presumably, the increased food availability and enhanced access to fruits and vegetables would result in great health outcomes but Cubans still experience diet-related troubles. According to WFP (2021), undernourishment is no longer a problem, but a double burden of malnutrition is taking place with micronutrient deficiency and overweight/obesity being common (p. 5). The average Cuban diet is not sufficiently healthy or diverse and is generally poor in micronutrients (p. 5). This can be explained by the unstable availability of nutritious foods, socioeconomic factors, and inadequate eating habits (p. 5). The poor nutritional outcomes have occurred despite national efforts to improve nutritional education (p. 14). A particular focus has been on the educational sector, by educating teachers, students, and the school cooks about the benefits of eating the vegetables from UA that are delivered to their schools (Koont, 2011b, p. 171). By 2001, all but the Havana province met the FAO guideline which at the time was at least 300 g of vegetables per person daily, and all provinces reached this by 2007 (Koont, 2011b, p. 171). The rise in vegetable consumption has been most evident in urban areas, whereas rural settlers have been more hesitant to change their diets (Leyva & Lores, 2018, p. 3). Therefore, while issues related to diet remain, UA has contributed to increased intake of such foods in urban areas. However, because the percentage of consumption coming from UA is as mentioned rather small, the contribution of UA to increased dietary diversity is not substantial. Also, the beforementioned issue of scarce protein sources remains a great weakness both in UA's contribution to food security as well as the Cuban food system in general.

Political and Climatic Instability

Despite the general improvement in food security since the 1990s, the stability of Cuban food security has been challenged repeatedly. For instance, the agricultural sector was hit by severe droughts and heavy hurricanes between 2005 to 2008, causing significant damage to crops (Riera & Swinnen, 2016, p. 427). These weather events were accompanied by a return to central planning and an elimination of what was left of market-oriented reforms. During the Special Period some of the reforms that were implemented had somewhat liberalized parts of the economy but the new leadership argued that this was a mistake and that the reforms had worsened "old problems that Cuban socialism had already overcome"

such as inequality and corruption (Riera & Swinnen, 2016, p. 426). The new reforms of 2003-2008 for instance led to heavy taxes and strict regulations on private restaurants which forced most of these restaurants to close (Riera & Swinnen, 2016, p. 426). The combination of political reforms and uncooperative weather led to a 20% decrease in agricultural production between 2003 and 2008 (Riera & Swinnen, 2016, p. 427). The fruit and vegetable sector which had been thriving mostly due to UA was also affected and output declined (Riera & Swinnen, 2016, p. 427). Consequently, the Cuban food system is still characterized by instability.

Climate-related risks and shocks such as hurricanes continue to pose a threat to productivity, yields, and livelihoods in Cuba until today (WFP, 2021a, p. 7). Between 2001 and 2017, Cuba lost a total of 41 billion pesos, out of which approximately 40 percent were in the agricultural sector, only due to hurricanes (WFP, 2021a, p. 6). Naturally, this has direct impacts on food availability and stability of the food system, including UA. In addition to higher frequency of extreme weather, climate change also threatens the stability of UA with higher temperatures, decreased rainfall, and rising sea levels (Fernandez et al., 2018, p. 6). In Cuba, water availability is already limited, especially in urban areas and during the dry season (McNamara, 2017, p. 51). This has implications for urban agricultural productivity but also for basic household needs. In times of drought, the government sometimes restricts residents' supply of water, and the essentiality of water raises the risk of conflict between urban farmers and their neighbors (McNamara, 2017, p. 51). Since water access is a prerequisite for a well-functioning urban food system this has been a consistent issue in Cuban UA. Growing food in cities is therefore not always a straightforward task, and UA is far from unaffected by environmental factors and weather affairs that cause disruptions and unreliability in the food system.

However, Cuba is experienced when it comes to dealing with threats such as hurricanes and epidemics and has developed a well-functioning disaster-mitigation apparatus (Salas, 2020, p. 233). For instance, Cuba has handled the COVID-19 pandemic well despite the tricky economic situation before the arrival of the virus (Salas, 2020, p. 233). Cuba's ability to "bounce back" after facing challenges can partly be explained by a robust and free universal health system that is oriented toward community and preventive medicine (Salas, 2020, p. 233). Despite generally low living standards, the health and education system is of overall high quality (Riera & Swinnen, 2016) (WFP, 2021a, p. 7). Illness can affect a person's ability to work and earn a living and can consequently impact all dimensions of food security.

Governmental institutions such as free healthcare and other social services thus enhance stability through the provision of essential services to those who need them. In addition, the emphasis on agroecological approaches in agriculture can help decrease losses during unfortunate weather events such as hurricanes. A study conducted in 2008 after hurricane Ike hit Cuba, found that agroecological farms had 50 percent crop loss compared to 90-100 percent on conventional monoculture farms (Fernandez et al., 2018, p. 7). The agroecological approach is thus an important aspect of UA that together with governmental institutions arguably enhances the stability of food security in Cuba.

Agency and Participation in Food Systems

The impact of UA goes beyond increased availability and access to food. The green spaces created through UA have for many served as a source of leisure, exercise, and relaxation while also acting as a community builder within neighborhoods (Altieri et al., 1999, p. 139). In addition, due to the reconstruction of the agricultural sector agricultural responsibilities have been reallocated and consequently allowed more people (including more women) into the food system. State farms were broken down into smaller units and vacant urban plots were distributed to people. Compared to the old system in which agricultural responsibilities were tied to a few large-scale farms and the state, this has increased the participation and involvement of the Cuban population over their food systems and thus enhanced agency. But even though urban farming initiatives started as a bottom-up response, Cubans did not really have a choice but to find a way to feed themselves. Many urban farmers do UA out of necessity (Leitgeb et al., 2015, p. 416), which suggests that UA is sometimes more a matter of survival than a wish to shape and participate in food systems.

A strong centralized government can sometimes restrict the autonomy of people. For instance, the organic and agroecological approaches that were introduced out of necessity have in general been supported by Cubans, but the lack of industrial inputs has continued beyond the Special Period due to the government's emphasis on agroecology. This is arguably an obstacle towards agency. In interviews farmers have expressed pragmatic attitudes toward the shift to agroecology, saying that they would use more chemical and fossil-fuel inputs if it was available to them (Koont, 2011c, p. 179). Although they acknowledge the benefits of agroecology, they feel like the paradigm shift was forced on them (Koont, 2011c, p. 179). The scarcity of adequate water, fertilizers (organic and conventional), hard currency to purchase necessary inputs such as irrigation equipment from international markets, and generally a shortage of essential items has been a consistent issue for Cuban farmers (Koont, 2011c, p.

180), threatening their capacity of participating in food systems the way that they want. On the other side, agroecological approaches have reduced reliance on changeable economic conditions for the gardens to thrive, which have arguably enhanced agency. Hence, in one way, UA can act as a stabilizing factor in the otherwise rather uncertain domain of the Cuban food system. Eventually, this can decrease people's stress and unpredictability concerning food. Obstacles remain, but overall Cubans have become more active food citizens rather than passive food consumers.

Sustainability and Agroecology

The pathway toward local and agroecological UA in Cuba turned out to be not only necessary but providing various benefits. Cuba's agricultural system is by no means dominated by agroecology (Fernandez et al., 2018, p. 4) and still has large areas of land cultivated as monocultures of sugar cane, coffee, and tobacco (Lucantoni, 2020). But the circumstances under the Special Period allowed agroecology to take root across the country, particularly in UA. Since situated in the city, these gardens drastically reduced the need for fossil fuels for the transportation of fresh produce, and the use of toxic agrochemicals had to be limited within city limits because of the health threats they pose to people if exposed too frequently and in such proximity (Koont, 2011a, p. 21), thereby reducing associated health risks. Due to agroecological approaches, different crops were planted next to each other, which increases biodiversity and is thought to enhance resilience in the face of extreme weather and socio-economic stressors (Fernandez et al., 2018, p. 7). Cuba had learned from its earlier mistakes; excessive plowing, heavy use of herbicides, and lack of methods that maintained crop diversity such as crop rotation and intercropping had led to a 65% erosion of agricultural land and 25% of the land experiencing severe to very severe erosion (Koont, 2011a, p. 22). Business as usual would likely hurt the agricultural land even more.

The emphasis on organic and agroecological methods induced by the Special Period has improved the sustainability of Cuban agriculture for several reasons. First, agroecological methods are generally thought to be more environmentally sound (Altieri et al., 1999, p. 135) and provide alternative solutions to conventional methods (HLPE, 2019, p. 31). For instance, pests and diseases can threaten the production of UA, and according to agroecology, this can be fought with methods such as IPM which uses biological control instead of synthetic chemical pesticides (Altieri et al., 1999, p. 136). The latter was prohibited within Cuban city limits due to concerns for public health (Altieri et al., 1999, p. 136). Organic fertilizers and techniques such as IPM and organic soil management have therefore partly substituted the

need for harmful chemical fertilizers and pesticides. Second, agroecological farms have proven to be more resilient in times of extreme weather, such as during hurricane Ike. Thus, agroecology can reduce farmers' loss of yields and income. Agroecological methods can therefore strengthen all aspects of sustainability; the social, economic, and environmental.

Cuba's environmental awareness has been amplified through the emphasis on agroecology but also through Cuba's experience with industrial agriculture. As mentioned, it is well established that the dominating industrial model of agriculture has dire consequences for the health of the planet and is thus not particularly sustainable. Cuba got to experience this first-hand with the severe erosion of their agricultural land. This might be a reason why Cuba generally has been engaged and aware of environmental issues (Koont, 2011b, p. 174). For instance, the UA sector has participated in a tree-planting initiative that aims to restore the forests of Cuba after the deforestation that happened throughout its colonial and postcolonial history (Koont, 2011b, p. 175). Some of their aims have been to grow food for humans (by planting fruit, coffee, and cacao trees) and feed for animals, and to produce organic materials to contribute to compost and production of fertilizers specifically for UA (Koont, 2011b, p. 175). Reforestation has environmental benefits such as reduction of air and noise pollution and enhancement of biodiversity (Koont, 2011b, p. 176). It can also improve the well-being of people in these areas by reducing urban stress and increasing physical and psychological well-being (Koont, 2011b, p. 176). Therefore, it seems that Cuba's lived experiences as well as the focus on agroecological UA have led to concern and care for the quality of food, soil, and water (Koont, 2011b, p. 174), to the benefit of both people and the environment. However, the sustainability dimension is a complex one that stresses not only environmental concerns but also the importance of meeting the present demands.

A debated topic is the efficiency of alternative approaches within agriculture such as agroecology (HLPE, 2019, p. 46). Sustainability does not only emphasize consideration of ecological aspects to ensure the capacity of the environment to sustain future generations. It also highlights that sustainability should not go at the expense of providing enough food for people today. Often, agroecological approaches are thought to be less productive than conventional or industrial agriculture (HLPE, 2019, p. 47). Cuban farmers are also split in their view of agroecology, and so are researchers, professors, and other professionals (Fernandez et al., 2018, p. 4). Although the research on this is underinvested, various studies have explored this with differing results; sometimes yields increased and other times decreased (HLPE, 2019, p. 46). Given the growing human population that will demand more

food, agricultural efficiency is important. However, some estimates indicate that we are producing enough food today to feed 9 billion people (HLPE, 2019, p. 46). Still, malnutrition and micronutrient deficiencies remain an issue. Therefore, at least on a global scale, the picture is more nuanced, and the concern should not only be focused on producing enough food.

In the case of Cuba, Fernandez et al. (2018) found that the limited ability of the agroecological approaches to feeding the Cuban population has more to do with a range of barriers in the economics of the food system (p. 20). These barriers include a lack of access to credits and investment for small infrastructural investments (for instance tools, netting, solar panels, and digging equipment), lack of markets to purchase basic inputs, lack of diverse markets to sell produce, lack of adequate storage and processing facilities and a taxation system that favors an import food model (p. 20). As discussed, many of these barriers apply to UA as well. Thus, the ability of UA to provide enough food is not (or not just) limited by agroecological approaches but rather other obstacles. Surely, the effectiveness of agroecological methods depends on the accurate use of agroecological techniques, which requires knowledge and practice. But that applies to conventional agricultural methods as well. Once that knowledge is obtained, however, agroecological approaches, which apply ecological principles, are less harmful than industrial methods and are thus more sustainable and better for the planet.

Urban Agriculture for Food-Secure Cities? The Global Context

The ability to utilize space, land, and resources effectively has become increasingly important on an increasingly crowded planet. Moreover, rising global instability and recent socioeconomic crises have disclosed that our food systems are vulnerable; in an intertwined global food market interruptions in the supply chain affect many people simultaneously. As the Cuban story has exemplified, UA can be a useful component to incorporate into cities, especially in times of instability. Considering the decrease in food security that many urban residents are experiencing worldwide, the potential of UA should be explored even further. UA in and by itself might not lead to food secure cities but it can increase cities' food security as it did in Cuba. For poor and vulnerable urban households, UA can act as a source of food, but also of leisure, employment, community-building, and wellbeing.

Furthermore, with threats like climate change, pressure on natural resources, and land degradation hovering above us, it has become evident that our food systems are not only

vulnerable but also flawed. The current food systems account for about one-third of all emissions (Crippa et al., 2021) and the dominating method of industrial agriculture continues to degrade the very ecological foundation that our food systems depend on. Because this is not sustainable in the long run, environmental concerns within food systems need to be prioritized if we want future (and present) populations to thrive. And with more people in urban areas, it only makes sense to start producing more food in cities. It seems that the world has come to the same point Cuba found itself in; we do not have a choice but to explore alternative methods for food production.

UA is only one of many potential solutions needed to tackle the challenges we are facing. Like every other “solution”, UA has its shortcomings and challenges as demonstrated in the Cuba case. For instance, UA will probably never become our main source of food due to limitations such as lack of space and climate restrictions within cities. The implementation of UA will have different goals and initial effects depending on individual prerequisites and circumstances in each city. For instance, the specific political and economic circumstances in Cuba complicate the replication of the system, but there are still lessons to be learned as discussed throughout this paper. In and by itself UA might not transform our food systems. But perhaps a more important question to ask is what will happen if we don’t embrace such alternative solutions. Hamilton et al. (2014) highlighted this in the case of Cuba, asking what would happen if Cuba did not embrace UA as a solution (p. 55). They pointed out that a country finding itself in a very similar geopolitical situation after the breakdown of the Soviet Union was the Democratic People’s Republic of Korea, which did not develop a UA response and suffered a series of famines in the 1990s that led to 2.5 million deaths in 1996/1997 (p. 55). Potentially, UA could have alleviated some of these deaths.

Conclusion

It is evident that UA has contributed in various ways to the increase in food security that Cuba has experienced. It has created jobs and purpose within neighborhoods, increased production of fruits and vegetables, diversified production in the agricultural sector, partly enhanced dietary diversity, increased people’s participation in food systems, and amplified environmental focus. But as discussed throughout this paper, this is only one part of the picture. Several important challenges and limitations remain. Some of these issues are related to UA directly, such as limited space for production. Other challenges are tied to the organization of the agricultural sector or the structure of the Cuban society, such as poor

distribution systems and low incomes. Nevertheless, the implementation of UA, including land reforms and support systems provided by the government, enabled a new sector to develop and eventually provide urban residents of Cuba with a fair share of fruits and vegetables.

However, framing UA's impact on food security in Cuba as a complete success story, such as many scholars have, would be an overestimation of its contribution. Food security can be said to have been reached in the area of fruit and vegetable production, but the contribution is far lower when it comes to high protein foods such as animal products. Thus, one can say that UA acts as an important supplement to rural agriculture and food imports. Because imports are still crucial for food security in Cuba, the generally high food security that Cuba has achieved is vulnerable. Food security is therefore not stable despite having implemented UA, but the agroecological methods introduced with UA, in addition to governmental institutions, have enhanced the resilience of the system. Increased resilience is useful in times such as political and climatic happenings, which also threaten food security stability in Cuba. Still, I am yet to find a negative outcome of UA, and as pointed out by Hamilton et al. (2014), perhaps a more important question to ask is what would happen if Cuba did not embrace UA as a solution. After all, Cuba fought its way out of extreme hunger and has overall managed to keep food security levels relatively stable, in part thanks to UA.

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Norges miljø- og biovitenskapelige universitet
Noregs miljø- og biovitenskapelige universitet
Norwegian University of Life Sciences

Postboks 5003
NO-1432 Ås
Norway