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Urban Agriculture: An Approach Towards Creating Sustainable Smart Cities: A Review

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ABSTRACT

The global food system is projected to experience increasing challenges over the years due to rising population and per capita consumption. Rapid population growth magnifies the effects of climate change by depleting resources and increasing exposure to climate-related risks, especially in urban areas with limited resources. Urban poor people have been proven to be more vulnerable to rising global food issues, climatic changes and unemployment rates due to unique elements of their urban life. Cities that deal with multiple urbanization challenges ultimately develop an urban sprawl which has detrimental effects on the economy, society and environment. Here comes the prevalence of urban agriculture as a form of modern agriculture that places an emphasis on its numerous goals in ensuring food security, maintaining urban ecosystem services and enhancing urban living standards. Urban green spaces are universally acknowledged as a nature-based solution that promotes social cohesion, healthy living and climate change mitigation and adaptation. Urban agriculture benefits a community in a variety of ways, from providing food and nutritional security, economic and environmental benefits and even modifying a city's urban form.

Key words: Nature-based solution, Social cohesion, Urban sprawl, Urbanization.

Today, urbanization is one of the primary drivers of the world's transformation. Currently, over three billion people live in cities around the world, accounting for 55 per cent of the world population and by 2050, it is expected that 68.00 per cent of the global population will be living in cities (UN, 2018). From an urban population of 366 million in 2011 (31% of the population), the urban population in India is expected to rise to 800 to 850 million by 2050 (50% of the population) (UN, 2010). Due to this scenario of rapid urbanization, there is an increased demand for fulfilling the needs of urban residents, putting additional pressure on rural households to increase production and productivity. Along with this, cities are beset with many problems of urbanization such as environmental degradation, creation of urban heat islands and increasing poverty (Sahasranaman, 2016) which make an urban sprawl with negative economic, social and environmental consequences. Urban agriculture is emerging as a real strategic solution for ensuring food security, preserving urban ecosystem services, improving the quality of urban living and diversifying urban livelihoods, especially for poor and marginalized groups. This growing trend can provide a varied and healthy food supply for urban regions, while also conserving key urban ecosystem services and providing residents with valuable economic benefits.

According to Veenhuizen (2007), urban farming is defined as the growing of plants and the raising of animals for food and other uses within and around cities and towns and related activities such as the production and delivery of inputs, processing and marketing of products. It also emphasizes the production of non-food items, such as bee pollination, greening and recreation through considerable resource reuse in metropolitan areas. Moreover, urban agriculture includes a number of activities that are involved in the production of food, including as plant and tree crop cultivation, animal husbandry, aquaculture, mycoculture, apiculture and floriculture. Urban agriculture is defined not only by its location within city limits, but also by its growing importance in the urban fabric from both a socio-economic status and an environmental standpoint (Mougeot, 2000). Urban agriculture (UA) could be a source of nutrition or income for families while also helping to mitigate the effects of the evolving threats to food security. Urban agriculture is defined as limited sections within cities, such as empty lots, gardens, roadsides, balconies and bins, that are employed for growing crops and rearing small farm animals or dairy cattle for own intake or selling it in local markets (FAO, 1999). Urban agriculture is vital for people who live in urban areas since it enables them to make the best of their land resources and produce more from their farming efforts. Utilizing urban yards can increase

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access to fresh, healthy food, increase consumption of vegetables and fruit and reduce the cost of food.

Growing better cities

Urban agriculture was already promoted as a viable worldwide strategy to provide many benefits to city dwellers. Reusing urban resources and promoting agriculture in cities includes various forms of socio-economic and ecological benefits. Urban agriculture has the potential to enhance the economic growth, social inclusion, food production, health conditions and overall sustainable development (Orsini, 2013). With regard to environmental and economic advantages like improved air quality, increased food security, or water regulation, cities could considerably benefit from urban agriculture's eco-system services. The ecosystem approach can be used as an integrative assessment technique to demonstrate how urban agriculture benefits humans in terms of providing (for example, food supply), controlling (for instance, stormwater runoff reduction), promoting (for instance, biodiversity), social and cultural benefits (for instance, well-being and recreation) (Sanye *et al*., 2018). Urban agriculture also increases resource efficiency, develops a food system, helps in urban renewal, land development, healthcare, community stability and economic expansion. It also assists urban residents in reconnecting with nature, reclaiming public spaces, recovering from disasters and earning a living.

Urban agriculture may have an impact, which may be either direct or indirect on people's health by generating safe, wholesome and environmentally friendly surroundings. In addition, this benefits health by in communities' schools and vacant lots. For instance, Intake of fresh vegetables and fruits is related positively to neighbourhood growing food experience (Patel, 1996).

Urban agriculture in Indian scenario

Urban agriculture has now become progressively crucial in India, as its population becomes more urbanized. This type of farming, which focuses on production of food within and around cities, holds the potential to reduce food and nutritional insecurity for the urban poor. Through local production of food, the risk of food availability uncertainties caused by climate variability, price swings and changes in oil prices can be reduced. At the same time, urban agriculture can help address numerous challenges that cities face today. These include tackling urban poverty, reducing air and water pollution, improving municipal waste management and addressing water shortages. Moreover, urban agriculture provides a range of benefits such as job creation, increased access to fresh healthy produce and green spaces in densely populated areas. Given these advantages, it is essential to prioritize urban agriculture as part of a holistic plan to make Indian cities more livable. There are various approaches that can be taken to support this endeavor such as providing financial incentives to farmers who practice urban agriculture and creating supportive policies that focus on research, education and extension services. Furthermore, local governments should promote urban agriculture through public-private partnerships with the aim of creating a sustainable food supply system. Relative importance of urban Indian agriculture is thus required to ensure nutrition and food security for the country's rapidly growing urban areas.

Urban agriculture and nutrition

Food security is defined as the availability, ease of access and affordability of safe and nutritious food on a consistent basis. Currently, the world population is anticipated to surpass eight billion people by 2025. This implies that an additional person who has to be nourished will join the three individuals who already inhabit the planet today. Therefore, it will be crucial to guarantee that food production stays up with this population growth. By 2050, there will be an additional 1.5 billion mouths to feed due to the world's growing population and decreasing amount of arable land (Rodriguez *et al*., 2020). If diets stay the same, by 2050 we will need 120 per cent more water and 42 per cent more crops, have lost 14 per cent of our forests and be producing 77 per cent more greenhouse gases (Godfray *et al*., 2010). Rapidly growing cities are often plagued by a food system that is stressed due to the pressure of increased food needs from expanding urban populations. This can lead to problems such as food shortages and health concerns (Zimmer *et al*., 2022). Urban households rely heavily on purchased food, making them particularly susceptible to changes in food prices. With rising food prices, many households are forced to rely on expensive and unstable food supplies which can have a significant impact on their health and well-being (McCordic and Frayne, 2017). Due to limited access to food, households are compelled to engage in urban agriculture as a coping mechanism (Warren *et al*., 2015). In this context, the most significant benefit of urban agriculture is the expansion of the availability of affordable, fresh and healthy food, which contributes to improving food and nutritional security in urban areas. Through providing healthy and inexpensive substitutes for food that needs to be purchased, especially for low-income households, urban agriculture enhances food security. It can also exacerbate social injustices by helping wealthy individuals and organizations while pushing out lower-income families.

The fundamental objective of urban agriculture is to produce food for domestic use, which is supported by the fact that, in most cases, farming households consume the large majority of the produced food rather than selling it. Financial incentive was yet another crucial element that was nearly inseparable. When we talk about food accessibility, income is also a prime factor for ensuring food and nutrient security. Urban farming may be a supplementary source of income and there by contribute to enhanced food security.

Urban agriculture policies have the power to considerably reduce social inequality, improve community access to food for socially vulnerable populations and support urban food systems during times of scarcity. In low-income developing nations, women profit from urban agriculture more than men do, especially as they try to

improve the stability of their households' finances, health and food security. Due to the enormous pressures on urban food supply systems created by the explosive growth of metropolitan populations in emerging countries, there are often food shortages during times of crisis. Since urban agriculture is believed to boost food security through the primary pathway of improved access to food, it is the sole remaining solution to this dilemma. Homegrown foods improve the overall amount of food that is accessible to a household, preventing hunger and malnutrition. Having access to fresh, locally grown food items, particularly fruits and vegetables, simultaneously improves household members' nutritional condition and, in turn, their health. Particularly disadvantaged households can frequently afford to eat a more varied diet due to direct access to food (Stewert *et al*., 2013).

Incorporating urban agriculture into urban planning and encouraging farming practices in cities with the limited space available is a practical idea that would also ensure food security and provide income to the people associated with these practices. This is because there is less land available for cultivation per capita and because people are relocating to cities in greater numbers in quest of better possibilities. Urban agriculture must be given top priority given that India's population is moving more and more into cities in order to boost food and nutritional security. Having at least a partial level of food self-sufficiency will safeguard the urban poor from the uncertainties in food supplies induced by climate variability, price swings, fluctuations in the price of oil and other factors. Urban agriculture (UA) could be a successful urban greening tool if it is scaled up to comply with microclimate regulation, natural hazard reduction and waste disposal goals, among others. This is done in order to implement restoration and conservation strategies to achieve maximum the delivery of ecosystem services by the entire network of urban green infrastructure (Cilliers, 2020).

Urban agriculture and ecosystem services

Urban agriculture is an application of an integrated approach that considers the use of a combination of techno-socio ecological measures to the risks of climate change by building resilient urban green spaces (Huq *et al*., 2007). Cities could gain largely from the ecosystem services of urban agriculture in terms of environmental and socio-economic benefits, such as water regulation, enhanced food security, or improved air quality (Lin *et al*., 2015). Urban agricultural systems can contribute to the health of the natural ecology and offer more ecosystem services (Andersson *et al*., 2014) than they demand. Restructuring agriculture, particularly urban agriculture, as a component of a greener infrastructure system might lead to the creation of a network of agricultural systems that enhance the health of the local ecosystem by supplying ecosystem services and avoiding harmful externalities.

Urban agriculture has indeed been proposed as a means for delivering ecosystem services like benefits for mental health and cultural enrichment (Jansson, 2013). Urban green spaces are well recognized as a nature-based solution that supports, among other things, social cohesion (Peters, 2010), climate change mitigation and adaptation (Kabisch *et al*., 2016) and healthy urban living. Urban agriculture provides food, energy and raw materials as well as a variety of other ecosystem services, which all contribute to the ecosystem services of green infrastructure. Urban agriculture has the ability to provide numerous ecosystem services in addition to food production, considerably contribute to the operation of green and blue infrastructure and help to slow down global warming (Lwasa *et al*., 2014). Urban agriculture has been promoted as a feasible option for addressing climate change because it can lower greenhouse gas emissions by minimizing the length of the food supply chain and the quantity and quality losses brought on by long-distance transportation. Urban agriculture has been demonstrated to increase food production, decrease greenhouse gas emissions (Kulak *et al*., 2013), promote biodiversity (Clucas *et al*., 2018), strengthen community ties and enhance human health and wellbeing (Russo and Cirella, 2019).

According to Millennium Ecosystem Assessment (2005), the ecosystem approach has the potential to illustrate how urban agriculture supports humans in terms of providing services(food supply, water supply, wood, pulp), regulating services (urban temperature regulation, noise reduction, air purification, runoff mitigation, pollination, pest regulation and seed dispersal), cultural services (recreation, aesthetic benefits, cognitive development, place values and social cohesion) and supporting services (habitat for biodiversity).

Urban agriculture and livelihoods

According to statistics, 881 million people, or 30 per cent of the urban population in developing countries, reside in slums (UN-Habitat, 2014). That number may rise to 3 billion by 2050, or 60 per cent (UN DESA, 2013, 2014). Finally, the crisis of extreme poverty, malnutrition and unemployment is brought on by the population's rapid growth.

Urban poverty has developed in India as a result of a sizable section of the urban population having insufficient employment opportunities and income (Selvi and Raheem, 2022). One of the aims of the MDGs is to halve the world's poor population with an income of less than one dollar a day as well as those who suffer from hunger (Mougeot, 2005). Urban agriculture (UA), which encompasses the production, processing and sale of cattle, poultry and horticulture produce and products due to the instant financial rewards and the need for a quick supply of food, is one typical livelihood that the poor engage in. Many urban-rural people use urban farming as a source of income and it allows them to save money on food because it is estimated that they spend between 60.00 and 85.00 per cent of their income on food (Mougeot, 2005). Urban farming generates jobs and encourages the expansion of allied businesses (*e.g*., farming inputs, food processing, packaging, marketing and so on).

Urban agriculture enhances food availability across nations and economies and community members participating in urban agriculture practices show excellent dietary consumption (Zezza and Tasciotti, 2010). By enhancing the cooperation between urban and rural areas in terms of technologies and promoting the importance of urban agriculture in its various roles of providing household livelihood strategies, resource allocation and farm management, urban agriculture can be viewed as an effective strategy for promoting integrated development of urban and rural areas.

The migration of individuals from rural to urban areas in quest of better socioeconomic conditions and improved lives is a major cause of rising unemployment rates, poverty and widespread urban deprivation in the majority of sub-Saharan African cities. Local communities in these places are becoming more susceptible to food insecurity and malnutrition as a result of such extreme poverty and the frequency of those who make less than $2 per day. Small-scale farming is one strategy for escaping the poverty cycle. It can be used for both dietary needs and money generation. Urban farmers in Jos adopted this. In an area of urban disadvantage, small-scale fish farming can provide much-needed revenue as well as local employment prospects. Because to its higher income than the minimum wage in Nigeria, a portion of the money made from this fish farming greatly reduces poverty (Wuyep and Rampedi, 2018).

The results of a study on the effects of urban agriculture on migrant women's livelihoods by Agho (2014), showed that many Cameroonian migrant women living in Turffontein use urban agriculture as a strategy for sustainable livelihood. The study also demonstrates how these migratory women have been able to support their family back home in South Africa and in Cameroon by engaging in urban horticulture.

In Addis Abeba, where farming accounts for over 65 per cent of household income, urban farming has a considerable impact on urban dwellers household livelihoods in comparison to other sources of income. In addition, it played a role in the economic gap among farmers and is equally important to the livelihoods of wealthy and less wealthy urban farmers. The income disparity between urban farmer households that are poor (lowest quintile) and wealthy (top quintile) was found to be reduced by the production of vegetables, whereas the production of huge cattle appears to worsen the inequality. Also, poor urban farmer households' sources of income are less varied, with the majority (80%) relying primarily on crop farming or non-farm-based livelihoods, as opposed to better-off households, who typically combined farming and non-farming activities as sources of income (Duressa, 2007).

Participation in urban food gardens mostly results in or benefits from improved food security (58.00%), health (56.00%), employment (37.00%) and self-esteem (29.00%). Urban food gardens might therefore be viewed as a means of generating income (Freda and Abdulrazak, 2016). Urban-peri agriculture is essential for urban livelihoods as evidenced by the fact that it has improved the nutrition of disadvantaged urban residents (Kushwaha *et al*., 2007). Future potential for local food production and job creation are provided by urban agriculture, especially in developing nations. Many people from the developing countries are currently adopting urban agriculture as a direct source of revenue generation by operating their own enterprises (Khan *et al*., 2020). Urban agriculture may certainly generate revenue, although the "poorest of the poor" rarely have access to this benefit (Olivier, 2018).

In Kwara state, Nigeria, 84.4 per cent of the urban dwellers outcomes for their livelihoods came from urban agriculture. While non-farming activity made up 17.6 per cent of the total. The majority of those surveyed (31.8%) engaged in non-farming activities to supplement their income, with their main obstacles being a lack of land (both in terms of access and tenure), restricted access to resources and agricultural inputs and restrictive urban policies and regulations (Olufemi and Folayimi, 2022).

Sack gardening is a practical livelihood strategy that residents of the slum have successfully incorporated with other urban livelihood methods in the Kibera slums of Nairobi. Sack gardening gave farmers a new expertise that they could impart to others, which contributed to the development of human capital. By earning money from vegetable sales and saving money by growing vegetables for the household's consumption, sack gardening helped build up financial capital. This income was utilised to satisfy other household necessities, such as paying for health services, rent and food, as well as to save money through local savings and credit systems. Sack gardening also improved farmers' social capital by building ties between farmers and their non-farming neighbours, fostering better social networks among those active in gardening organisations and providing a stronger feeling of community (Galleher *et al*., 2015).

Urban agriculture is a vital source of additional income and a part of the livelihood strategy for many urban poor people (Thys *et al*., 2006). Urban agriculture has the potential to enhance living standards by achieving food and nutritional security through a number of mechanisms, such as direct access and availability of food to raise revenue from the sale of food items (Warren *et al*., 2015). Due to the diversity of urban peri agriculture systems, each farm home has a distinctive farming system, especially in terms of household livelihood choices, resource allocation and farm management (Tittonell *et al*., 2005).

Agro-tourism is another business venture that can be used in many per-urban and urban regions, contributing to the multifunctionality of urban agriculture. Several issues that both urban and rural regions encounter may be resolved as agro-tourism grows. The promotion of agricultural output by tourism justifies the preservation of arable land in peri-urban areas and enhances the effectiveness of land use. It generates a sizable number of well-paying jobs, which helps social security, notably for migrant and low-income groups.

It varies the rural and urban economic systems and creates more business prospects for the local uplift of the urban underprivileged (Yang *et al*., 2010).

In Lusaka, as in many other African towns, the effects of extreme weather conditions present a significant problem for both the local government and the urban poor. Determining effective responses to climate change ought to be a major component of the sustainable development plans established by the impacted nations. In many cases urban agriculture was livelihood mean for the residents. But these urban farmers were finding it harder and harder to produce food in cities due to climate change. It was due to the inability or limited capacity of the urban poor to adapt to the impacts of climatic variability on them; it is also reflected in the absence of pro-poor policies. In Lusaka, the industry had become vulnerable to climatic changes due to the failure to integrate and adopt UA in urban development and planning policies (Simatele *et al*., 2012). Therefore, while making policies, it is necessary to consider urban agriculture not only as sustainable urban agriculture practices but also as an integral livelihood mean for urban poor.

Urban agriculture and social cohesion

Urban gardening may improve a community's sense of social cohesiveness. It connects people, businesses, or other stakeholders. Participation, trust and integration make up the three primary components of social cohesion. In case of community farming, individuals can socialize with new people, which might strengthen their ties to their neighbours and community. The majority of the garden groups' participant relationships are positive because of the active participation. While planning initiatives promoting urban farming and related activities, it is a must to maintain a low threshold so that all segments of society can access them (Heerkens, 2018).

People in the city are encouraged to engage in urban agriculture as a healthy, communal and community-led activity that enhances both physical and mental wellbeing. It is usually done through social farming. It is a concept related with group farming, where people collectively grow crops. It supports social inclusion and increase togetherness. In case of framing activities in common places, the residents become more acquainted and connected with each other. In a group where everyone is open and honest with one another, trust develops, uncertainty and fear vanish and mutual ties gradually strengthen. Support or help is accessible and solidarity kicks in if there are any issues among the group's members or within the group itself. Mutual aid or solidarity, which is one of the key purposes of such groupings, will naturally result from well-established trustworthy relationships and good knowledge of one another (Medi and Peak, 2012).

Population decrease, unemployment and the generally challenging socioeconomic circumstances of their multiethnic citizens were the main causes of the absence of social cohesion and identity. The research on social cohesiveness and the work produced by urban agriculture seem to be alternatives to encourage internal regeneration. It can provide a job, a set of common values and a new sense of self. Urban agriculture also has the ability to empower communities by bringing institutions together and involving them in community development (Almeida *et al*., 2006).

The place-based community gardens in particular have the potential to develop into significant gathering spots because they present the chance to collaborate together towards a common objective and, once established, can transform into neighborhood spaces to be used for a variety of other shared activities. The majority of interest-based gardens don't offer many chances to expand the social connections that started at the garden outside of its physical boundaries and their interactions are limited. These gardens are frequently cared for by individuals who do not live nearby or near one another and gardeners are typically less driven by social factors (Veen, 2015).

Urban agriculture had a positive impact in terms of social cohesion, well-being and economic opportunities of practitioners. Urban agriculture can have a positive impact on activism, gender equality, social cohesion and inclusion, education and cultural heritage preservation. An overall sense of strengthening for individuals and the network results from a sense of collective responsibility for the local food system and those involved reflect on themselves and their neighbours and are satisfied with their shared success (Postek *et al*., 2021).

Impact assessment of urban agriculture

In Cuba for the residents of the cities and suburbs urban agriculture has quickly grown to be a substantial source of fresh produce. In reaction to the difficulties brought on by the loss of commerce following the fall of the socialist bloc in 1989, there are many urban gardens in Havana and other major cities that have grown as a result of a grassroots initiative. The fresh food supply to Cuba's urban centres is being stabilized by these gardens. 8,500 tonnes of agricultural products, 4 million bouquets of flowers, 7.5 million eggs and 3,650 tonnes of meat were produced by urban farms in Havana in 1996 for the use of the city's urban population. An agroecological urban farming system, which consists of roughly 8,000 gardens across the country, was created and is being run without the use of pesticides and chemicals (Vagneron, 2007).

Urbanization frequently outpaces expansion in social amenities including water, health care, education, shelter and food supply in the majority of developing countries (Armar-Klemesu, 2000). Due to this, urbanization is frequently linked to rises in poverty, poor health, illiteracy, housing instability and food and nutritional insecurity (de Zeeuw and Dubbeling, 2009). But urban agriculture contributes to the viability of cities by serving economic, social and environmental purposes (Cook *et al*., 2015). The effects of urban agriculture on each country's development are described in the status of a few chosen reviews as follows.

In Sub-Saharan Africa, urban agriculture provides for urban dwellers' nutritional demands while lowering their food costs (Binns and Nel, 2013). The growth of urban agriculture in New York City has significantly aided in the promotion of a healthy lifestyle for both the current generation and the ones to come (Jamal, 2015). Nearly 25 per cent of the vegetables grown by urban farmers in Yaounde, Cameroon, are consumed there itself (Prain and Lee-Smith, 2010). Several important policy texts in South Africa's post-apartheid era have supported peri-urban agriculture as a means of reducing poverty (Thornton, 2008).

The importance of urban agriculture cannot be understated, especially in large portions of Africa and in all those nations where agriculture contributes a significant portion of the revenue for the urban poor and for those households for which it is a significant source of subsistence (Zezza and Tasciotti, 2010). Many cities in Sub-Saharan Africa (SSA) rely heavily on urban and peri-urban agriculture for their food supply. Urban diets, which often include exotic or perishable vegetables, fresh milk and chicken products, are given special attention by urban and peri-urban agriculture. UPA is so making a substantial contribution to a wider selection of foods in city markets, as well as to jobs, livelihoods and the reduction of poverty (Cofie *et al*., 2003). Urban food systems in Kenya include both peri-urban and urban agriculture, which both assist urban households' livelihood strategies, especially those of the poor (Owuor, 2002).

Urban agriculture activities can take various forms and spatial structures, such as rooftop gardens, aquaponics system greenhouses, community and outdoor gardens, school farms, food cooperatives and markets. The appropriateness of the surrounding area is responsible for the diversity of spatial structures. The social, economic and environmental characteristics of a field determine its suitability for urban agriculture.

Gains in social capital from urban agriculture have an immediate positive impact on the economy. Farmers, for instance, owe their neighbours a debt of reciprocity by giving them access to their surplus produce. This increases the likelihood that farmers will get aid from their neighbours in times of need. Urban agriculture training is the most effective strategy to motivate people to lead healthy lifestyles and safeguard the environment. Small-scale farmers begin to understand the importance of a healthy diet in general even though they may not see any quantitatively significant increases in their food security as a result. Farmers are also conscious of how their everyday actions affect the environment, even though a small plot might not have much of an ecological impact.

Urban agriculture presents a new opportunity for land use planners and landscape architects to participate in the development and transformation of cities in developed nations, including the United States, to support community farms, allotment gardens, rooftop gardening, edible landscaping, urban forests and other productive features of the urban environment (Lovell, 2010).

According to a thorough household study conducted in Russia, urban gardeners in the country's three capital cities generated an average of 12% of their income from gardening in 1995, compared to 10.6 per cent in smaller cities (Seeth *et al*., 1998). Urban farming has a significant impact on reducing food insecurity in Havana and other cities (Nugent, 2000). According to estimates from Dar es Salaam, maintaining a few dairy animals, a garden and some specific vegetables full-time can generate an income of US$60 per month, which is 30 per cent more than the average wage. Families in Nairobi's slum regions experienced the same thing, despite the fact that they sold relatively little and mostly consumed their own produce. The standard of living of these households was higher than that of the non-farming neighbours (Nugent, 2000). In Rosario, Argentina, A sustainable ecological and social project was launched, making it possible to provide forty thousand people with vegetables and herbs grown without chemicals (Jamal, 2015).

In India, the Mumbai city's central kitchen (280 m^2) rooftop is used for organic farming and each day it provides food to about 3000 employees (Bhat and Paschapur, 2020). Urban agriculture is a new type of farming that is becoming more and more popular in Hyderabad's outskirts, where more than 4000 families are self-sufficient in their vegetable needs. Delhi's urban farmers benefit from higher remuneration, convenient access to essential facilities and the ability to sustain their family and sell their goods directly to consumers (Diehl *et al*., 2019).

Negative impacts

Urban agriculture is gaining popularity across the developing world, but there is ongoing discussion about whether it is a blessing or a curse. While some view it as a lifesaver for the poor, providing food and a means of subsistence, others view it as a disease-hosting and -vectoring outdated practice that has no place on the path to development. As a result, there is disagreement about the activity and despite widespread support in many cases, it is not necessarily moving forward without any obstacles. Further investigation and attention are necessary due to the threats posed by chemical contamination. The proper management of wastewater irrigation will need to take into account chemical contaminants in addition to microorganisms as industrialization progresses in case of Africa and Since the region's strong reliance on coal is gradually replaced with fuels that burn considerably more thoroughly, including oil and gas, the concern the same is likely to last for some time to come in case of Asia (Hamilton *et al*., 2014).

Urban agriculture is thought to provide food and a source of potential income to the urban poor while improving the urban environment and reducing pressure on finite farmland. However, there are also potential drawbacks because of this growing push for urban agriculture. This is mainly associated with urban health risks and environmental implications. The use of waste water, for example, may contaminate produced food and extensive irrigation may

result in the spread of pathogens. Malaria and water-borne diseases are on the rise, threatening already scarce water supplies. Soil erosion, as well as the extensive use of fertilizers and pesticides, may pose health risks to urban populations and harm the environment (Stewart *et al*., 2013).

The negative effects of urban agriculture in Zambia included the reduction of safety in urban areas, the beauty of the city and the reported cases of cholera, dysentery and typhoid cases. There were also reported cases of threats to human health due to cholera, dysentery and typhoid cases that are associated with the consumption of vegetables that have been irrigated with untreated wastewater from the sewerage ponds. Eating vegetables grown and irrigated with water from highly industrialized peri-urban areas would pose harm to human health. It has been claimed that heavy metal contamination of the water and soil in industrialized areas has a detrimental impact on the health of the locals (Therese and Pride, 2017).

Constrains in urban farming

Finding land, water, healthy soil and money are just a few of the obstacles facing urban farmers today. There may be opposition to gardens and urban agriculture in some cities due to restrictive rules and ordinances. Each of these difficulties varies in size depending on the city.

By promoting food diversity, sustainability and localization of food systems, urban agriculture can support food supply chains. We need to come up with other methods since expecting rooftop gardens, community plots and the like to supply the majority of the city's.

The lack of proper information about urban agriculture is one of the main constraints faced by urban farmers. The study conducted by Byamugisha *et al*. (2008) revealed that urban farming is a diverse industry and each farming activity has different information demands. Farmers use a variety of information-seeking techniques and rely primarily on oral sources of knowledge. They prefer extension services over local languages when accessing information and they run across a variety of issues when doing so.

The challenges in practicing urban agriculture in Hawassa City Administration are obstacles like market accessibility, a lack of technologies supporting the practice, a lack of inputs, feeds and treatments for plants and animals, a lack of credit, a lack of social institutions supporting the practice and high theft (Debela and Mohmmad, 2020).

Locating land was the most frequent issue raised by farmers because they all depend on small parcels of land and farming in urban areas was very expensive because of the high cost of agricultural inputs. Fertilizers, pesticides and insecticides are examples of agrochemicals that are pricey. Additional issues include the inability to get bank loans for farming, theft of agricultural products and a lack of expert advice and extension services. Due to significant price swings brought on by supply and demand imbalances, farmers found it impossible to market urban commodities and they were forced to sell their products through intermediaries and women (Ruma and Sheikh, 2010).

Urban agriculture must be expanded in urban areas through initiatives that promote food literacy, equity and inclusion in municipal food system policy and planning, as well as the chance to frame support for urban farming as a tool for educating urban residents about issues with peri-urban and rural food production (Valley and Wittman, 2019).

CONCLUSION

The most prevalent justifications for people's participation in urban gardening are income and food security. People engage in urban agriculture for a number of social reasons. For collective gain, individuals can congregate in a lawn or rooftop farm, which typically promotes the common cultural and social identity of urban residents. Also, larger urban farms participate in initiatives that support marginalized populations by offering job development as well as other learning programs. Ultimately, urban agriculture can contribute significantly to a city's environmental sustainability. Urban farms and communal food gardens contribute to a reduction in the urban heat island as a form of green infrastructure (Ackerman *et al*., 2014).

It is evident that urban agriculture can help with community development (such as boosting social cohesion and preventing crime), urban food security (to reduce hunger as well as to give access to fresh and healthful food) and educational goals. Urban agriculture can be utilized for environmental development in order to green cities, mitigate global warming, adapt to it, increase biodiversity and lessen pollution. New closed-loop technologies could be used with urban agriculture and other urban activities. Urban agriculture offers potential for the creation of new revenue, entrepreneurship, knowledge creation and innovation, as well as for new export goods from an economic perspective.

We must highlight, that the "success" of urban agriculture in a city is by no means guaranteed. This is clearly demonstrated by the concept's limitations and the challenges that lie ahead, including obstacles related to the law, high costs, a lack of available space, conflicts with other urban functions and health risks associated with food produced on urban farms. Therefore, it is necessary to pay attention to these issues' prior strategy development for urban agriculture.

Conflict of interest

All authors declared that there is no conflict of interest.

REFERENCES

Ackerman, K., Conard, M., Culligan, P., Plunz, R., Sutto, M.P. and Whittinghill, L. (2014). Sustainable food systems for future cities: The potential of urban agriculture. The Economic and Social Review. 45(2): 189-206.

Agho, N.G. (2014). Urban agriculture for sustainable livelihood: A case study of migrants' women in Johannesburg. PhD Thesis. Nelson Mandela Metropolitan University, Port Elizabeth, South Africa.

Almeida, K., Mateev, G., Mendoza, N. and Polak, C. (2006). Social cohesion and work opportunities in urban agriculture. Workers, Football, Neighbourhood. 89p.

Andersson, E., Barthel, S., Borgström, S., Colding, J., Elmqvist, T., Folke, C. and Gren, Å. (2014). Reconnecting cities to the biosphere: Stewardship of green infrastructure and urban ecosystem services. Ambio. 43(4): 445-453.

Armar-Klemesu, M. (2000). Urban Agriculture and Food Security, Nutrition and Health. In: Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda. [Bakker, N., Dubbeling, M., Guendel, S., Sabel-Koschella, U. and de Zeeuw, H. (eds.)], Feldafing: DSE. pp. 99-117.

Bhat, C. and Paschapur, A. (2020). Urban agriculture: The saviour of rapid urbanization. Indian Farmer. 7(1): 1-9.

Binns, J.A. and Nel, E. (2013). The significance of urban agriculture in food security and sustainable livelihoods in response to economic restructuring in Zambia's Copperbelt province. Global Education Programme International Development Research Fund.

Byamugisha, H.M., Ikoja-Odongo, R., Nasinyama, G.W. and Lwasa, S. (2008). Information Seeking and Use Among Urban Farmers in Kampala District, Uganda. Agric. Inf. Worldwide. 1(108): 94-101.

Cilliers, E.J., Lategan, L., Cilliers, S.S. and Stander, K. (2020). Reflecting on the potential and limitations of urban agriculture as an urban greening tool in South Africa. Frontiers in Sustainable Cities. 2: 43. https://doi.org/10.3389/frsc.2020.00043.

Clucas, B., Parker, I.D. and Feldpausch-Parker, A.M. (2018). A systematic review of the relationship between urban agriculture and biodiversity. Urban Ecosyst. 21(4): 635-643.

Cofie, O.O., Van Veenhuizen, R. and Drechsel, P. (2003). Contribution of urban and peri-urban agriculture to food security in sub-Saharan Africa. Africa Day of the 3rd WWF in Kyoto. 3.

Cook, J., Oviatt, K., Main, D.S., Kaur, H. and Brett, J. (2015). Re-conceptualizing urban agriculture: an exploration of farming along the banks of the Yamuna River in Delhi, India. Agriculture and Human Values. 32(2): 265-279.

de Zeeuw, H. and Dubbeling, M. (2009). Cities, Food and Agriculture: Challenges and the Way Forward. Working Paper No. 3. Leusden: RUAF Foundation.

Debela, M.F. and Mohammed, A.F. (2020). The Role of Urban Agriculture in Improving the Livelihood of the Urban Poor and the Challenges: The Case of Hawassa City Administration, SNNPRS, Ethiopia. City. 11(1). DOI: 10.7176/JESD/11-1-01.

Diehl, J., Oviatt, K., Chandra, A. and Kaur, H. (2019). Household food consumption patterns and food security among low-income migrant urban farmers in Delhi, Jakarta and Quito. Sustainability. 11(5): 1378. https://doi.org/10.3390/su11051378.

Duressa, T.F. (2007). Livelihood Dependence on Urban Agriculture in Addis Ababa, Ethiopia. Ph.D Thesis, Norwegian University of Life Sciences [On-line]. Available from: http://www.umb.no/noragric. [12 Dec 2022].

FAO, (1999). Issues in Urban Agriculture. (spotlight retrieved 11.01.14). http://www.fao.org/ag/magazine/9901sp2.

Freda, R.P. and Abdulrazak, K. (2016). Assessment of urban agriculture as a livelihood strategy for household food security: An appraisal of urban gardens in Langa, Cape town. Int. J. Arts Sci. 9(1): 327-338.

Gallaher, C.M., WinklerPrins, A.M., Njenga, M. and Karanja N.K. (2015). Creating space: Sack gardening as a livelihood strategy in the Kibera slums of Nairobi, Kenya. J. Agric. Food Sys. Community Dev. [On-line]. Available: http://erepository.uonbi.ac.ke/handle/11295/85294. [18 Dec. 2022].

Godfray, H.C.J., Beddington, J.R., Crute, I.R., Haddad, L., Lawrence, D., Muir, J.F., Pretty, J., Robinson, S., Thomas, S.M. and Toulmin, C. (2010). Food security: The challenge of feeding 9 billion people. Science. 327: 812-818.

Hamilton, A.J., Burry, K., Mok, H.F., Barker, S.F., Grove, J.R. and Williamson, V.G. (2014). Give peas a chance? Urban agriculture in developing countries. A review. Agronomy for Sustainable Development. 34: 45-73.

Heerkens, L. (2018). Social farming rotterdam. Case study about how Urban Farming Can Contribute Optimally to the Social Cohesion in Rotterdam, Radbound University, 64p.

Huq, E., Saleemul, S. and Kovat, S. (2007). Editorial: Reducing risks to cities from disasters and climate change. Environ. Urban. 19(1): 3-15.

Jamal, A. A.E. (2015). Urban agriculture in residential buildings of Kerala. B.Arch. dissertation, University of Calicut, Kuttippuram. 71p.

Jansson, Å. (2013). Reaching for a sustainable, resilient urban future using the lens of ecosystem services. Ecol. Econ. 86: 285-291.

Kabisch, N., Frantzeskaki, N., Pauleit, S., Naumann, S., Davis, M., Artmann, M., Haase, D., Knapp, S., Korn, H., Stadler, J., Zaunberger, K. and Bonn, A. (2016). Nature-based solutions to climate change mitigation and adaptation in urban areas: Perspectives on indicators, knowledge gaps, barriers and opportunities for action. Ecol. Soc. 21(2): 39-55.

Khan, M.M., Akram, M.T., Janke, R., Qadri, R.W.K., Al-Sadi, A.M. and Farooque, A.A. (2020). Urban horticulture for food secure cities through and beyond COVID-19. Sustainability. 12(22): 9592. https://doi.org/10.3390/su12229592.

Kulak, M., Anil, G. and Julia, C. (2013). Reducing greenhouse gas emission with urban agriculture: A lifecycle assessment perspective. Landsc. Urban Plann. 111: 68-78.

Kushwaha, S., Sen, C. and Yakasai, M.T. (2007). Current trends in vegetable consumption in Nigeria: Case study of consumption pattern in Kano state. Paper presented at the I Mediterranean conference of agro-food social scientists. 103rd EAAE Seminar 'Adding Value to the Agro-Food_Supply Chain in the Future Euromediterranean Space', 23-25 April 2007, Barcelona, Spain.

Lin, B.B., Philpott, S.M. and Jha, S. (2015). The future of urban agriculture and biodiversity-ecosystem services: Challenges and next steps. Basic Appl. Ecol. 16(3): 189-201.

Lovell, S.T. (2010). Multifunctional urban agriculture for sustainable land use planning in the United States. Sustainability. 2(8): 2499-2522.

Lwasa, S., Mugagga, F., Wahab, B., Simon, D., Connors, J. and Griffith, C. (2014). Urban and peri-urban agriculture and forestry: Transcending poverty alleviation to climate change mitigation and adaptation. Urban Climate. 7: 92-106.

McCordic, C. and Frayne, B. (2017). Household vulnerability to food price increases: The 2008 crisis in urban southern Africa. Geogr Res. 5(2): 166-179.

Medic, A., Pesak, S. (2012). Grupe solidarne razmjene. Zagreb: ZMAG.

Millennium Ecosystem Assessment, (2005). Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC. 563p.

Mougeot, L.J.A. (2000). Urban Agriculture: Definition, Presence, Potential and Risks. In: Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda. [Bakker, N., Dubbeling, M., Gundel, S., Koschella, S.K. and de Zeeuw, H. (eds)], DSE, Feldafing, Germany. pp. 1-62.

Mougeot, L.J.A. (2005). Agropolis: The Social, Political and Environmental Dimensions of Urban Agriculture. Earthscan, IDRC, London, 305p.

Nugent, R. (2000). The impact of urban agriculture on the household and local economies. Bakker, N., Dubbeling, M., Gündel, S., Sabel-Koshella, U., de Zeeuw, H. Growing cities, growing food. Urban agriculture on the policy agenda. Feldafing, Germany: Zentralstelle für Ernährung und Landwirtschaft (ZEL). pp. 67-95.

Olivier, D.W. (2018). A cropping system for resource-constrained urban agriculture: Lessons from Cape Town. Sustainability. 10(12): 4804. https://doi.org/10.3390/su10124804.

Olufemi, O.S. and Folayimi, O.O. (2022). Contribution of Urban agriculture to the livelihood of Urban dwellers in ilorin West local Government area of Kwara State, Nigeria. Int. J. Econ. Financial Manag. 7(4): 31-44.

Orsini, F., Kahane, R., Nono-Womdim, R. and Gianquinto, G. (2013). Urban agriculture in the developing world: A review. Agronomy for Sustainable Development. 33(4): 695-720.

Owuor, S.O. (2002). Enhancing Food Security in African Cities: Rural Farming by Urban Households - The Case of Nakuru Town, Kenya. Paper Presented at the "Workshop on Urban Policy Implications of Enhancing Food Security in African cities", Nairobi, 27-31 May 2002.

Patel, I.C. (1996). Rutgers urban gardening: A case study in urban agriculture. J. Agric. Food Inf. 3: 35-46.

Peters, K.A. (2010). Creating a sustainable urban agriculture revolution. J. Envtl. L. and Litig. 25: p.203.

Postek, A., Kisic, I., Cerjak, M. and Brezinssak, L. (2021). Social aspect of urban agriculture with examples from Croatia. J. Central European Agric. 22(4): 881-891.

Prain, G. and Lee-Smith, D. (2010). Urban Agriculture in Africa: What has been Learned? In African Urban Harvest. Springer, New York, NY. (pp. 13-35).

Rodriguez, J.P., Rahman, H., Thushar, S. and Singh, R.K. (2020). Healthy and resilient cereals and pseudocereals for marginal agriculture: molecular advances for improving nutrient bioiavailability. Front. Genet. 11: 1-29.

Ruma, M.M. and Sheikh, A.U. (2010). Reuse of wastewater in urban farming and urban planning implications in Katsina metropolis, Nigeria. African Journal of Environmental Science and Technology. 4(1): 28-33.

Russo, A. and Cirella, G.T. (2019). Edible urbanism 5.0. Palgrave Commun. 5(1): 1-9.

Sahasranaman, M. (2016). Future of urban agriculture in India. Inst. Resour. Anal. Policy. 2(10): 1-24.

Sanye, M., Specht, E., Krikser, K., Vanni, T., Pennisi, C., Orsini, G. and Gianquinto, F.P. (2018). Social acceptance and perceived ecosystem services of urban agriculture in Southern Europe: The case of Bologna, Italy. PLoS ONE. 13(9). https://doi.org/10.1371/journal.pone.0200993.

Seeth, H.T., Chachnov, S., Surinov, A. and Von Braun, J. (1998). Russian poverty: Muddling through economic transition with garden plots. World Development. 26(9): 1611-1624.

Selvi, S., Senthamizh and Abdul Raheem, A. (2022). India's urban agglomeration growth: A focus. International Journal of Innovative Science and Research Technology. 7(4): 678-682.

Simatele, D., Binns, T. and Simatele, M. (2012). Sustaining livelihoods under a changing climate: The case of urban agriculture in Lusaka, Zambia. J. Environ. Planning and Manag. 55(9): 1175-1191.

Stewart, R., Korth, M., Langer, L., Rafferty, S., Da Silva, N.R. and van Rooyen, C. (2013). What are the impacts of urban agriculture programs on food security in low and middle-income countries? Environ. Evid. 2(1): 1-13.

Theresa, K. and Pride, C. (2017). The social, economic and health impacts of urban agriculture in Zambia. Asian J. Adv. Agric. Res. 3(1): 1-8.

Thornton, A. (2008). September. Beyond the metropolis: Small town case studies of urban and peri-urban agriculture in South Africa. In Urban Forum. Springer Netherlands. 19(3): 243-262.

Thys, E., Schiere, H. and Van, G. (2006). Three approaches for the integrated assessment of urban livestock production systems: Cases from sub-Saharan Africa. Outlook Agric. 35: 7-18.

Tittonell, P., Vanlauwe, B., Leffelaar, P.A., Rowe, E.C. and Giller, K.E. (2005). Exploring diversity in soil fertility management of smallholder farms in western Kenya: I. Heterogeneity at region and farm scale. Agriculture, Ecosystems and Environment. 110(3-4): 149-165.

UN [United Nations]. (2010). World Urbanization Prospects: The 2009 Revision [on-line]. Available: https://www.ipcc.ch/apps/njlite/ar5wg2/njlite_download2.php?id=10148 [25 Oct. 2022].

UN [United Nations]. (2018). UN home page [online]. Available: https://www.un.org/development/desa/en/news/population/2018-revision-of-worldurbanizationprospects.html [01 Nov 2022].

UN DESA (UN Department of Economics and Social Affairs) (2013). World economic and social survey: Sustainable development challenges. New York: UN DESA.

UN DESA (UN Department of Economics and Social Affairs) (2014). World urbanization prospects the 2014 revision. New York: UN DESA.

UN-habitat (UN Human Settlements Programme). (2014). The global urban indicators database 2014. Nairobi UN-Habitat.

Vagneron, I. (2007). Economic appraisal of profitability and sustainability of peri-urban agriculture in Bangkok. Ecol. Econ. 61(2-3): 516-529.

Valley, W. and Wittman, H. (2019). Beyond feeding the city: The multifunctionality of urban farming in Vancouver, BC. City, Culture and Society. 16: 36-44.

Veen, E.J. (2015). Community gardens in urban areas: A critical reflection on the extent to which they strenghten social cohesion and provide alternative food. Wageningen University and Research, Netherlands. [On-line] Available: https://edepot.wur.nl/345279. [19. Jan. 2023].

Veenhuizen, R.V. (2007). Profitability and Sustainability of Urban and Periurban Agriculture. Agricultural Management, Marketing and Dinance Occasional Paper 19. Food and Agriculture Organization, Rome. Available: https://www.fao.org/3/a1471e/a1471e.pdf [21 Oct. 2022].

Warren, E., Hawkesworth, S. and Knai, C. (2015). Investigating the association between urban agriculture and food security, dietary diversity and nutritional status: A systematic literature review. Food Policy. 53: 54-66.

Wuyep, S.Z. and Rampedi, I.T. (2018). Urban fish farming in Jos, Nigeria: Contributions towards employment opportunities, income generation and poverty alleviation for improved livelihoods. Agric. 8(7): 110. DOI: 10.3390/Agriculture8070110.

Yang, Z., Cai, J. and Sliuzas, R. (2010). Agro-tourism enterprises as a form of multi-functional urban agriculture for peri-urban development in China. Habitat International. 34(4): 374-385.

Zezza, A. and Tasciotti, L. (2010). Urban agriculture, poverty and food security: Empirical evidence from a sample of developing countries. Food Policy. 35(4): 265-273.

Zimmer, A., Guido, Z., Davies, J., Joshi, N., Chilenga, A. and Evans, T. (2022). Food systems and rural-urban linkages in African secondary cities. Urban Transformations. 4(1): 1-23.