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Review Article

Adoption of urban farming as a means of soil reclamation practices

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ABSTRACT: Rapid and emerging world population coupled with climate change have led to landscape transformation accompanied by rapid expansion of urban areas globally. This paper contributes to the discussion of how urban farming is serving as a "saving grace" to our degraded land covers that have witnessed human-driven degradation processes by highlighting how natural and socioeconomic forces trigger soil depletion and eventually loss of quality land cover. And also, how the solutions depend on us humans. The study aimed to identify and synthesize the interactions of urbanization-driven factors with direct or indirect, impacts on land degradation, focusing on how human activities have affected our lands over time. Based on complex and diverse interactions among influencing factors, a relevant contribution to land degradation was shown to derive from socioeconomic drivers, the most important of which was population growth and urban sprawl. Viewing our land areas as socio-environmental systems adapting to intense socioeconomic transformations, based on this, a key measure was suggested which is "urban farming" not only to support urban planning and development but also to sustain food production and healthy food living.

Keywords: Agriculture, degradation, food, urban farming, urbanization.

INTRODUCTION

Land regardless of region is being used for various purposes, recreational purposes, social amenities (building houses, roads, hospitals, schools etc), and agricultural purposes (growing crops, trees, and rearing animals). It also serves as a natural reservoir for our resources (Hartemink *et al.,* 2008).

Globally, land cover has witnessed its share of intensification resulting in land cover changes, reflecting the enormous growth and continuous increase in human population and our unending need for food, shelter, and other necessities of life. The surge in the human population has many implications but most of it, require an increasing shift in agricultural production to meet food demands, this increase is then met by expansion of lands or by the intensification of existing systems (Oladimeji, 2020).

Intensification of existing systems, expansion, and urbanization of new areas have altered land in its entirety, as such mounted pressures upon land resources and altered its interactions between varying climatic characteristics, facilitating changes in land use and land cover (Hartemink *et al.,* 2008). In the absence of alternative living opportunities and proper environmental management, this population surge and urbanization have resulted in environmental degradation and resource depletion. According to FAO (2018a), recent land degradation is estimated to be 5-7 million hectares per year suggesting that 0.3-0.5% of the world's arable land is lost annually due to degradation.

Land degradation entails natural and/ or human activities or processes that negatively alter the soil functionalities within the local or regional level of an ecosystem. Population growth, the evolution from saving lands to intensely consuming lands through settlements, widespread urbanization and rising human pressure in different parts of the world, suggest and justify completely different considerations, shifting the concentration of land degradation from rural communities to a more complex and developed environment (Carley and Christie 2017). Figure 1 illustrates a degraded area, likely caused by erosion, which highlights the consequences of poor land management.

Figure 1. A degraded land (Source: https://www.researchgate.net/figure/A-picture-showing-a-severely-degraded-area-by-soil-erosion-in-the-rangelands-near-Lake_fig3_261135236).

Statement of problem

Land degradation in most African countries is associated with various factors. Some of these are mismanagement and unsustainable use of natural resources, deterioration of landscape structure, uncontrolled socio-economic development in terms of poverty, human pressure, rural-to-urban migration, settlement densification, resource extraction, land fragmentation and urbanization (Smith and Wanjohi, 2021). Additionally, the decline of landscape structure due to poor agricultural practices has been identified as a key contributor to land degradation (Hossain *et al*., 2020)

Land degradation is one of the most critical environmental issues affecting African countries, with significant socio-economic implications. For example, in the Sahel region, desertification and land degradation threaten the livelihoods of millions, with over 80% of the land area affected by soil erosion and desert encroachment (FAO, 2018b). Mismanagement of natural resources, coupled with rapid urbanization, has exacerbated these problems. In Sub-Saharan Africa, it is estimated that 65% of arable land is degraded, contributing to reduced agricultural productivity and increased poverty levels (Gao *et al*., 2021)

Urbanization is a major socioeconomic process that interacts with environmental factors to contribute immensely to recent world soil degradation (Gao *et al*., 2020). This interaction often leads to increased impervious surfaces such as, roads and buildings, which prevents water infiltration and increase soil erosion (Yao *et al*., 2016). Furthermore, unplanned urban expansion reduces green spaces and vegetation cover, amplifying land degradation effects (Basu *et al*., 2023). As such, land degradation is driven by a wide range of interacting forces which may be associated with short duration process but a century-scale regeneration if not carefully managed.

In the existence of an increasing population, there is bound to be an intense need for food and water, as such there exists an unsustainable use of natural resources, which is eventually leading to a strong increase in water withdrawal and consumption from both qualitative and quantitative aspects. Using most of the available resources through unsustainable means, there is bound to be a decline in the available groundwater and nutrient availability in the soil (Gavrilescu, 2021). An unsustainable decline in groundwater can then expose the soil to salinity risks and this can be detrimental to crops especially when used in irrigation (Mohanavelu *et al*., 2021).

In the absence of proper planning, human pressure on land can reduce vegetation cover and green spaces, as such exposing the soil to various degrading hazards (Osman, 2014). Reduction in plant density reduces biodiversity by altering species composition, this limits the capacity of the soil and exposes them to degradation factors like erosion and various hazardous factors (see Figure 1).

Human activities have definitely amplified the soil degradation process over time, ranging from urbanization, and industrialization to mismanagement of natural resources. Finding the appropriate means to eradicate soil degradation, improve agricultural sustainability and at the same time manage the unending population increase and urbanization processes that come with it, is no longer debatable but absolutely requisite. This leads us to the principle of urban farming, which is the practice of cultivating, processing and distributing crops/food around or in an urban settlement (Garnida, 2022). It encompasses a diverse mix of food production activities, including fisheries, animal husbandry and horticulture in both the developed and developing countries.

The objective of this study is to explore the role of urban

Figure 2. Example of wooden structure used for urban farming (source: https://www.researchgate.net/figure/Example-of-wooden-structure-use-for-urban-farming_fig2_369547250.

Figure 3. Backyard farming uses water bottles as growing pots (Source: https://www.researchgate.net/figure/Backyard-farming-using-water-bottle-as-growing-pot_fig3_369547250?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6Il9kaXJlY3QiLCJwYWdlIjoiX2RpcmVjdCJ9fQ).

farming as a sustainable mitigating factor to soil degradation, particularly in rapidly urbanizing regions. By reviewing existing literature and case studies, this study aims to identify how urban farming can mitigate the negative impacts of urbanization on soil quality, while also enhancing food security and promoting sustainable land use practices. This review analyses key findings on urban farming's contributions to soil reclamation, environmental sustainability, and socio-economic benefits.

URBAN FARMING

Since the advent of Greenhouse, it has opened up new possibilities in the field of agriculture, one of such possibilities is urban farming (Figures 2 and 3). Urban farming, also called urban agriculture (UA), is the cultivation of plants and livestock within cities and towns or in their immediate surrounding (FAO, 2003). It is acquiring a global interest, as it can contribute to the achievement of

Figure 4. An example of a small area used for urban farming illustrates how limited spaces can be effectively managed (Source: https://www.researchgate.net/figure/Small-area-of-land-use-to-grow-vegetables_fig4_369547250).

different sustainable development goals (SDGs) identified by the United Nations (Stevens and Kanie, 2016), and to the creation of a green economy (Merino-Saum *et al.,* 2020), countering the economic and environmental crises that the world is facing. For the purposes of our project, the definition provided by Bailkey and Nasr (2000) is used: "The growing, processing, and distribution of food and other products through intensive plant cultivation and animal husbandry in and around cities. Therefore, the distribution and processing of such agricultural produce is done in urban and suburban areas. This system of farming is getting popular now as a result of urbanization, whereby people prefer to grow their food by themselves, this according to the Frontiers in Public Health (2020), also helps to reduce the consumption of processed foods, thereby ensuring that urban dwellers have access to fresh fruits and vegetables.

There are three main types of urban agriculture: backyard gardens, community gardens, and commercial farms (Brown and Carter, 2003). Backyard gardeners use land around their homes or grow on rooftops and balconies. Community gardeners use larger pieces of land or roof that are subdivided among several households. The produce from both types of gardens is used primarily for home consumption. Commercial farms are operated by professionals and are run with the aim of making profits.

The benefits of urban farming can be grouped into the following categories; health benefits, environmental benefits, economic benefits, social benefits, and educational benefits.

ADVANTAGES OF URBAN FARMING

Small area of land required

Urban farming requires small areas of land, and most times it involves the use of a backyard to grow horticultural crops. This space is commonly used to grow horticultural crops like vegetables, which are consumed daily by family members (Rogus and Dimitri, 2015). Urban farming not only maximizes limited space but also promotes food security by allowing families to grow fresh produce at home (Eigenbrod and Gruda, 2015). As shown in Figure 4, even small plots can be efficiently used to grow a variety of vegetables, displaying how limited spaces can be effectively utilized for production.

Reduction in the amount of labour required

Urban farming often requires a smaller amount of labour when compared to traditional farming due to the use of high-tech systems and efficient resource management

Figure 5. Tomatoes harvested from backyard farm (Source: https://www.researchgate.net/figure/Tomatoes-harvested-from-backyard-farm_fig5_369547250).

(Dunn, 2023). After the initial set-up, the management and maintenance of the farm can be done by the family members (Extension, 2023). According to Nugent (2000), this ease of maintenance encourages urban dwellers to engage in farming activities, leading to more self-sufficiency and reducing dependency on external food sources.

Source of vitamins and minerals

Urban farming involves the growing of horticultural crops (Figure 5). Studies have shown that vegetables are a rich source of vitamins and minerals which are needed for growth and development (Nwosisi and Nandini, 2018). This access to fresh produce contributes to the overall health and nutritional status of urban populations (Mead *et al*., 2024).

Provides job opportunities

According to Sigma Earth (2024), urban farming creates job opportunities through activities such as production, processing, marketing and delivery of produce. These sectors can employ a significant number of people, which is particularly crucial in urban areas facing high unemployment rates, especially following the outbreak of Covid 19, which adversely impacted multiple sectors of the economy (Brookings, 2020). By engaging community members in urban agriculture, we not only reduce unemployment but also foster local economic development (World Bank, 2024).

Climate friendly solution

Climate change has become a concern for leaders around the world (Pew Research Center, 2022), adoption of urban farming can help to reduce the level of carbon dioxide present in the atmosphere, because the production areas are not far from the market, which minimizes transportation emission (Sigma Earth, 2024).

Furthermore, urban farming often involves the recycling of organic waste through composting, contributing to a more sustainable waste management system (Sustainable Review, 2023) by utilizing local resources and reducing food miles, urban farming plays a crucial role in mitigating climate change impacts and promoting environmental sustainability.

Reduction in prices of agricultural commodities

Studies have shown that most agricultural products are typically produced in some part of the country and then transported to another region for market sale. The transportation expenses associated with this process contribute proportionately to the final price of these commodities, often making them unaffordable for the average consumer (USDA, 2023). Urban farming can help mitigate these by producing food closer to where it is consumed, thus reducing transportation expenses and making fresh produce more accessible to urban residents (Freight Farms, 2023). By minimizing production miles and supporting local markets, urban farming plays a vital role in ensuring that food remains affordable for all.

Increase infrastructure lifespan

Each year, governments allocate billions of dollars for infrastructure development. Despite this substantial investment, many citizens do not feel the impact of these efforts, often due to the overuse of available facilities (Pew

Figure 6. A commercial urban farm setup (Source: LinkedIn (https://www.linkedin.com/posts/farouq-onaolapo-954785160_urbanfarming-farminginthecity-backyardgarden-activity-6999677496669429760-MUr5).

Trusts, 2023). According to Sigma Earth (2024), the adoption of urban farming can help alleviate this burden by providing local food sources, thereby reducing the demand for transportation and storage infrastructure. When urban farming is embraced, it allows existing facilities to be used more efficiently, potentially extending their lifespan and improving overall community resilience (UNEP, 2019).

It leads to an efficient marketing system

Urban farming addresses the inefficiencies caused by middlemen in traditional food supply chains. Typically, when farmers bring their produce to market, middlemen purchase it and significantly raise prices, making fresh produce less affordable for consumers (Pingali *et al.,* 2020). By growing food locally and selling directly to consumers, urban farmers can relinquish the need for intermediaries. This not only helps reduce costs but also ensures fair prices for both farmers and consumers, contributing to a more efficient and transparent marketing system (Brown and Carter, 2003).

Increase the country's GDP

Studies have shown that each year, billions of dollars are spent importing processed agricultural commodities (United States Department of Agriculture [USDA], 2020). By promoting urban farming, countries can limit their reliance on imported food, which in turn can lead to significant savings. These savings can be redirected to other sectors of the economy, helping to boost overall GDP. Additionally, the local production of food reduces costs associated with transportation and imports, which significantly impacts the economy and provides new employment opportunities for urban residents (Despommier, 2010).

Decrease in the usage of chemicals

The large-scale production of agricultural commodities often involves the extensive use of chemicals such as fertilizers, insecticides, and herbicides. In contrast, urban farming generally makes use of fewer chemicals. Instead, it focuses on organic practices, using organic or organo-mineral fertilizers (Orsini, 2020). Moreover, the small planting populations involved in urban farming help to naturally reduce weed growth, which minimizes the need for herbicides. Weeds, when they appear, are often managed manually through hoeing or hand-pulling, further reducing chemical usage and promoting a healthier urban environment (Wezel *et al*., 2014). Figure 6 shows a commercial urban farm setup.

It curbs wastage

Urban farming helps control wastage by allowing people to

harvest only what is needed or intended for immediate sale/consumption. This reduces the losses typically caused by poor transportation and inadequate storage methods (Grewal and Grewal, 2012). By growing food locally and in small quantities, urban farmers can ensure that produce is consumed fresh, reducing the likelihood of spoilage and minimizing waste. Additionally, urban farming encourages composting of organic waste, which further contributes to reducing overall wastage (Smith *et al*., 2001).

It is sustainable

Urban farming is inherently sustainable because it can be practised year-round, even during the dry season. This is made possible through the use of irrigation systems, which are often easily accessible in urban areas (Orsini *et al*., 2013). Many urban households have various water sources that can support irrigation needs. By ensuring continuous production throughout the year, urban farming contributes to food security and reduces the reliance on seasonal farming practices. Furthermore, urban farming makes use of organic waste as compost, promoting a circular and sustainable approach to food production (Frontiers in Public Health, 2020)

DISADVANTAGES OF URBAN FARMING

Large amount of initial investment

Start-up costs are high to purchase land in central business districts. Government-led initiatives and accelerator programs are needed to help reduce the burden of high initial startup costs, provide support for sustainable development and drive for a circular economy all play an important role in the realization of a successful urban farming model for a state or a country (Chatterjee et al., 2020).

It requires technical knowledge to set up.

Setting up the farm requires technical knowledge because it requires professionals to plan the farm and to help maximize the available land. In recent years urban agriculture has gained considerable momentum in North America. For instance, in Canada, there are interesting projects and initiatives on rooftop gardens aiming to develop effective methods for urban agriculture (ARGP, 2008; Canadian CED Network, 2007; Kaethler, 2006; Kortright, 2001; Nasr *et al*., 2010).

Japan has set a pace for others to follow by adopting urban farming, Japan emphasizes a lot on domestic food production and consumption among households, the Japanese term for “local food” is known as “地産地消” (chisanchishou), which means locally produced and locally consumed, with the first and third kanji being the word soil.

CONCLUSION

Soil degradation is a form of land degradation that refers to loss of soil quality and productivity which can occur as a natural process caused by the inherent characteristics of the soil, climate, and topography. Urban farming should be adopted by developing and developed nations because this can be established through “Green City” which is an environmentally friendly city, this will make the earth to be a safe dwelling for its inhabitants and also help reclaim degraded soils. This study was considered preliminary research for the quality of human-driven soil degradation factors and using urban farming as a sustainable practice to support the recovery process and to develop a soil health program for degraded lands and preventive measures for non-degraded soil.

Recommendations

The degree of degradation in an area are major factor to be considered when determining the appropriate approach to soil rehabilitation or improvement. As such to reduce soil quality loss as a result of the recent urbanization problem, there is a need to embark on urban farming which is a sustainable management practice to promote soil physico-chemical properties so as to attain optimum crop productivity and thus, enhance food security. Therefore, the following propositions were made:

1. The government at all levels should ensure that the curriculum of Agricultural subjects should be revised to accommodate recent developments in the field.
2. Non- Non-governmental organization has a huge role to play by sensitizing people on the need to be environmentally friendly.
3. Organizations that are involved in the agricultural value chain, should ensure that the waste generated is properly recycled.
4. The government should enact laws that ban the importation of some processed agricultural produce, this will boost domestic production.
5. The government should create training centres in each region as a means of social empowerment program.

CONFLICT OF INTEREST

The author declares that they have no conflict of interest.

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