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Assessing Waste Management through Urban Agriculture for Urban Sustainability Development.

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Abstract

This study examines waste management through urban agriculture for urban sustainability development in Lokoja, Nigeria. This study adopts a mixed-methods research approach; data were generated using a structured questionnaire, interview guide, and observation. The analysis was carried out using descriptive analysis; 230 poultry farmers were sampled from the total population of 874 of the entire urban agriculture farmers in the study area for even representation, and results were presented descriptively using tables and charts. *The result of the analysis revealed that farmlands within the urban periphery had the highest annual rate of decrease of 1.97% compared to other land uses, while the vegetation cover decreased by 5.39% between 1999 and 2009 and decreased by 0.78% between the year 2009 and 2019. Urban Agriculture practice is associated with age, non-farm income, and educational background. The study also revealed that only 5 out of 7 of the key requirements for Urban Agriculture are met by practitioners in lokoja metropolis. 24.7% of the practitioners owned the land for farming, and renting is the major form of land access for Urban Agriculture (32.4%). Urban Agriculture in lokoja metropolis is constrained by limited land, water scarcity, lack of agricultural support, and enabling laws guiding the practice. Recommendations were made regarding spatial planning incentives for Urban Agriculture practices, designing buffers to suppress nuisance odor from the practices, encouraging gardening on undeveloped land, and hydroponic agricultural practices.* There are many options for the management of waste. There is no single correct method to achieve proper waste management; most of the options have been practiced, and the problem still remains the same. For this reason, we found the urban agriculture practice the best option for the management of waste among the urban dwellers.

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Key Words: Assessing *Urban agriculture, Waste management, Food security, Sustainable development.*

Introduction

Urban agriculture is an industry located within (intra urban) or on the fringe (peri-urban) of a town, a city or a metropolis, which grows and raises, processes and distributes a diversity of food and non-food products, reusing largely human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area (Mougeot and Barker, 2001). The twenty-first century has often been described as 'the first urban century'. Unprecedented rural–urban migration has led to rapid urban growth (Kironde, 2012). According to the World Food Summit Declaration of 2009, more than one billion people were suffering from hunger and poverty, whereas the year before, 800 million were estimated to be food insecure, mostly in poor countries (FAO, 2009).

Some example projects are implemented and are successes. In Harare, 60% of food consumed by low- income groups were self- produced, in Kampala Urban producers obtain 40-60% or more of their household food needs from their own urban garden, in Hanoi 80% of fresh and vegetables, 50% of pork, poultry and fresh water fish, as well as 40% of eggs originate from urban and peri urban areas (Kyle, 2013). Local authorities and specialists in Vancouver (Canada) have promoted progressive programmes on urban agriculture utilizing wastewater/ sewage streams from buildings (Robert, 1997). From these examples, it can be related to Nigeria, a developing country with issues of food security and waste management. The numbers of hungry people in Nepal continue to rise even as global food production has been increasing since the 1990s (Centre for Social Sciences Studies, 2011). For several decades, a diverse literature has claimed that urban agriculture has the potential for hunger

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and poverty alleviation (Stewart et al., 2013). World population is expected to peak at nine billion by 2050, and food production capacity is stretched to its limits based on current and projected patterns of demand (Smit and Nasar, 1992). Urban agriculture is a mechanism that can play a role in enhancing access to and distribution of food in urban areas, thus filling the hunger gap (DIANA, 2010).

Although there has been a significant volume of research on urban agriculture, rather little has been directed at quantifying its scale and extent based on data that can be projected to show its incidence in a population (Wegelin and Borgman, 1995). In 1996, a global survey sponsored by the United Nations Development Programme (UNDP) estimated that 800 million people worldwide were engaged in urban agriculture (Smit and Nasar, 1992). While it is true, as often pointed out, that the majority of urban farmers are poor, the socioeconomic data need careful examination. In general, the majority of such farmers are poor because so is the majority of the urban population.

The objective of this term paper is to review the urban environmental issues relating to urban agriculture and seeking to establish the relationship with urbanization and the potential of urban agriculture in Nepal. This review will seek out, appraise, and synthesize evidence on the impacts of urban agriculture on food security and nutrition. This will employ systematic review methodology to ensure that the review of the evidence is comprehensive. The review is based on the information and data published in scholarly journals and relevant reports from organizations and individuals.

Study Area

Lokoja, the capital city of Kogi State, can be found between latitude 7045’ 27.56’’ - 7051’ 04.34’’ N and longitude 6041’ 55.64’’ - 6045’ 36.58’’ E of the equator with a total land

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coverage of about 63.82 sq. km. (Adeoye, 2012). It is a former capital territory of the British Northern Protectorate under the leadership of Lord Lugard. According to Olawepo (2009), Lokoja became the headquarters of the Kogi Local Government Area as far back as 1976 and was later made the Kogi State capital in 1991. Since then, there has been a massive change in all activities of Lakoja, including its size, structure, population, and other socio-economic development. The city is located at the confluence of the rivers Niger and Benue (See Figure 1). These two rivers serve as a driving mechanism for the movement of agricultural products from riverine areas of the state to Lokoja, where a bulk of the population resides. Within the last three decades, Lokoja Metropolis, like many other urban centers in Nigeria, has witnessed a tremendous population increase. The phenomenal increase in the population over the years in the city has led to a high demand for goods and a resultant increase in waste generation.

Methodology

The study employed mixed approach research methods, and data were generated using a structured questionnaire, an interview guide, and observation. The analysis was carried out using descriptive analysis. 230 poultry farmers in the study area were sampled from the total population of 874 of the entire urban agriculture farmers in the study area for even representation, and results were presented descriptively using tables and charts

Primary source of data collection

The Data from the primary source was collected using the following techniques:

i. Reconnaissance survey: This involves a preliminary survey of the study area to get acquainted with it. This is very important as it gives an idea of the existing situation of the various land uses in the study area. To also get familiar with the study area.

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ii. Observation: This involves going to the study area to collect or gather relevant information. This also involves visual observation to help identify the nature, pattern, and physical characteristics of the study area. Personal interviews and observations were done.

Secondary source of data collection

i. Documents: Literature relating to the subject matter, such as journals, books, dissertations, project works, and the internet, will be consulted. In addition, references will also be accessed from various relevant books, magazines, and statistical records from where useful information will be consulted, and a Base map of the study area.

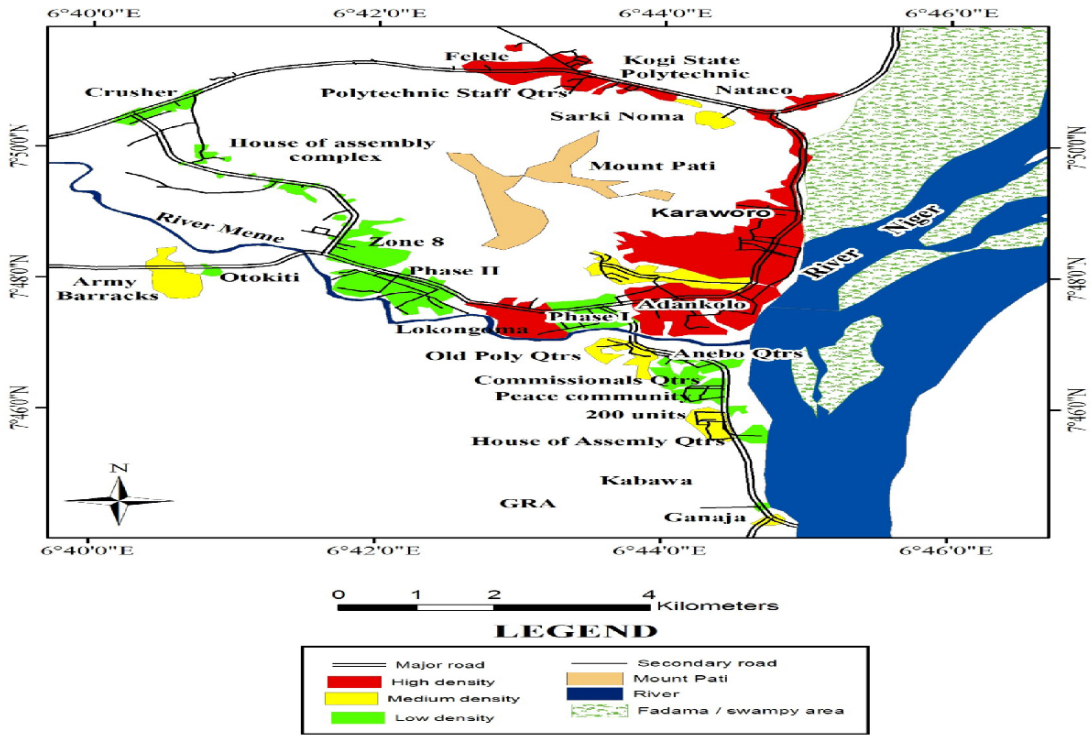

Figure 1. **Map of the Study Area.** Source**: Author's fieldwork, 2024**

Importance of Urban Agriculture

Issues of food security and nutrition have wide-reaching implications for people and their environments, particularly in low and middle-income countries (Cabannes, 2012). One

proposed solution is urban agriculture, which has been widely upheld as a solution to the food crisis, faced by increasingly metropolitan populations (Stewart et al., 2013). It is believed to provide the urban poor with food and a source of potential income, whilst improving the urban environment and reducing pressure on finite farmland (Satterthwaite and Dodman, 2013). There are, however, potential disadvantages to this increasing drive for urban agriculture, including associated urban health risks and implications for the environment (Stewart et al., 2013).

Despite the potential benefits and harms of urban agriculture, the evidence base is not well established. There is an urgent need to analyze its impacts on urban populations and their environments. The benefits of urban agriculture can be summarized mainly by four sectors: health, ecology, social, and economy (Stewart et al., 2013). Towards health, urban agriculture practice could provide access to healthy food, food health literacy, healthy eating habits, and physical activity for good health. According to Smit et al (1996), social benefits include social empowerment and mobilization, youth development and education, food security, safe space, and socially integrated ageing. The economic sector includes local economic stimulation, job readiness, job growth, food affordability. The ecological sector benefits include awareness of food system ecology, stewardship, conservation, waste management, water management and wastewater management, soil improvement, biodiversity, and habitat improvement.

Urban agriculture and food security

Food security means that "*Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life*" (FAO, 1996). This can be measured at different levels, from the household to the national level. In different developing countries,

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urban agriculture practices are good examples for the reduction of food insecurity among the urban poor. The main factors affecting household food security were wealth, land size, the keeping of livestock, gender, and education (Smit and Nasar, 1992). Besides food security, there might be another condition, i.e., nutrition security. Nutrition security is a condition for which food security is a necessary but not sufficient condition, so that it is important for the care of livestock farming, along with kitchen gardening and crop production, for the insurance of nutrition security, which are major components of urban agriculture (David et al., 2010), farm, community garden (Jenkins, 200).

Result and discussion

The importance of urban agriculture in Lokoja, Nigeria

The Population in the city in Nigeria was last reported at 19.02% in 2010, according to World Bank report published in 2012 (World Bank, 2012). The population in the largest city is the percentage of a country's urban population living in that country's largest metropolitan area. The rural population growth rate is 1.3% whereas urban population growth rate is 4.7% per year (Centre for Social Sciences Studies, 2011). In addition, ecological, climatic, and political crises create new waves of migration to the cities, which are the major issues contributing to the problem.

Lokoja is urbanizing rapidly, with a population of about 2.3 million people, and Oworo Valley is growing at 4.67% per year (Centre for Social Sciences Studies, 2011). Lokoja is one of the fastest growing metropolitan areas in North central Nigeria, and first state capital in Nigeria to face the unprecedented challenges of rapid urbanization and modernization at a metropolitan scale. Outside the capital, Felele, Ganaja, Banda are also expanding rapidly, with an annual population growth rate of above 5% (Centre for Social Sciences Studies, 2011). Clusters of non-farm economic activities, comprising core urban centres surrounded

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by a hinterland of small towns and rural areas, have emerged close to the border with the federal capital. Towns are growing rapidly along the highways, with population increasing by 5-7 percent every year in the fastest-growing settlements.

Since Nigeria is a developing country, fighting food deficiency since 1990, the importance of urban agriculture is desired. The urbanization and migration of people from rural to urban areas are increasing. The population census of 2011 shows that the urban areas are developing towards the Northern region, the grain basket of the nation, and the productivity is decreasing, leading to increased food insecurity. We can learn from the lessons of other developing nations that have made significant progress by adopting urban agriculture practices. Although urban agriculture is not the perfect solution to the food insecurity problem, it helps to minimize the problem. Besides the food insecurity, it also helps to minimize the waste management burdens and improve the economic conditions of the urban poor. Most of the urban cities are facing the problems of solid waste management, and the urban water resources are also under great pressure due to unmanaged liquid waste. Waste management is a recurring issue for the Felele and Ganaja areas, with garbage collection being regularly halted, for reasons ranging from employee protests to local communities living near the waste disposal site. Despite the potential for reuse, resource recovery, and organic waste composting, solid waste management is an acute problem for all 8 settlements. Lokoja, the capital city, is categorized as the list of the most polluted cities.

There are some reasons to promote urban agriculture, some of which are.

• Demand for fresh food in Restaurants and Hotels, which can be easily obtained from the urban yards and gardens.

• Demands for organic food with high cost will be one of the promoting factors that can be possible from implication of urban household and other organic waste.

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• Need not pay extra money for the water bills for irrigation, fertilizers, or waste bills for the municipality for waste management.

• Protect the urban water sources from pollution, ultimately the whole aquatic system.

• Increases the greenery of the surroundings, which enhances the beauty,and can be the site for recreation.

Urban agriculture and food security

Food security means that "*Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life*" (FAO, 1996). This can be measured at different levels, from the household to the national level. In different developing countries, urban agriculture practices are good examples for the reduction of food insecurity among the urban poor. The main factors affecting household food security were wealth, land size, the keeping of livestock, gender, and education (Smit and Nasar, 1992). Besides food security, there might be another condition, i.e., nutrition security. Nutrition security is a condition for which food security is a necessary but not sufficient condition, so that it is important for the care of livestock farming, along with kitchen gardening and crop production, for the insurance of nutrition security, which are major components of urban agriculture (David et al., 2010).

Urban agriculture and poverty

While it is true, as often pointed out, that the majority of urban farmers are poor, most of them use 80% of their income for food for their family (FAO, 2002). It was seen in many urban areas of the developed world; most urban farmers who are well-placed people benefit most from urban farming, whereas the poor, landless, and women benefit least, which really cannot decrease the urban poverty (Rogerson, 1996). It is not clear whether households with

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many mouths to feed experience pressure to farm for food security, or whether farming enables households to enlarge and support more people.

Urban agriculture and waste management

Smit and Nasr (1992) pointed out that cities are conventionally planned and developed without taking account of ecological processes, but that urban agriculture, which makes use of natural resources otherwise treated as waste and processes them, is an appropriate way of planning for urban environmental sustainability. There are a number of examples in the management of waste in urban agriculture. These emphasize recycling of liquid waste, including the use of wastewater in agriculture, both from developed and developing nations around the world (Wolf et al., 2003). Good examples come from Mexico City and Kolkata in the production of fish and vegetables using sewage lagoons and wastewater (David et al., 2010). While the equal importance of recycling organic solid waste through urban agriculture is highlighted, it prioritizes the recycling or use of agricultural residues. Urban agriculture practices can be taken through different models, i.e., community farm, commercial farm, institutional farm, community garden (Jenkins,2009).

Urban management implications of urban agriculture in Lokoja, Nigeria

Urban poultry farmers in the study area raise poultry birds at the front, backyard, and rooftops of their houses. The practice of poultry farming has its potential benefits and challenges in urban areas. The urban management implications relating to urban poultry farming in the study area are highlighted below:

I. Economic development:

The basic reason of poultry farming identified by urban poultry farmers in the study area is to provide additional income and to supplement household consumption, income generated by households through poultry farming practices contributes to the household

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economy of poultry farmers in the study area, the average income accruable from poultry farming by sampled poultry farmers in Lokoja metropolis, it found out that the average income acquire from poultry farming is about (₦49,996.8) per harvest.

Considering that the majority of urban agriculture farmers are engaged in other non-farming activities in the study area, the average income from urban farming activities and the average income from non-farming activities were correlated to establish the differences as well as the relative contribution of the two to household income in the study area. The average income per harvest from sample urban poultry farmers and the mean average income derived from non-poultry farming activities in the study area. Average income per harvest from poultry farming was found to be ₦49,996.8, which accounts for 70% of the total income of farmers. The average monthly income from non-poultry farming was ₦29,000, which is 30% of the total income of the poultry farmers. This shows that urban poultry farmers earned much from urban poultry farming practices, thus poultry farmers practiced urban poultry farming as an alternate way for additional income generation in the study area. This also implies that since urban poultry farming provides a reasonable amount of income, thus serves as an employment opportunity to the urban population, as the study earlier established majority of urban poultry farmers in the study area are satisfied with urban agriculture farming practices as a source for employment.

Conclusion

Nigeria is a country where the population growth rate is high, and the trend of urbanization is also increasing. Some of the cities are already experiencing the problem of solid waste management. So, it is high time to think over this problem of garbage and manage it at the source. There are many options for the management of waste, although there is no single correct method to achieve proper waste management. All the options have been practiced,

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and the problems regarding solid waste in urban areas persist. For this reason, the urban agriculture practice is recommended as the best option for the management of urban waste in the source through the active participation of the urban people.

The urban slums are increasing, unemployment rate surging, all leading to the urban sprawl and ultimately a crisis without fair livelihood options (Mougeot and Barker, 2001). Thus, an envisaged urban agriculture system can be a part of the solution to the urban crisis. It has the potential of generating benefits like chances of growing own food, thus reducing total dependence on imported food. Quality foods, good utility of leisure time, and low prices are some of the benefits. Waste reduction at source by composting the household waste to prepare manure is sought to be beneficial for both urban agriculture practice and waste management. The use of manure in food gardens is the best option. The other benefits for the city dwellers are: protection of human health and the environment, conservation of resources such as materials, energy, and space. Care-free waste management system, in current practice, will leave problems to be solved by future generations, and this is not acceptable, as we are talking about the sustainability of urban areas and sustainable cities. There are some models, from countries that have similar economic conditions and rapid urbanization as Nigeria, proven effective in managing urban waste and promoting urban agriculture. We can borrow ideas and technologies from their learning and practice it to promote urban agriculture in Lokoja, Nigeria, to create better livable cities.

Recommendations

Urban agriculture farming has its potential benefits and challenges in Lokoja metropolis, as discovered by the study. For sustainable urban agriculture farming practices in the study area, specific strategies are recommended in line with the study findings.

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1. Since most of the urban agriculture farming activities are practiced at the household level, authorities should provide laws and regulations to regulate urban farming activities at the household level to ensure the sustainability of the practice.

2. Though most of the urban farmers in the study area use different techniques (application of sawdust) to reduce odor release from farming activities from causing discomfort to other residents, urban farmers, especially with a large number of poultry, should be sensitized on using advanced ventilation systems and integrating odor-reducing technologies to help minimize the impact of odor on urban residents.

3. To reduce and prevent the presence of flies and other rodents, urban farmers should inculcate the habit of frequently collecting poultry litters, reduce feed losses during storage and feeding poultry, use closed bags to store poultry manure, application of non-harmful insecticides, build wind protection structures, and provide nets around poultry shelters.

4. A minority of urban farmers in the study area provides a buffer to separate farming shelters from other residences, especially poultry. To reduce discomfort, there is a need to encourage the use of buffers and other soundproofing measures to help minimize the impact of noise on urban residents.

5. Zoning and regulation for urban agriculture farming should be provided. It is recommended that households, especially with a large number of poultry inside houses, practice in a separate place away from other residences, to prevent discomfort and affect the urban environment.

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