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Awareness of Container Urban Agriculture among Urban Dwellers for Food Security and Environmental Sustainability in North-Central, Nigeria

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Abstract: *Low agricultural activities among urban dwellers in the country has created imbalance in demand and supply for food thus threatening food security. The need to bridge the demand and supply gap for food calls for urban agriculture. The study therefore sought to investigate awareness of container urban agriculture among urban dwellers for food security and environmental sustainability in North-Central, Nigeria. The study was guided by five objectives, five research questions and three null hypotheses. The study adopted survey research design. The population for the study was 125 which consist of 51 vegetable farmers, 36 civil servants, 27 retirees and 24 florists. The entire population was used. The instrument for data collection was Container Urban Agriculture Awareness Questionnaire (CUAAQ) validated by three experts and pilot-tested on 30 urban farmers in Taraba State. Cronbach-Alpha was used to obtain reliability coefficient of 0.821. The data were analysed using percentages, mean and ANOVA. The null hypotheses were tested at 0.05 level of significance. Results revealed that people of different socioeconomic status were involved in urban agriculture, cereals, root/tubers, and vegetable crops were produced and containers like old motor tyres and sacks were used for food production. It further revealed that urban dwellers adopted the use of animal manure, reduction in the use of inorganic fertilizers to promote environmental sustainability. The study recommended enlightenment campaigns, training urban dwellers to acquire skills in container urban agriculture and making laws that permit the inclusion of agricultural land in master plans of towns.*

Keywords: Container urban agriculture, urban dwellers, food security**,** environmental sustainability**,** open spaces**,** biodegradable wastes

Introduction

One of the major problems confronting man from time immemorial is the challenge of adequate food supply to support growth in population. The demand for food at different times seems to unequal the supply thereby creating imbalance in demand and supply chain. The demand for food is compounded by the increase in population, abandonment of agriculture in the hands of rural farmers and fast expansion of urban cities without corresponding level of food production which perpetually put urban dwellers at the risk of food shortage.

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The urban dwellers are civil servants, retirees, businessmen/ women, artisans, the politicians, military and para-military living in cities who partly or exclusively rely on rural agriculture for food supply. The dependence on rural communities for food supply is perhaps linked to the fact that agricultural activities are rarely carried out in urban areas because land is in shortage and is reserved for other important uses other than agriculture (Sroka & Polling, 2015). Agricultural activities in some cities in African and Latin America is regarded as illegal and should simply be ignored because it can temper with the aesthetic appeal of cities (Smit, *et al.,* 2001; Matos & Batista, 2013). This leaves the supply of agricultural commodities almost completely in the hands of the rural communities thus bringing untold hardship on urban dwellers as every food consumed is being bought at exorbitant prices. The high rate of inflation at 21.82% as released by the National Bureau of Statistics (2023) is an indication that many urban dwellers spend most of their income on purchase of food items. According to Kareem and Raheem (2012) many urban households spend as much as 50-80% of their income for food thereby leaving meagre amount amidst other competing demands. Some of the urban dwellers are low income earners as opined by Mougeot (1999) and if they are to spend that much on food, it obviously portends a great danger. A survey of agricultural commodities in local markets in North-Central, Nigeria shows that prices of staple food are more than double in the last few months. In recent time in the face of Nigeria's government naira redesigned policy, it is even more difficult for many to see cash to buy what to eat.

It is projected that in no distant time, the urban cities will be confronted with increase in population. Orsini, *et al.,* (2013) reported that between 2030 and 2050 urban population will rise by 60-70%. Empirical evidence shows that more than half of the population in cities in countries like Angola, Guatemala, and Georgia among others are living below poverty line (UN-HABITAT, 2010). The situation is so bad that since 2016, the living conditions of people in Nigeria has continued to decline to the level that 82 million Nigerians are living below the poverty line (Leke & Leke, 2019). This will seriously compound even more the challenges of food supply in urban cities particularly North-Central, Nigeria. This perilous situation can be averted when urban agriculture is fully embraced by urban dwellers.

Urban agriculture can be explained from the view point of the location from where food crops are produced and animals are reared as opposed the rural agriculture. It is carried out in urban areas (towns or cities) rather than rural areas. Urban agriculture is the production of food/vegetables crops, keeping of livestock, processing of plant and animal products, advertising and marketing of agricultural products in the urban areas for human consumption and or income generation. A look at our cities shows that the urban dwellers of low income engage in several agricultural activities (Mntambo, 2012). They operate backyard animal pens or cultivate open spaces, abandoned sites or sideways for the production of vegetables and other food crops (Mhache & Lyamuya, 2019). This is done by planting directly into the soil or the use of various containers.

Container urban agriculture is the use of different kinds of containers such as old motor tyres, plastic/iron containers, wooden boxes, nylon bags, empty sacks, PVC pipes, drums, pots, jerry cans, basins, among many others to produce (Boland, 2005; Githinji, 2022; Harrrison, 2022; Deveza & Holmer, 2022). These containers are filled with planting media which is sometime a mixture of soil and organic matter content (poultry droppings and animal dung), sawdust and animal manure. When filled with planting media, they are planted with crops of choice. The major advantage of the container farming over planting directly in the ground is that it makes use of any space, indoor and outdoor thereby bridging any possible gap that might arise as the result of no space.

Benefits to be derived from the use of containers in urban agriculture are numerous. In the submission of Masabni (2022); Deveza & Holmer (2022); Harrrison, (2022), containers can be used to produce

all types of vegetables and any other food crop that is grown in the backyard. It ensures maximum use of space as patios, terraces, porches, balconies, rooftops, window boxes, drive ways, sidewalks, can be used to produce food. Another advantage is that where it is practically impossible to produce food crops such as rocky areas, it is achievable with containers. Planting in containers add to the aesthetic value of the environment. More importantly, the use of containers in urban agriculture is capable of driving the environmental sustainable project as discarded objects can be re-used, thereby ensuring a cleaner environment. Today, the use of old motor tyres, trash cans, empty cement/livestock feeds bags that hitherto litter in cities have tremendously reduced the amount of solid wastes in our environment, the use of animal manure and biodegradable wastes have greatly reduced soil, water and atmospheric contaminations. Refuse dumps which have become common phenomenon constituting an eye-saw in our urban cities form rich sources of plant nutrients. It has tremendously reduced the uncontrolled application of inorganic fertilizers since emphasis now seems to be tilted in favour of organically produced foods (Game & Primus, 2015). Today, the innovative means of crop production using containers in urban centres is a panacea to the unavailability of land, and an assurance to ending the over dependence on rural agriculture for food supply in our cities.

The most common forms of urban agriculture in North-Central Nigeria are more visible in the activities of florists/horticulturalists and vegetable farmers who produce by the road sides and banks of river for commercial purposes respectively (Ezedinma & Chukuezi, 1999). A discourse on urban agriculture to many in North-central, Nigeria is relatively new and many people who are involved in urban agriculture are not even aware of it. Elsewhere in China and Singapore, Kenya, Uganda, Togo and Sierra Leone urban agriculture is gaining unprecedented attention. Today, many available open spaces or abandoned factory sites in Nigeria's major cities are planted up by residents. It is reported that over 80 million persons worldwide are into urban agriculture, with West Africa accounting for 20 million of the number (Game & Primus, 2015).

Studies on urban agriculture have shown that it is capable of mitigating the food insecurity and providing a sustainable source of livelihood to urban dwellers (Mntambo, 2012). In an assessment of the profitability of urban agriculture in Abuja (Federal Capital Territory), Egbuna (2023) reported that vegetable/ other crop farmers generate income of N11 million. In an earlier study, Ezedinma and Chukuezi (1999) reported the profitability of urban agriculture in Lagos and Port-Harcourt in Nigeria. Urban agriculture is now seen as a potential tool towards attaining food security, employment and environmental sustainability in urban areas (Lau, 2013). The adoption of urban agriculture has become imperative due to government unrealistic efforts at reducing poverty among urban people, and taking over of expanse of land hitherto farmlands by fast expanding cities. There are numerous benefits to be derived from the adoption of urban agriculture. In the words of Orsini, *et al.,* (2013); Ndem, *et al.,* (2018), urban agriculture guarantees fresh, quality and nutritious food as the mileage gap between point of production and market is greatly reduced. Money is also saved for other family needs, the green in cities add to its aesthetic value and help to purify the environment (Mougeot, 1999). Most importantly, the need to be gainfully employed in the face of unemployment, attain food security and environmental sustainability has provided impetus for urban agriculture to strive (Orsini, *et al.*, 2013).

Food security connotes access to quality food for healthy living by all people at all times. Mntambo (2012); Ikeoji (2018) asserted that food security is attained when there is access, availability and affordability of adequate and nutritious safe food. It is needless to argue that the nation has attained food security for all. Chiaka, *et al.,* (2022) reported that Nigeria occupies the 98th position out of 107 countries based on 2020 Global Hunger Index. It clearly tells that Nigeria is far from attaining food security. No wonder the Agricultural Promotion Policy, (APP) of Nigeria acknowledged the inability of the country meeting local demand for food which has necessitated food importation worth $3-$5

billion annually (Lokpobiri, 2019). The challenges of availability, accessibility and affordability is still staring us in the face. Urban agriculture has the propensity of producing all year round (Orsini *et al.,* 2013). Access to quality food is enhanced unlike those who almost completely depended on the rural areas for their supply of food. Other than attaining food security, involvement in urban agriculture can change the deteriorating environmental conditions in cities to an environmental friendliness which is sustainable.

The present environmental conditions in urban areas have but pose a serious threat and harm to living species and non-living alike. For instance, the soil is prone to pollution by solid and semi solid wastes. Water bodies are constantly being polluted with biodegradable wastes, industrial wastes, chemicals and the atmospheric environment being contaminated with greenhouse gases particularly carbon dioxide. If projection by Orsini *et al.,* (2013) that by 2050 up to 60% of the world population would live in urban areas is anything to go by, this will no doubt constitute even worse environmental conditions except environmental friendly practises for a safer environment are adopted (Igbabaka, *et al.,* 2015).

One of the challenges urban cities in Nigeria are confronted with is pollution/ degradation that has become injurious to ecosystem (Leke & Leke, 2019). There is the need to urgently adopt innovative method of urban farming that would promote environmental sustainability. Environmental sustainability is concerned with practices aimed at preventing harm and threats to interaction between living organisms and non-living component making the environment friendlier (Moldan, *et al.,* 2012; Orsini & D'Ostuni, 2022). Environmental friendliness can be achieved by adopting container method of urban farming. This means of food production has continued to capture the interest of urban dwellers. Container method of urban agriculture uses different kinds of containers exclusively for the purpose of planting rather than sowing directly in the ground (Boland, 2005; Githinji, 2022; Harrrison, 2022; Deveza & Holmer, 2022).

Container urban agriculture can be practised under rain-fed and irrigation systems there by making food production all year round thus placing the practitioners on advantage over their rural producers (Piso, *et al.,* 2019). It is arguable that the use of containers may be more expensive than planting directly in the ground and cannot be afforded by the urban poor, fortunately, it can be adopted at almost no cost as discarded materials like empty sacks, plastics, iron wooden and clay wares form valuable means of food production which in turn make the environment friendly. The desire for a shift from the traditional means of food production to the use of containers among the urban dwellers will suffer a setback if the people are not aware of its viability and profitability as to meeting their food supply needs. It is the awareness that will guarantee the rate of adoption. The motivation for this study is borne from the fact that urban agriculture is yet to be fully embraced by the people especially where containers are used for production purposes. Hence the researchers are interested to ascertain awareness of container-urban agriculture among urban dwellers for food security and environmental sustainability in North-central, Nigeria.

Statement of the Problem

Urban cities in North-Central, Nigeria are fast expanding and are seriously faced with the challenges of adequate food production for the surging population most of which live below poverty line (Lokpobiri, 2019; Chiaka, *et al.,* 2022). Another problem is the worsening environmental conditions such as pollution/degradation (Leke & Leke, 2019). Prompt measures are required not just to address food shortages but to also manage the environmental conditions in cities in order to avert the impending food and environmental deterioration in no distant time. These challenges can be surmounted with efficient urban agriculture because it can enhance food security and make the environment friendly to live in (Deveza & Holmer, 2012). The success of urban agriculture is

dependent on the extent of awareness. This has become expedient because the system is yet to receive the attention it deserves and there is paucity of empirical literature on the urban agriculture in North-Central, Nigeria.

Objectives of the Study

Five objectives guided the study. Specifically, the study sought to:

1. ascertain the socioeconomic characteristics of urban dwellers into urban agriculture;
2. identify different types of vegetable/food crops produced by urban dwellers in North-Central, Nigeria;
3. identify different types of containers used to produce vegetable/food crops by urban dwellers in North-Central, Nigeria;
4. ascertain means urban dwellers adopted to attain food security in North-Central, Nigeria; and
5. describe practices adopted by urban dwellers to promote environmental sustainability in North-Central, Nigeria.

Research Questions

Five research questions were raised and answered. These are;

1. What are the socioeconomic characteristics of urban dwellers into urban agriculture?
2. What are the different types of vegetable/ food crops produced by urban dwellers in North-Central, Nigeria?
3. What are the different types of containers used to produce vegetable/ food crops by urban dwellers in North-Central, Nigeria?
4. What are the means urban dwellers adopted to attain food security in North-Central, Nigeria?
5. What are the practices adopted by urban dwellers to promote environmental sustainability in North-Central, Nigeria?

Research Hypotheses

The study formulated three null hypotheses and was tested at 0.05 level of significance. There is no significant difference in the mean responses of urban farmers in Benue, Kogi and Plateau states on:

1. types of containers used to produce vegetable/ food crops by urban dwellers in North-Central, Nigeria;
2. means adopted to attain food security in North-Central, Nigeria; and
3. practices adopted to promote environmental sustainability in North-Central, Nigeria.

Methodology

The study was conducted in North-Central geopolitical zone, Nigeria. North-Central geopolitical zone comprised of six states and Federal Capital Territory (FCT) namely Benue, Kogi, Kwara, Nasarawa, Niger, Plateau and Abuja. The states have a combined land mass of 24,242,500ha with the population of 29,252,408 Census (2006). The major ethnic groups in this zone are Tiv, Igala, Idoma, and Birom. The guinea-savannah vegetation of the zone favours the production of different food crops such as yams, cassava, tomato, and tree crops (citrus and mangoes).

The population for the study was 125 which consist of 51 vegetable farmers, 36 civil servants, 27 retirees and 24 florists. The entire population of 125 was used as it was manageable by the researchers. Only those who had evidence of involvement in urban agriculture were used for the study. This was because there is no urban agriculture farmers' association in existence. The instrument used for data collection was a questionnaire titled: Container Urban Agriculture Awareness Questionnaire (CUAAQ). The CUAAQ was made up of two parts. Part A sought information of respondents' socioeconomic characteristics, while Part B was subdivided into four

sections. Section 1 has items on vegetable/ food crops produced, Section 2 solicited responses on containers used, Section 3 sought answers on means of attaining food security, and section 4 probed into practices for promoting environmental sustainability in urban cities.

The instrument was validated by three (3) experts. Two experts in Agricultural Education, Department of Vocational Agriculture and Technology Education, Joseph Sarwuan Tarka University, Makurdi and an expert in Environmental Resource Management, Department of Environmental Sciences, Benue State University. The instrument was pilot-tested on 30 urban farmers in Takum Local Government Area of Taraba, State in North-East, Nigeria. Cronbach-Alpha was used to obtained reliability coefficient of 0.821 which indicated that the instrument was internally consistent and could be used. One hundred and twenty-five (125) copies of the questionnaire were administered on the spot with the aid of a research assistant from each town selected for the study. This helped the researchers to achieved 100% retrieval rate.

The data were analysed using frequency count and percentages to answer research question one, mean was used to answer research questions two-five. Any item with mean value equal or above 2.50 benchmark was accepted while any item with mean score less than 2.50 were rejected. The null hypotheses were tested at 0.05 level of significance using ANOVA statistics. Comparism was made between p-value and alpha value. The null hypotheses of no significant difference were not rejected where p-value (Sig.) was greater than the alpha-value (0.05).

Ethical Considerations

The researchers sought approval from the Ministry of Agriculture and Urban Development Board from the respective states to conduct the study. Participation in the study was voluntary as the respondents' consent were sought. The respondents were given assurances that any information provided for the study would be treated confidentially. Their cooperation was gained when they discovered no part of Container Urban Agriculture Awareness Questionnaire (CUAAQ) required revealing personal information that is traceable. The data collected was confidentially treated, honestly analysed and discussed mainly for academic purpose. Most importantly, the paper was not plagiarized.

Results

Table 1: Socioeconomic characteristics of urban dwellers into urban agriculture

Socioeconomic Characteristics	**Frequency**	**Percentage (%)**
Gender		
Male	70	56
Female	55	44
Marital status		
Married	84	67.20
Single	41	32.80
Age		
18-30	34	27.20
31-45	72	57.60
46-above	19	15.20
State		
Benue	50	40
Kogi	50	40
Plateau	25	20
City		

Gboko	25	20
Makurdi	25	20
Ankpa	25	20
Lokoja	25	20
Jos	25	20
Crop produced		
Flowers	24	19.20
Vegetables	51	40.80
Food crops	50	40.00
Occupation		
Civil servants	36	28.80
Retirees	27	21.60
Artisans	11	8.80
Businessmen	xx	xx
Urban poor	51	40.80
Politicians	xx	xx

The result in Table 1 indicated that all genders, male (56%) and female (44%) were involved in urban agriculture. The respondents were either married (67.20%) or single (32.80%). The percentage of crops produced in the area shows that vegetable is most produced (40.80%), this is followed by other food crops (40%), while flowers are the least produced (19.20%). The percentage occupation shows that the majority of the respondents are urban poor with 40.80%, followed by civil servants (28.80%), retirees (21.60%), while the artisans were the least (8.80%).

Table 2: Different types vegetable/ food crops produced by urban dwellers in urban cities in North-central, Nigeria

Sn	Item Statement	Mean	Std. Dev.	Remarks
	Cereal crops			
1.	Maize	3.67	.59	Agree
2.	Sorghum	1.96	.37	Disagree
3.	Rice	2.42	.62	Disagree
4.	Millet	2.34	.61	Disagree
	Leguminous crops			
5.	Groundnut	3.81	.55	Agree
6.	Cowpea	3.78	.54	Agree
7.	Bambara nut	1.97	.42	Disagree
8.	Soy beans	1.47	.75	Disagree
	Roots/ tuber crops			
9.	Yam.	2.62	.99	Agree
10.	Sweet potato.	3.37	.58	Agree
11.	Irish potato.	2.07	1.04	Disagree
12.	Cassava.	2.46	.67	Disagree
	Bulbs/root vegetable			
13.	Onions.	3.71	.61	Agree
14.	Ginger.	3.24	.45	Agree
15.	Carrot.	2.35	.81	Disagree
16.	Garlic.	2.31	.77	Disagree
	Leafy vegetable			
17.	Cabbage.	3.21	.48	Agree

18.	Lettuce.	2.34	.81	Disagree
19.	Bitter leaf.	3.78	.55	Agree
20.	Water leaf.	3.88	.35	Agree
21.	Spinach.	3.12	.50	Agree
	Fruit vegetable			
22.	Eggplant.	3.76	.54	Agree
23.	Okra.	3.84	.41	Agree
24.	Pepper.	3.84	.41	Agree
25.	Tomato.	3.78	.52	Agree
	Tree crops			
26.	Citrus.	2.71	1.01	Agree
27.	Mango.	3.43	.54	Agree
28.	Guava.	3.40	.54	Agree
29.	Cashew.	3.17	.76	Agree
	Horticultural plants			
30.	Flowers.	3.81	.49	Agree
	Grand mean	**3.02**	**.61**	**Agree**

Std. Dev. = Standard Deviation

Result in Table 2 revealed 20 out of 30 items with mean values ranged from 2.71-3.88 and a grand mean of 3.02 which were greater than the benchmark of 2.50 on a 4-point scale. This indicated that the respondents agreed that urban dwellers are involved in the production of vegetable/food crops such as maize (3.67), groundnut (3.81), yam (2.62), citrus (2.71), and flowers (3.81).

Table 3: Different types containers used to produce vegetable/ food crops by urban farmers in North-central, Nigeria

Sn	Item Statement	Mean	Std. Dev.	Remarks
1.	Old motor tyres.	3.82	.54	Agree
2.	Nylon bags.	3.02	.25	Agree
3.	Plastic containers	3.89	.36	Agree
4.	Iron containers.	2.01	.37	Disagree
5.	Sacks/ bags.	3.01	.24	Agree
6.	Empty livestock feeds/ cement bags.	3.89	.41	Agree
7.	PVC pipes.	3.07	.29	Agree
8.	Wooden boxes.	1.18	.54	Disagree
9.	Ceramic/ Clay pots.	3.81	.53	Agree
10.	Jerry cans.	2.04	.39	Disagree
11.	Cartons.	2.02	.36	Disagree
12.	Drums.	3.06	.37	Agree
	Grand mean	**2.90**	**.39**	**Agree**

Std. Dev. = Standard Deviation

Result in Table 3 showed 8 out of 12 items with mean values ranged from 3.01-3.89 and a grand mean of 2.90 which were greater than the benchmark of 2.50 on a 4-point scale. This indicated that the respondents agreed that urban dwellers in North-central use different containers like old motor tyres (3.82), nylon bags (3.02), plastic containers (3.89) and sacks (3.01) to produce vegetable/ food crops.

Table 4: Means urban dwellers adopt to attain food security in North-central, Nigeria

Sn	Item Statement	Mean	Std. Dev.	Remarks

1.	Production of different types of vegetables like spinach, okra.	3.74	.62	Agree
2.	Production of other food crops like cowpea, groundnut, yams.	3.07	.46	Agree
3.	Producing vegetables/ food crops at river banks in the dry season.	3.06	.48	Agree
4.	Using balconies, porches, door and rooftops to produce vegetables.	1.30	.70	Disagree
5.	Production of vegetables/ food crops under rain-fed condition.	3.72	.64	Agree
6.	Production of vegetables/ food crops under irrigation system using wells and boreholes.	3.06	.34	Agree
7.	Producing both vegetables and food crops.	3.82	.49	Agree
8.	Production of vegetables/ food crops in batches throughout the year.	1.98	.44	Disagree
9.	Production of vegetables/ food crops in empty spaces within and around compound.	3.75	.53	Agree
	Grand mean	**3.06**	**.52**	**Agree**

Std. Dev. = Standard Deviation

Result in Table 4 showed 7 out of 9 items with mean values ranged from 3.06-3.82 and a grand mean of 3.06 which were greater than the benchmark of 2.50 on a 4-point scale. This showed that the respondents agreed that urban dwellers in North-central employ different means such as producing vegetables/ food crops at banks of river in the dry season (3.06), production of vegetables/ food crops under rain-fed condition (3.72) and production of vegetables/ food crops in empty spaces within and around compound (3.75) to attain food security.

Table 5: Practices adopted by urban dwellers to promote environmental sustainability in North-central, Nigeria

Sn	**Item Statement**	**Mean**	**Std. Dev.**	**Remarks**
1.	Use of livestock manure to enrich the soil for production purposes.	3.73	.56	Agree
2.	Use of solid wastes such as old motor tyres to produce.	1.98	.43	Disagree
3.	Conversion of biodegradable into compost for growing crops.	3.05	.33	Agree
4.	Recycling of water and other waste for food production purposes.	3.06	.41	Agree
5.	Use of saw dust/ wood chips and rice bran as growing media.	3.06	.34	Agree
6.	Increase use of organic manure for crop production.	3.74	.61	Agree
7.	Reduction in the use of inorganic fertilizers for production purposes.	3.78	.58	Agree
8.	Planted crops to help reduce the amount of carbon dioxide in the atmosphere.	3.01	.41	Agree
9.	Planting in containers to add to the aesthetic appeal of the environment.	3.11	.43	Agree
	Grand mean	**3.17**	**.46**	**Agree**

Std. Dev. = Standard Deviation

Result in Table 5 revealed 8 out of 9 items with mean values ranged from 3.01-3.78 and a grand mean of 3.17 which were greater than the benchmark of 2.50 on a 4-point scale. This demonstrated that the respondents agreed that urban dwellers in North-central used livestock manure to enrich the soil for production purposes (3.73), conversion of biodegradable into compost for growing crops (3.05) and reduction in the use of inorganic fertilizers for production purposes (3.78) to promote environmental sustainability.

Table 6: One-way ANOVA analysis of the responses of urban farmers in Benue, Kogi and Plateau states on types of containers used to produce vegetable/ food crops by urban farmers in North-central, Nigeria.

Source of variance	Sum of squares	df	Mean square	Sig. (P-Value)	Alpha -value	Dec.
Between Groups	.011	2	.005	.666	0.05	NS,NR
Within Groups	1.598	122	.013			
Total	1.609	124				

df = degree of freedom, NS = Not Significant, NR= Not Rejected, Dec. = Decision

Result in Table 6 showed that the P- value (sig.) of .666 was greater than the alpha- value of 0.05 with the sum of squares between groups of .011 and the degree of freedom of 2 and sum of squares within groups of 1.609 with the degree of freedom of 122. This implies that there was no significant difference in the mean ratings of the responses of urban farmers in Benue, Kogi and Plateau states on types of containers used to produce vegetable/ food crops. Hence, the null hypothesis was not rejected.

Table 7: One-way ANOVA analysis of the responses of urban dwellers in Benue, Kogi and Plateau states on means adopted to attain food security in North-central, Nigeria.

Source of variance	Sum of squares	df	Mean square	Sig. (P-Value)	Alpha -value	Dec.
Between Groups	.025	2	.012	.668	0.05	NS,NR
Within Groups	3.751	122	.031			
Total	3.776	124				

df = degree of freedom, NS = Not Significant, NR= Not Rejected, Dec. = Decision

Result in Table 7 showed that the P- value (sig.) of .668 was greater than the alpha- value of 0.05 with the sum of squares between groups of .025 with the degree of freedom of 2 and sum of squares within groups of 3.751 with the degree of freedom of 122. This indicated that there was no significant difference in the mean ratings of the responses of urban dwellers in Benue, Kogi and Plateau states on means adopted to attain food security. Hence the null hypothesis was not rejected

Table 8: One-way ANOVA mean ratings of the responses of urban farmers in Benue, Kogi and Plateau states on practices adopted to promote environmental sustainability in North-central, Nigeria.

Source of variance	Sum of squares	df	Mean square	Sig. (P-Value)	Alpha -value	Dec.
Between Groups	.014	2	.007	.728	0.05	NS,NR

Within Groups	2.663	122	.022
Total	2.677	124	

df = degree of freedom, NS = Not Significant, NR= Not Rejected, Dec. = Decision

Result in Table 8 revealed that the P- value (sig.) of .728 was greater than the alpha- value of 0.05 with the sum of squares between groups of .014 with the degree of freedom of 2 and sum of squares within groups of 2.663 with the degree of freedom of 122. This implies that there was no significant difference in the mean ratings of the responses of urban dwellers in Benue, Kogi and Plateau states on practices adopted to promote environmental sustainability. Hence, the null hypothesis was not rejected.

Discussion of Results

Result showed that people of different socioeconomic status are involved in urban agriculture in North-central, Nigeria. This is in concordance with Asogwa, *et al.,* (2021) finding that people of different socioeconomic status; genders, marital status and ages are involved in plantain value addition. Their involvement in urban agriculture may not be unconnected with the high cost of vegetable and food items. The need to produce for family consumption and sales for income generation, saving for other family expenses and consuming vegetables in their fresh forms must have been some of the irresistible motivation for embracing urban agriculture.

Result also revealed the production of different vegetable and other food crops in different urban centres in North-central, Nigeria. This is in agreement with Agbulu, *et al.,* (2013) that cereal, legumes, roots/tubers, leafy vegetable and bulbs/ roots crops have entrepreneurial opportunities in Benue. Venturing into urban agriculture by some urban dwellers may be a deliberate attempt to shorten the food miles and food production at low cost (Lau, 2013). Involvement in urban agriculture by city residents might have reduced the over dependence on rural communities for food supply.

Result showed the use of different containers for the purpose of vegetable and food crops production. It also revealed that there was no significant difference in the responses of the respondents on the containers used for urban agriculture in Benue, Kogi and Plateau states. This was in consonance with Githinji, (2022) who reported the use of containers such as clay/ ceramic containers, plastic and iron containers, trash cans among others for the purposes of practising urban agriculture. Their adoption of these containers may have been linked to the fact that it gives urban dwellers an opportunity to produce even where direct sowing into the ground would have been difficult. The adoption of containers for urban dwellers will make the act of food production in cities for flexible even for those people without enough land to produce.

Result demonstrated that urban dwellers adopt different ways of achieving food security in cities. The result has demonstrated that there was no significant difference in the responses of the respondents on means for achieving food security in Benue, Kogi and Plateau states. This supports the position of Mhache and Lyamuya (2019) operate backyard, open spaces, abandoned sites or sideways for the production of vegetables and other food crops. It further agrees with Boland (2005) on the use of banks of rivers and streams to ensure continuous food production even during dry season. The adoption of rain fed agriculture and irrigation farming for both wet and dry seasons are efforts aimed at ensuring continuous flow in the supply of food items which assist them to attain food security.

Result has also indicated that urban agriculture avail farmers' opportunities to adopt practices that promote environmental sustainability. The finding is congruent with Orsini, *et al.,* (2013); Igbabaka, *et al.,* (2015); Piso, *et al.,* (2019) who identified practices such as the use of biodegradable waste, the

use of solid waste (plastic, iron, ceramic and wooden boxes) as being capable of promoting a sustainable environment. The necessity of adopting environmental friendly practices by urban dwellers can be attributed to the need to make urban cities less harmful for human habitation.

Conclusion and Recommendations

Urban agriculture is a veritable tool towards attainment of not just food security but also economic and employment needs of the fast growing population in our urban cities. With urban agriculture in place, the environmental conditions of cities are drastically improved upon. Sadly, urban agriculture is not incorporated in the master plan of urban centres in as much as it has contributed significantly to the socioeconomic status of urban dwellers. Urban agriculture can reach its full potentials when it is given the attention it deserved. The following recommendations have been put forward;

1. Agricultural educators are encouraged to carry out enlightenment campaigns to educate urban dwellers to adopt container urban agriculture as it has the potentials of meeting their food, economic securities and sustainable environment.
2. Agricultural educators should train urban dwellers on container urban agriculture to acquire skills for container urban agriculture.
3. Necessary legislative laws should be made by law makers (legislative arm of government) permitting the inclusion of agricultural lands in township master plan to ease access to land for increased urban agricultural activities.
4. The urban dwellers involved in container urban agriculture should be given financial assistance by government in form of soft loans for start-up capital for the purchase of farm inputs and other materials.
5. Urban dwellers into urban agriculture are encouraged by the agricultural educators to be creative by converting wastes materials and products into production purposes.

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Declaration of Interest

The researchers declare that there is no conflict of interest in this study. The study was entirely founded by the researchers.

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