

Assessing the Effects of Urban Agriculture on the Architecture of Uyo Metropolis, Nigeria

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Abstract

The study is an assessment of the effects of urban agriculture on the architecture of Uyo Capital City in Akwa Ibom State, Nigeria. A total of 240 copies of questionnaires were distributed among the six sectors into which the study area was divided. Data on 10 dependent variables and 10 independent variables were collected and used for the study. Descriptive, Person's Product Moment Correlation and Multiple Regression Analysis techniques were used for the analysis. Descriptive analysis was used to identify the various types of urban agricultural activities existing in Uyo urban areas. Person's Product Moment Correlation was used to determine the relationship between each variable of urban agriculture against each variable of environmental qualities in the six sampled sectors. Based on the results of the analysis, there was a weak statistical significant relationship between urban agriculture and the environmental quality of Uyo in all the sampled sectors. Furthermore, a unit increase in the number of farmers would increase pollution by 0.03 units, and given a unit increase in intensity of cultivation, pollution would increase by 3.47 units, holding other variables constant. Based on these findings, it is recommended among other things that there should be a monitoring board set up by the Ministry of Agriculture whose functions will include checking the quality of agro-chemicals in use in the urban area.

Keywords: *Effects, Urban agriculture, Architecture, Uyo urban, Nigeria*

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Background to the Study

A look at some postcards or pictures of some Nigerian cities taken many years ago reveal an enviable display of architectural forms against a background of a well-ordered urban environment. Although the architecture of a city is generally most strikingly perceived in terms of the characteristic architectural forms of the buildings and physical structures, so also the architecture of the city requires a background of a decent, orderly and well-planned environment to enhance its beauty and aesthetic perception. Today even though we have more architecturally appealing forms springing up, the average Nigerian city still lacks that character and orderliness that would make it a place with pride (Mesan, 2009). Even Abuja our so much cherished masterpiece, has begun to imbibe some of the negative attributes that are closely associated with other Nigerian cities. The rapid urbanization that is taking place goes together with a rapid increase in urban poverty and urban food insecurity.

Urban agriculture has been described as an oasis of green in a concrete-dominated urban world which has existed since the dawn of cities and continues to serve many functions in today's metropolises. Whether to ease racial and socio-economic tensions, heal urban food deserts, the lack of sustainability of our food system, or provide a safe and encouraging recreational environment for teens, urban agriculture has woven itself into the fabric of what makes a city healthy. There are several ways to produce food in an urban setting (some private, some public, some institutional) and innovative technological advances are developing creative solutions to enable urbanites to grow more of their own food than was ever possible.

The phrase "urban agriculture" could therefore refer to any agricultural activity, including crop cultivation, livestock, and aquaculture (fish farms) that take place in an urbanized area. Most of today's working definitions come from International Development Research Center (IRDC). For instance, Egziabher (1994) defined urban agriculture as the practice of food production within a city boundary or on the immediate periphery of a city. It includes the cultivation of crops, vegetables, herbs, fruit, flowers, orchards, parks, forestry, fuel wood, livestock, aquaculture, and bee-keeping.

Urban agriculture provides a complementary strategy to reduce urban poverty and food insecurity and enhances urban environmental management. It plays an important role in enhancing urban food security since the cost of supplying and distributing food to urban areas based on rural production and imports continue to increase, and do not satisfy the demand, especially of the poorer sectors of the population (NISER, 1992). Next to food security, urban agriculture contributes to local economic development, poverty alleviation and social inclusion of the urban poor and women in particular, as well as to the greening of the city and the productive reuse of urban wastes.

Urban agriculture involves farming activities carried out within the city limit. It could be likened to an industry located within a town, a city or a metropolis, which grows, raises, processes and distributes a diversity of food and non-food products using largely human and natural 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.

A number of research results in the last decade indicate the growing importance given to the issue of urban cultivation by international development organizations and researchers. For example, the Canadian International Development Research Centre has sponsored a series of detailed investigations on urban agriculture. Many of these researchers are very positive about the role which urban agriculture might play in solving the problems of unemployment, food security and environmental quality in African cities. The United Nations Development Programme (UNDP, 1996) published a comprehensive report for consideration at the Habitat II Conference, Istanbul in June, 1996, based on the evidence gathered on urban agricultural activities across the world and compiled by the Urban Agriculture Network. This research therefore examines the effects of urban agriculture on architecture of Nigerian cities with particular reference to Uyo, the Akwa Ibom State capital, where urban agriculture is practiced on every available vacant land

Statement of Problem

The city of Uyo, the Akwa Ibom State capital is currently facing a serious environmental crisis like other major cities in developing nations. This crisis which is multifaceted and multidimensional is threatening the future of the cityscape so much that a lot of concern is being raised in many quarters over the need for the sustainability of the city to meet its primary functions and status in terms of liveability, urban aesthetics, safety and convenience. The situation is further made worse by pollution caused by emission of harmful substance, e.g. carbon dioxide, methane, nitrous oxide, ammonia, and animal wastes being discharged in such high concentrations that they poison the environment and deplete the protective ozone layer. These have subjected the city to health problems and squalid urban environment.

Man's activities on land in the areas of commercial, industrial and agricultural concerns have largely been blamed for the depleting quality of the environment. While much of these problems have been linked to the activities of the first two (commercial and industrial), not much has been said or known about the impact of the third (agriculture) even with the increasing involvement of many urban residents in urban agriculture. The impetus for this research was therefore borne out of the perceived notion that there is a negative impact on the architecture of Uyo and this was consequent upon the increasing rate of urban agriculture. This effect could be perceived in Uyo in the forms of erosion, soil waste, and unkempt open spaces in the built-up areas of the city which are used as farms.

The Study Area - Location

According to Etim and Ofem(2005), Uyo urban situates about 70 kilometres inland from the coastal plains of South Eastern Nigeria between latitudes 7° 47" and 8° 03" north and longitudes 4° 52" and 5° 07" east. Uyo is bounded on the north by Ibiono Ibom and Itu Local Government Areas. It is bounded on the south by Ibesikpo/Asutan Local Government Area and in the east, by Uruan Local Government Area while Abak local Government Area bounds it in the west as shown in Figure1. Uyo is relatively at the centre of Akwa Ibom State and is easily accessible to all the South-East and South-South States. Suffice it to say that what constitutes Uyo urban is as marked by the limits of the Uyo Capital City Development Authority (UCCDA) which extends beyond the original Uyo Local Government Area into parts of Uruan, Itu and Ibesikpo/Asutan Local Government Areas.

Identification of Variables

Table 1: Independent Variables (X) (Urban Agriculture)

S/N	Independent Variable (X)	Unit of Measurement
X1	Crops	Annual/No of types
X2	Farmers	Number of farmers Per Sector
X3	Status of Farmers	Fulltime/Part time
X4	Income	Naira
X5	Age of Farmers	Years
X6	Area cultivated	Hectares
X7	Horticulture	Number of sites/ sector
X8	Urban forestry	Number of sites/ sector
X9	Intensity of cultivation	Number of farmers/hectare
X10	Chemical fertilizer	Number of bags/hectare

Source: Authors' Field work (2015)

Population of Study and Sampling Frame

The population of the study comprised all the farm sites that are found in Uyo urban area. Through reconnaissance survey, a total number of 549 urban agriculture sites were identified in the study area. The number of the urban agriculture sites and farmers formed the sampling frame. The number of farm sites and farmers are shown on Table 2.

Table 2: Population of the Study

Sectors / Quadrants	No of farm sites	No of farmers
A	100	140
B	87	92
C	88	96
D	80	60
E	94	63
F	100	63
TOTAL	549	581

Source: Authors' Field Survey, (2015)

Sampling Design

There are many sampling designs, but for the purpose of this research, the Yaro Yamane's formula for a finite population was used to determine the sample size which is as follows:

$$n = \frac{N}{1 + N(e)^2}$$

Where n = The Sample size
 N = The Study Population (Farmers) = 581
 e = The Level of Significance (Limit of tolerable error = 0.05)
 1 = Unity (Constant)

$$\begin{aligned}
 n &= \frac{581}{1+581(0.05)^2} \\
 &= \frac{581}{1+581(0.0025)} \\
 &= \frac{581}{1+1.4525} \\
 &= \frac{581}{2.4425} \\
 &= 236.9011 = 240
 \end{aligned}$$

This means that our sample size is 240. Therefore, 240 farmers would be interviewed with the use of questionnaire.

Data Analysis

This involves the testing and computing of data collected from the field. Analysis of data by qualitative methods is required to determine this phenomenon. The data collected from the field survey were analyzed using descriptive and inferential statistical method.

Descriptive statistics such as percentages and frequency counts were used to analyze the demographic variables of the respondents. This method makes it easy for understanding and is particularly effective in an exploratory survey such as this.

Inferential statistics (Pearson's Product Moment Correlation and Multiple Regression Analysis) were used to perform a simple analysis of relationship on the data and determine the relationship and assessing the effect of urban agriculture on the architecture of the city of Uyo Urban which involves establishing the strength of the association between two variables. This was applied to measure the prediction of the dependent variable by the independent variables. It is a statistical tool which relates quantitatively variation of dependent variables (Y) based on the independent variables (X) using the formula:

$$Y = a + bx_1 + bx_2 + bx_3 + bx_4 + e$$

Where;

Y	=	the dependent variable (amount of waste generated)
X1-Xn	=	the independent variables of households
a	=	y intercept in the regression plane
b	=	the regression coefficient
c	=	error term

The statistical tool used to address objective (i) which is to identify the type of urban agricultural practices in Uyo urban area was the Descriptive Statistical Technique like frequencies, and percentages. The statistical tool used to address objective (ii) which was to determine the relationship between urban agriculture and environmental quality of Uyo urban area was the Pearson's Product Moment Correlation. Multiple regression Analysis was applied to address objective (iii) which was to assess the effects of urban agricultural activities on the architectural quality of Uyo urban.

Administration of Questionnaire

The respondents of the field survey were farmers who have been involved in urban agriculture in different sectors of Uyo urban area. The features of these respondents were distributed evenly using the simple descriptive statistics to make this work easy to understand. This provided a summary of the result at a glance without much difficulty.

A total of 240 copies of questionnaire were administered to different urban agricultural practitioners across the 6 sectors of the study area. Out of 240 copies, 228 questionnaires were correctly filled and returned while 12 copies of the questionnaire were discarded due to the fact that they were incorrectly filled and were not used in this research in order to avoid bias.

The 6 Sectors and the component roads and streets are as follows:

Wellington Bassey Way axis (A):	Eka street, Udo Street, Utang street, Dominic Utuk Avenue, Uyo Village Road.
Ikot Ekpene Road axis (B):	Udi Strret, Ikpa Road, Ekpanya Street, Ebong, Essien Street, Udo Ette Street, Ibiyam Street, Odu Oku Street, Iboko Street, Afaha Ube street.
Aka Road Axis (C):	William Street, Ukana Offot, Obio Imo Street, Akpa Ube Street, Enwe Street, Etuk Street, Jubilee School Road, IBB Avenue.
Abak Road Axis (D):	Nsentip Strret, Udo Eduok Street, Nkemba Street, NEPA Line, Calabar Street, Peter Uboh Street, Atiku Abubakar Avenue.
Oron Road Axis (E):	Uruan Street, Nsikak Eduok Avenue, Udo Umana Street, Ekpo Obot Street.
Nwaniba Road Axis (F):	Udo Inwang Street, Atakpo Street, Gibbs Street, Ekpri Nsukara Street.

Analysis of Dependent Variables (Y)

Having identified and studied the independent variables, the dependent variables were also identified and studied and their findings presented below:

Table 3: Agricultural Waste Products

Sector	Mean Score	%
A	2.77	16.89%
B	2.71	16.52%
C	2.84	17.32%
D	2.88	17.56%
E	2.55	15.55%
F	2.65	16.16%
Total	16.40	100.00%

Source: Authors' Field Survey, (2015)

Soil Erosion

Areas with steep slopes were found to be vulnerable to soil erosion, where trees had been cut down and where crops and other vegetation grew poorly. Sectors C and E recorded the highest number of soil erosion occurrences. In Sector A where the Uyo ravine is located, a total number of 7 soil erosion ravaged sites were enumerated while in sector E, 6 badly affected sites were observed. At the other 4 sectors, erosion sites also spotted but were not as devastating in degree as the ones found in sectors A and E. These analyses are presented on Table 4.

Table 4: Erosion Sites in the Study Area

Sectors	Number of Sites	Percentage Contribution
A	7	36.84
B	1	5.26
C	2	10.53
D	2	10.53
E	6	21.05
F	3	15.79
Total	21	100%

Source: Authors' Field Survey, (2015)

Visual Untidiness

The whole study area was observed several times for the purpose of ascertaining the degree of untidiness occasioned by agricultural practices. The findings are presented on Table 5 below:

Table 5: Visual Untidiness of Respective Sectors in the Study Area

Sector	VU	U	A	T	VT	Mean Score	%	Perceived Score
A	5	3	8	11	12	3.56	19.05	6
B	10	8	6	9	7	2.88	15.37	2
C	6	7	8	9	8	3.16	16.88	4
D	5	6	5	8	10	3.25	17.92	5
E	11	8	9	6	6	2.70	14.43	1
F	5	7	9	7	6	3.06	16.35	3
Total	42	39	45	50	49	18.71	100%	

Source: Authors' Field Survey, (2015)



Plates 1 and 2: Showing Visual Untidiness in Sectors A and B

Flood

It was observed that some areas where urban agriculture was practiced were prone to flooding. Flooding came as a result of blocking of the drainage and water channels by debris from agriculture. To determine the severity of the flooding, measurements were taken of the volume of water that caused the flood. At some points within the study area like Udu Oku Street where urban agriculture was carried out on both sides of the road, flood rose to 381mm as shown in Table 6.



Plates 3 & 4: Flooded Areas around Abak Road by Nkamba Junction.

Source: Researchers' field work (2015)

Table 6: Flood Stages of the Sectors

Sector	Flood Stage measured in mm	%
A	241	13.77%
B	381	21.74%
C	225	13.04%
D	325	18.84%
E	313	18.12%
F	250	14.49%
Total	1735	100.00%

Source: Authors' Field Survey, (2014)

Flood stage is the water level as read by a gauge for a body of water at a particular location. “Gauge height” (also refers to “stream stage”, “stage of the body of water”, or simply “stage”) is the level of the water surface above an established zero level at a given location. The zero level can be arbitrary but is usually close to the bottom of the stream or river, or the average level of standing bodies of water (Bolund and Hunhannar, 1999). The flood stage measurements are given as a height above or below the zero level. A level below zero is reported as a negative value. Flood stages are usually calculated for bodies of water near communities. The above measurements were taken after a heavy downpour in Uyo, sometimes in November, 2014.

Street Quality

The street quality of the study area is under constant threat partly as a result of the ever-increasing rate of urban agriculture. It was observed that any time it rained, flood/rain water would carry debris, mainly of urban agricultural wastes to the streets and that affected adversely, the quality of the streets so much so that the 3 times a week cleaning of the streets by the contract staff of the State Ministry of Environment, code-named Green Brigade were not enough to provide a healthy and aesthetic environment.

Table 7: Street Quality

Sector	Vegetable	Crop	Market	Food	Miscellaneous	Mean	%
		Peals	Residues	Waste	Score		
A	5	10	7	6	11	3.21	18.07
B	9	9	6	9	7	2.90	16.35
C	9	6	7	9	7	2.97	16.76
D	11	5	8	7	6	2.78	15.69
E	10	7	10	5	8	2.85	16.06
F	8	5	7	6	8	3.03	17.07
TOTAL	52	42	45	42	47	17.742	100.00

Source: Authors' Field Survey, (2014)

Table 7 outlines the debris of urban agricultural wastes that litter the streets thereby affecting the quality and cleanliness of the street. It evidently shows that vegetables constitute more

with a total aggregate of fifty-two (52). Followed closely is miscellaneous (unclassified agricultural wastes) with forty-seven (47), market residue with forty-five (45), food waste and crop peels with a similar aggregate of forty-two (42).



Plate 3: Effect of Farming on Street Quality in Sector D

Health

It was observed through interview that some of the people living within the areas where urban agricultural activities were carried out experienced one type of disease or the other. The frequency of the diseases occurrence is given in table 8 below.

Table 8: Frequency of Diseases Occurrence

Sector	Malaria	Typhoid	Catarrh/Cough	Diarrhea	Mean Score	%
A	8	5	3	4	2.15	14.43%
B	3	7	4	6	2.65	17.79%
C	6	3	5	6	2.55	17.11%
D	6	5	4	5	2.42	16.11%
E	5	4	7	4	2.53	16.78%
F	4	6	3	7	2.65	17.79%
Total	32	30	26	32	14.95	100.00%



Plate 4: Effect of Farming on Street Quality in Sector D

Discussion of Major Findings

Focusing on the Uyo Urban area which is currently facing a lot of environmental problems ranging from erosion to pollution, this study aimed at assessing the effects of urban agriculture on the architecture of Uyo.

The following findings were made from the study, 9.21% of those engaged in urban agriculture fell within the age bracket of 16-35 years, while 21.93% belonged to the age bracket of 26-35 years. The age bracket of 36-45 and 46-55 provided the largest percentages of 41.23% and 27.63% respectively.

Moreover, the study revealed that given a unit increase in the number of farmers, pollution would increase by 0.03 units and that given a unit increase in intensity of cultivation; pollution would increase by 3.47 units, holding other variables constant. The visual untidiness, soil erosion, destruction of vegetation, siltation and depletion of water bodies and pollution of resources (air, soil and water) were associated with urban agriculture. The use of agro-chemicals in urban agriculture was discovered to be one major source of concern. As such, agro-chemicals like: urea, triple super phosphate, and single super phosphate, were discovered to be the major pollutants in the study area.

In the case of flood and health, it showed that flood's relativity was more of stronger negatives and few of stronger positive relationships while health had more of stronger positive relativity than the negative (Ofem and Udoibeh, 2014). Pollution is mostly negatively related to their independent variables because it is a major issue of urban agricultural activities to the environmental quality while Garden/Parks, street quality and spaces are weakly related due to the fact that there was no enough manpower to tidy and maintain these areas.

The effect of urban agriculture on the architecture of Uyo urban area was investigated. The result of the model showed that crops cultivated by farmers, the intensity of cultivation, urban forestry and horticulture have a strong significant effect on the aesthetics of Uyo with a coefficient of 995 ($R^2 = 0.990$). This implies that 99% of urban agricultural activities had an effect on the architecture or the beauty of Uyo urban area.

Conclusion

The study was undertaken with a view to assessing the effects that urban agriculture has on the architecture of Nigerian cities using Uyo as a case study. The study revealed that there were many benefits derivable from involvement in urban agriculture and also exposed the ills of the practice in masking the architectural beauty of the Nigerian cities. Recommendations were made that would help stem these ills.

Recommendations

Having established that urban agriculture has contributed to food security and nutrition, reduced one's household expenditure on food, served as an important strategy for poverty alleviation and social integration as well as caused pollution, emitted injurious gases and masked the architectural beauty of our cities, the following recommendations were made:

1. Incorporate mechanisms for effective coordination of urban agriculture activities by allocating land in urban Master Plans for urban agricultural activities and direct stake-holders participation in planning and implementation.
2. Provide a legal framework for urban agricultural activities
3. Regulate access to land and water as well as urban organic wastes and wastewater
4. Define environmental and health standards; maximum quality standards for agricultural soil and irrigation water and health standards tailored to the ultimate consumers of the product produced.
5. Institutionalize administrative procedures to get access to the above-mentioned resources.
6. Institutionalize procedures to monitor the positive and negative effects of urban agriculture with regard to social, economic and environmental conditions and define responsible bodies charged with respective task.

Also, government should make deliberate efforts at integrating urban agriculture into its overall physical planning scheme. If it must be practiced, then it should be provided for in the Master Plan as is done in Abuja, Dodoma, and Havana.

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