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Analysis of Urban Agricultural Characteristics along Land Use Gradient in Lagos State, Nigeria.

Olalekan John Taiwo
Department of Geography,
University of Ibadan, Nigeria
Email: olalekantaiwo@gmail.com

Abstract

The paper argued that land use diversity influenced urban agriculture and that understanding the characteristics of each land use type within which urban agriculture is situated will help to identify prospects and challenges confronting urban agriculture. Three hundred questionnaire coupled with personal interviews were used in collecting relevant information and data pertaining to socio-economic and demographic characteristics of urban farmers. Existing land use map of the LGA was updated with the 2010 high-resolution satellite (*Quickbird*) image of the LGA. Frequencies, cross-tabulation and analysis of variance were used in analysing variations in socio-economic factors across different land use types. The rapid disappearance of urban agricultural sites within the built-up areas is situated within the concept of the survival of the fittest.The results showed that the land use characteristics within which urban agriculture is located moderate its size, rental cost, profit, accessibility to roads network, while it exacts little or no influence on it with regard to distance from markets and water sources. The findings provide new insights into theoretical debates on the role of land use pattern in influencing pertinent factors of urban agriculture in and around cities. It brings to the fore the need to consider the spatial pattern of urban land use in the allocation of space for urban agriculture while emphasising the role of geographical distance in determining urban agricultural outcomes.

Key words: Land use, distance, setbacks, rent

Introduction

The rising personal expenditure on food related items, coupled with the persistent urban poverty has raised the need for increased and improved food production in cities. In developing countries, a large percentage of urban dwellers spend between 50%-80% of their income on food related items (Mougeot, 1993), while the concept of 'food desert' has emerged, describing the increasing distance separating food sources from cities in developed countries. Addressing the challenges arising from food scarcity, poverty and food desert in cities would require among other things the continuous promotion of urban agriculture. Urban agriculture includes backyard, balcony and rooftop farming and its wide recognition is based on the increasing awareness of its role in addressing urban nutritional deficiencies, unemployment, increasing urban poverty, and rampaging urban poverty among others, which were mostly brought about by rapid rural-urban migration, structural adjustment policy, economic transition, and improved

agricultural policies (Crush et al., 2011; Mkwambisi et al., 2011; Taylor and Lovell, 2012). In addition, rapid urbanization, ineffective agricultural policies, inadequate food distribution systems, withdrawal of subsidies, reduction of wages, inflation, unemployment, ineffective urban regulations, civil strife, and drought are among other factors that have promoted urban agriculture in the recent time (Mougeot, 1993).

Despite that urban agriculture has been recorgnised as an essential element of urban landscape, nevertheless, its distinctive characteristics are easily enmeshed within other land use types within which it is located. This is because urban agriculture many times exists as an isolated land use type within a larger urban land use fabrics. Therefore, the characteristics and challenges confronting the dominant land use within which urban agriculture exists oftentimes define the characteristics and potentials of urban agriculture. Thus, the dominant land use type will most likely influence the scale and other characteristics of urban agriculture located within its corridor. In addition, the scale of urban agriculture is mostly influenced by the characteristics of the larger land use type within which it is situated. Therefore, in cities, each land use type within which urban agriculture is situated will exact considerable influence on it. Urban agricultural related factors likely to be influenced by land use characteristics include size of available plots of land, distance to market, cost of land acquisition, distance to road network and rent pattern.

Urban land use expansion typically displace urban agriculture from not only within the cities but also from the periphery of cities to some distance further away(Bittner and Sofer, 2013). The continuous shifting of urban agriculture is as result of intensive competition for the use of land occupied by urban agriculture. Despite this continuous shifting, patches and or relics of urban agricultural land use still characterise some isolated localities in cities where condition is favourable or near favourable for its survival. Therefore, rather than analysing urban agriculture in isolation, it is important that it should be analysed within the context of human environment which may be expressed in terms of the various land use and land cover in which it is situated(Pearson et al., 2011).Although a distinct land use type in itself, nevertheless, what happens in the immediate vicinity of other land use types affect transactions within it (Xia et al., 2011).It is through the analysis of the linkages between urban agriculture and other land use and land cover types that their effects on urban agriculture can be adequately assessed. Some of the factors that directly and or indirectly affect urban agricultural production include the activity of urban land speculators which clearly influences price of land at city fringe. The anticipated conversion of agricultural land to urban land use is responsible for the reduction in price of farmland with increasing distance from city since price of farm land decreases sharply with decreasing distance towards the city and increase gently away from the city (Cavailhès and Wavresky, 2003). Proximity to market is also important in urban agricultural decision making as it affects transportation cost(Drechsel and Dongus, 2010). In addition, accessibility to water is equally important in urban agricultural decision making, since most farmers make more profit during the dry season compared to rainy season (Drechsel and Dongus, 2010).

This study posited that urban agricultural sites in cities and peri-urban neighbourhoods exist as an 'island' land use and are mostly influenced by the characteristics of the predominant land use within which they are situated. Thus, the characteristics of the dominant land use type influenced a number of factors that affect urban agriculture. Despite the myriads of research on land use and land cover dynamics (Lambin et al., 2001),little is known about its effects on some of the critical urban agricultural input factors. Furthermore, while limited efforts have been geared towards the understanding of the relationship between component of urban land uses and urban agricultural activities, we are not aware of any comprehensive study

that analysed the effects of different land use types in the immediate vicinity of an urban agriculture on urban agricultural practises. This study addressed the question of whether variations exist in the factors that are crucial in urban agricultural production across different land use gradient in cities. Therefore, our view of urban agricultural dynamics both at local and national scales will be enhanced with adequate understanding of the interactions and feedbacks between land use types and various factors that influence urban agriculture (Grimm et al., 2000). The incorporation of land use types brings to fore the role of local factors rather than regional or national factors in influencing urban agricultural production and it also provides the means by which it can be assessed. A thorough understanding of the interaction between land use and urban agricultural related factors such as distance to market, and rent regime can be useful to land owners, real estate appraisers, economic analysts and policy makers in general. Such knowledge will help in crafting sustainable public policies on land management for cities in developing countries.

Study Area

Lagos State had a total population of 9,013, 534 in 2006, which constituted about 6.44% of Nigeria's total population (NPC, 2007) and ranked sixth among the 28 megacities surveyed in 1991, however, it had the least standard of living (Linden, 1996; Oduwaye, 2005). The state has an estimated population growth rate of 9.0% (Lagos State Government Diary, 1992). In terms of industrial concentration, it accounts for over 60% of Nigeria's industrial and commercial establishments, as well as international seaport and airport. In addition, it has 70% of the nation's banking institutions, 90% of foreign trade, and corporate headquarters of multinational corporations (Lagos State Government, 2006). Based on these opportunities, the state attracts people from virtually all the states in Nigeria and beyond. The metropolitan area comprises seventeen out of the twenty local government areas (LGAs), which make up the state. Specifically, Ojo LGA (the study area) was created in 1989, with a landmass of 180sq km and about 30% of it can be described as riverine (Figure 1). Urban farming in Lagos State is diverse and it includes poultry keeping; artisan fishing in coastal villages; roadside horticulture; and market gardening at flood plains (Akinmoladun and Adejumo, 2011). Some of the localities where urban agriculture takes place include Iyana Iba, Aboroko, Lagos State University (LASU) campus, Ojoo Cantonment. This study, however, only focused on urban arable farmers.

Methodology

The choice of Ojo LGA was based on earlier studies in Lagos that identified its long history of urban agriculture (Akinmoladun and Adejumo, 2011). The LGA is diverse in terms of land use, ethnicity, and income distribution. In the absence of secondary data that could provide an exhaustive assessment of the effects of land use on urban agriculture, we resolved to the use of open-ended pretested questionnaire coupled with personal interviews in collecting relevant information and data pertaining to socio-economic and demographic characteristics of farmers. The questionnaire was designed to capture information on the socio-economic characteristics of farmers operating within and around Ojo LGA. Land use characteristics in the immediate vicinity of these farms were also observed during the questionnaire administration. Pertinent questions include

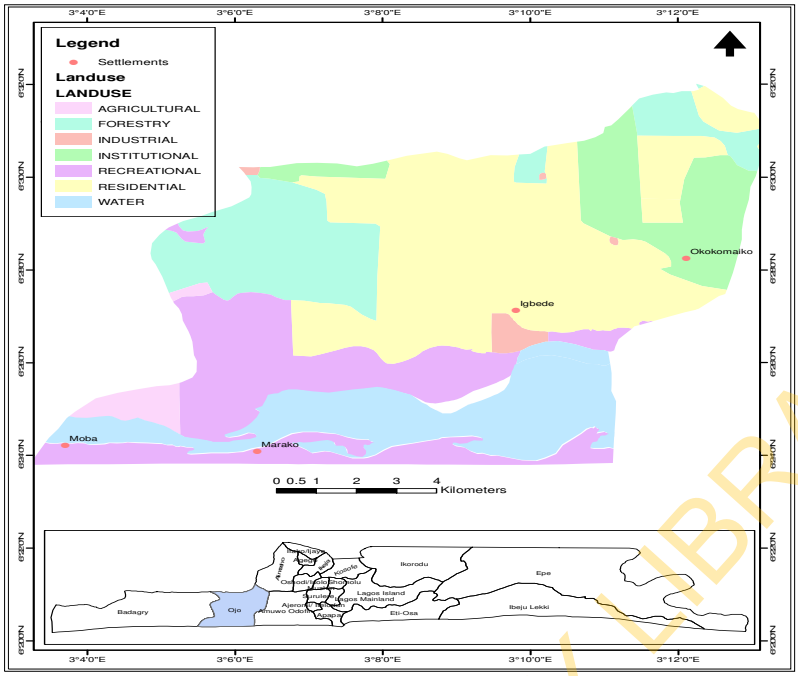

Figure 1: Map of Ojo Local Government Area, Lagos State

the socio-economic characteristics of urban farmers (age, sex, income, and education), distance from market, roads, and water/rivers, dominant land use in the immediate vicinity of urban farm. Snowball approach was used in the identification of urban farmers and this was further complemented with information obtained from satellite image showing peri-urban agricultural sites in the LGA (Figure 2). Three hundred pretested questionnaires were administered to the urban farmers. Existing land use map of the LGA was updated with the 2010 high-resolution satellite (*Quickbird*) image of the LGA. The image provided the basis for the generation of land use map of the LGA, especially the area in the immediate vicinity of the urban farms surveyed. Statistical Package for the Social Scientist (SPSS 21) was used for all the statistical analysis. Furthermore, one-way analysis of variance was used to compare the mean values of each factor across different land use types. The Least Significance Difference (LSD) test was applied for variables with significant mean difference. Significant differences were detected based on a probability level of $p < 0{\cdot}05$.

Results

Socio-economic Characteristics of Urban Farmers

The analysis of the socio-economic characteristics of urban farmers focused on their education, occupation, length of farming and employment condition. Education may influence major urban agricultural decisions as well as the processes and procedures adopted in land acquisition. Farmers with primary and secondary education dominate urban farming, while those with post-secondary school education were 11%. In addition, about 10% of the farmers do not have any formal education (Table 1). Lower educational status may be one of the reasons why some of these urban farmers embark on agriculture because in the absence of any other occupation, agriculture provides opportunity to earn daily living (Gefu, 1992).

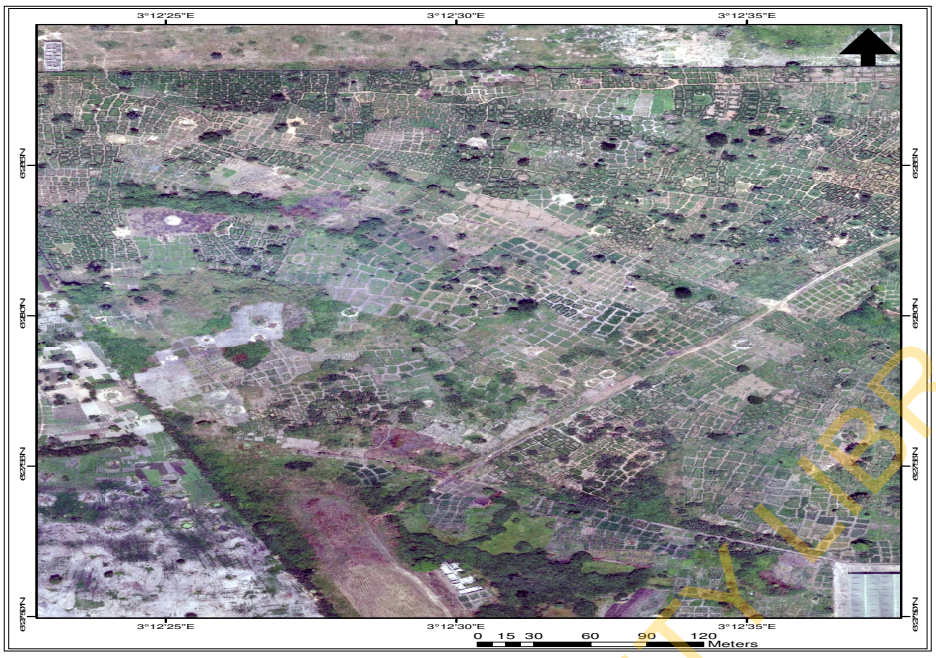

Figure 2: High Resolution Satellite Image Showing Urban Agricultural Farm in Ojo LGA.

Lack of employment, the need to raise additional money for the family and sustenance of traditional occupation were the three most important reasons identified for engaging in urban agriculture. Educational status could also influence the different farming strategies adopted and negotiation skill employed in land acquisition by farmers towards enhancing their productivity (Van de Steeg et al., 2010; Antwi-Agyei et al., 2012). The highest percentage of respondents with highest educational attainment was in residential land use and this was followed by the institutional land use. No significant difference in education attainments among urban farmers across the different land use types was observed in this study (X^2= 8.6342, P<0.05).

There are two categories of urban farmers, namely: full-time farmers and part-time farmers. Full-time farmers are without any other form of occupation, while part-time farmers have other forms of occupations. Urban wage earners may engage in urban farming to supplement declining real wages (Gefu, 1992). More than 80% of the farmers surveyed were full-time farmers. The part-time farmers comprised civil servants, unemployed, students and artisans. There was no significant difference in the numbers of full time and part time farmers across the different land uses in Lagos (X^2 = 9.2832, P>0.05). Satterthwaite and McGranahan (2010) observe similar diversities among urban farmers in Dar es Salaam. In terms of income, close to 70% of the farmers made less than ₦20,000 ($125) monthly from urban farming, while one out of every ten farmers indicated making more than ₦40,000 ($250) monthly. Farmer's annual income may also be influenced by farm size, and this may be limited by existing land use factors (Ellison et al., 2010).Farmers in setback and institutional land uses earn more profits compared to farmers in residential and wetland areas. There were noticeable significant difference in income from different land use types (F=365.14 P>0.05).

Farmers between the ages of 26 and 50 years dominated urban agriculture, followed by

those between the ages of 51 and 75 years (Table 1). There was no significant difference in the demographic characteristics of these urban farmers across the various land use types considered in this study (F= 63.881, P<0.05).The urban farmers were from all the geopolitical zones in Nigeria, however, larger percentages were from the following states: Jigawa (10.9%), Katsina (12.9%), and Akwa-Ibom (10.9%). Others included Abia (7.9%), Delta (5.0%), Cross Rivers (5.9%), Imo (8.9%), Enugu (5.0%) and Kano (5.0%). None of the south-western states accounted for up to 10% of urban agricultural farmers in the LGA. Thus, there is ethnic diversity among the farmers. In terms of urban agricultural involvement, 43.4% of the respondents claimed to have been farming between 1 and 5 years; 26.3% between 6 and 10 years; 11.1% and 13.1% between 11 and 15 years and 16 and 20 years, respectively, and 6.0% for more than 20 years. Thus, 69.7% have been practising urban agriculture for more than ten years. The farmers grew food crops such as maize, okro, assorted vegetables, and yam.

Land use Characteristics in the Immediate Vicinity of Urban Farms

Four types of land use characterized the immediate vicinity of urban farms. There are farms located within institutional land use. Institutional land use refers to land occupied by government institutions-schools, ministries, departments and agencies (MDAs), hospitals, military formations, police etc. Institutional land uses are particularly attractive because they are often situated on large expanses of land, which is mostly developed in phases. Sections not yet developed are potential sites for urban agriculture and staff in such government institutions practise urban agriculture on such land (Drechsel and Dongus, 2010). Women feature prominently here, using the land for planting of assorted vegetables, especially during rainy season. Availability and accessibility to free land, therefore, provide incentives for urban agriculture, especially among low-income staff in most government institutions. Farming near workplace ensures that no additional transportation cost is incurred. Farmers operating on institutional land account for 38.0%, out of which female farmers were 20%, while their male counterparts were 18%. Institutional land uses are common within the built-up areas and only few are found in urban periphery. Military formations are the most important institutional land use common at the peri-urban areas. Although, it is possible to find some of them now existing within the built-up areas, but as at when they were sited, the neighbourhoods were largely rural in outlook.

Table 1: Socio-Economic Characteristics of the Urban Farmers

Socio-Economic Characteristics	Percent
Education	
Primary School	28.3
Secondary School	45.5
Tertiary Education	6.1
National Cert. of Education (NCE)	3
Polytechnic	2
Quranic Education	5
No formal Education	10.1
Occupation	
Full Time Farming	81.2
Part-Time Farming	18.8
Civil Servants	6.8
Unemployed	9
Students	1
Artisans	2.1
Income (in Naira)	
₦00000 - ₦20,000	68.7
₦21,000 - ₦40,000	20.6
More than ₦41,000	10.7
Age (in years)	
15-25	8
26-50	64.7
51-75	27.3

The right-of-ways (setbacks) of utilities such as roads and transmission lines are other major land use types where urban agriculture is predominant in the metropolis. Setbacks are

land corridors around different utilities such as electricity transmission lines, and road networks within which developments are not permitted. The challenge with such setback land within the metropolis is that they are already taken over by various forms of informal activities such as block making, and small retail shops. The nearness of such land to road network is its major advantage. At the urban fringes, there are urban farms within the setbacks of roads, which farmers perceived as free lands. Setback land offers opportunity for large-scale farming, especially where they have not been concretized or taken over by roadside commercial activities (Smit and Nasr, 1992). In addition, the linearity of such land guarantees easy movement of inputs and outputs to and from the farms. Farmers who indicated farming within setbacks of utilities account for 43.0% of the farmers surveyed. This showed that lands within setbacks of government utilities are critical to the increasing engagement of the public in urban agriculture and thus an important land use in urban agricultural consideration in cities. However, produce from such farms may be exposed to lead poisoning and theft based on the increasing motorization and poverty in developing countries (Gbadegesin, 1991). Most of the vegetable farms in the Ojoo area of Lagos State are situated along the public-right-of-ways (Akinmoladun and Adejumo, 2011).

Residential land use is another major land use type indicated by farmers. Residential land uses are continuous patch of built-up land. It is possible to further subdivide residential land uses to high, medium and low density residential localities. The differentiation is in terms of building density per square kilometre. Residential neighbourhoods characterized by large human population provide the needed market for urban agricultural produce. Urban agriculture within this land use is seen as advantageous because of the guaranteed market as well as reduced cost of transporting inputs and outputs from farms. Absence of vacant land, scarcity of water for an all year round production, coupled with prohibitive cost of land acquisition are the greatest challenge confronting urban agriculture in the residential land use (Gbadegesin, 1991; Akinmoladun and Adejumo, 2011). These are in addition to a number of social and psychological factors that often militate against the leasing of land for urban agriculture. Most farmers depend on hand-dug wells or borehole water for an all-year-round production. This tends to increase the cost of production compared to their counterparts located close to water bodies in the outskirts of cities. Pollution and contamination by household and industrial wastes are some additional challenges often encountered in this land use (Gbadegesin, 1991). Farmers operating within built-up area were 10% and this percentage was comparatively lower than those in other land use types.

Finally, wetland areas surrounding lagoons, rivers and creeks dominated largely by undeveloped swamp and marsh are other locations where urban agriculture thrives. Drechsel and Dongus (2010) observe that urban agriculture is common in undeveloped plots particularly in lowlands and along urban streams and rivers. Smit and Nasr (1992) averred that intensive agriculture might be the only suitable economic uses for fertile but flood-prone areas. Occasional flooding and site inaccessibility are two major challenges encountered by farmers using swamps. One of the main attractions of swamp and marsh land is the potential for an all-year-round farming due to availability of water. The percentage of farmers using wetland areas for urban agriculture was 9%. One major disadvantage of urban farming in this land use is that many of the farmers are at the peril of annual flood which may wash all their crops away. The floods, according to the farmers, is highly unpredictable.

Variations in Distance Travelled to Urban Farms across Different Land Uses

Distance from roads affects choice of urban agricultural site and considerably impact on farmer's profit (Mann et al., 2010). The

distance from road influences the cost incurred by farmers in the process of transportation of inputs and outputs.Land use diversity can however affects the distance between urban farm and road network. The longest distance between farm location and road was observed in the institutional land use (620m), while the shortest average distance was observed in residential land use (30m). Generally, the average distance to road network in institutional land use was 102meters, 80meters in right-of ways,87 metersin wetland and swamp, and 18meters in the residential land use (Table 2).The highest percentage of urban farmers within the institutional land use were observed within the 101-200meters.Furthermore, farmers in the swamp areas were also clustered between 50 and 100meters from road network. Thus, the areas closest to road networks were not utilised heavily compared to areas farther away from road by farmers cultivating in the swamp.

The linear nature of most setbacks also accounts for the short distance between farms located within such setback and road network. This distance is particularly short where farms are located within the setback of road network or electricity transmission lines which often follow road alignment. However, the distance between farm lands located in swamp area is high because the usable part of most swamps are further away from road network. Swampy land in the immediate vicinity of road network are often not used because of the problem of water logging due to construction activity and many a times, the topsoil may have been scraped away in the course of road construction. There is a significant variations in the distance travelled by farmers to their respective farms across different land use types ($F= 45.67$, $P<0.05$). Thus, land use differential is among the factors that account for variations in commuting distance to urban farms as distance travel is shorter within some land use types compared to others. These variations have implications for cost incurred by farmers across different land uses and may also serve as disincentive to farmers. Consequently, it may influence the choice of crop planted.

Table 2: Variations in Distance from Road network Across Different Land Uses

	Distance from Road					
Land use Type	Below 50m	50-100m	101-200m	201-400m	More than 400m	Total
Institutional	7.2	9.2	14.2	5.3	2.1	38
Setback	36.5	4.4	2.1	0	0	43
Residential	5.2	3.1	2.7	0	0	10
Wetlands/Swamp	0.9	8.1	0	0	0	9

Variation in Distance to Water across Different Land Use Types

As with land, inaccessibility to water constitutes a barrier to urban agriculture in many cities. Water scarcity and contamination are among the factors impeding urban agricultural development (Duque et al., 1998). Inaccessibility to water limits the sphere of urban agriculture and impose additional cost on production. Variations in the average distance from water source needed for urban agricultural production was assessed across different land uses. The distance from water sources ranges from 10m to 520meters across different land uses. The highest average distance to water source was in institutional land use (520m), while the lowest was in swamp area (10m). The average distance to water sources in institutional, setbacks, residential and swampy land uses are 280m, 120m, 82m and 10meters respectively. Thus, institutional land use has the longest distance to water body.

There are 33% of the farmers within the 50m corridors of water source, however, the percentage of farmers reduces with increasing

distance from water bodies (Table 3).Farmers cluster within 100meters corridor of water source. In addition, 15.6% of the farmers in the institutional land use obtain water at a distance of more than 400meters, while 5.1% obtained water at the same distance in the setback land use. However, none of the farmers in the residential and swampy land uses obtain water at a distance beyond 200meters from their farms. All the farmers operating in the swampy areas travelled less than 50meters to obtain water. Accessibility to water therefore varies across land use type. The analysis of variation in distance travel to obtain water for urban agriculture across different land uses showed that despite the observed variations noticed in the distance to water sources across the different land use types, such variations were not significant ($F = 214.21$, $P>0.05$). Thus, diversity in land use types may not be an important factor accounting for variation in distance travelled to obtain water for urban agriculture.

Variation in Distance to Markets across Different Land Use Types

Distance to market can also impact on urban agriculture most especially in developing countries with poor road network. Accessibility to market exact considerable influence on urban agricultural profitability. The average distance between farm and market across the various land use ranges between 100meters to 9.6Km, with an average of 6.22±1.5km. However, the distance travelled to market from different land use varied and the average distance between markets and farms in institutional, setback, residential, and swampy land use was 1.2km, 3.4km, 800meters, and 4.1km respectively. The longest distance to market was recorded among farmers in the swamp and this was followed by farmers in the setback of utilities. The observed higher distance in the swamp/wetland was based on its distance from residential neighborhoods, since commercial and informal activities have taken over similar site within the residential land use. Shorter distances were recorded between markets and farms in the residential land use because of the closeness of farms to residential area. Thus, in terms of market advantage, farmers in residential land use have the highest advantage compared to other land use types.

More than 18% of the farmers in institutional land use had farms at more than 2km distance from markets, while in the setback land use, 13.6% had farms at a distance of more than 2km from market. Almost all the farmers operating within the swamp land cover types are located at a distance of between 1 and 2 km from markets, while all farmers in the residential land use are confined to within a distance of 1.5km from markets (Table 4). There is no consistent discernible pattern in terms of distance between farm and markets. The analysis of variations in distance between markets and urban farms located across different land uses types did not revealed any significant difference in the distance separating farms from markets across different land use types ($F = 342.62$, $P>0.05$). Thus, land use dynamics may not account for variations in distance travelled to markets by urban farmers.

Table 4: Variations in Distance Travel to Markets across Different Land Use Types

	Below 500m	500m-1Km	1.0-1.5 Km	1.5-2.0 Km	More than 2.0Km	Total
Institutional	3.1	4.6	5.2	6.5	18.6	38
Right-of-Ways	8.2	4.2	6.7	10.3	13.6	43
Residential	6.2	3.4	0.4	0	0	10
Wetlands/Swamp	0	0	5.6	3.4	0	9

Variations in Number of Urban Agricultural Farm Plots across Different Land Uses

The average number of plots among the various land uses considered was 1.8. However, this varies greatly among the four land use types that characterised the study area. The average number of plots in the institutional, setback, residential and swampy land use was 1.6, 2.1, 1.0 and 1.1 respectively. Institutional land use has the largest number of urban agricultural plots, while residential land use has the lowest. In institutional land use, 27.1% of the farmers have less than 2.5plots (Table 5). However, none of the farmers in the residential and swampy areas indicated having more than 5 plots. It was only in the institutional and setback land uses that farmer's owned more than 5plots. Farm plots in institutional and setback land uses are owned by government and oftentimes, little or nothing is paid for their use and this explains why farmers have access to large plot size there. Due to the exorbitant cost of land acquisition in cities, most of the residents could only afford a plot of land for urban farming. Furthermore, due to the way land purchases are financed sometime, there is always a time lag between the time a land is purchased and when the owner commences development. During the waiting period, some land owners either farm or allow others to farm such plot, not necessarily because of the return expected but rather as a means of securing such plot from trespassers.

Significant variations exist in the number of plots available for urban agriculture across different land use types ($F=21.5$, $P<0.05$) and thus, land use diversity is one of the factors accounting for variation in the number of plot sizes available for urban agriculture. Addressing the challenge of small plot size holding among urban farmers would require an understanding of the characteristics of land use in the immediate vicinity of urban farms. Much of the variations in plot size were noticeable between residential and setback land use as well as residential and swampland use type.

Table 5: Variations in Plot Size across Different Land Uses

	Below 1 Plot	1.1-2.5 Plots	2.51-5.0 Plots	5.1-10 Plots	Above 10 Plots	Total
Institutional	16.3	10.8	7.5	3.4	0	38
Setback	9.1	20.6	6.7	4.1	2.5	43
Residential	6.8	3.2	0	0	0	10
Wetlands/Swamp	5.7	3.3	0	0	0	9

Variation in Annual Rent across Different Land use Types

Rent is an indication of the value placed on land and it reflects the amenities available at that location as well as the prevailing socio-economic characteristics of such neighbourhood (Drechsel et al., 2006). It impacts on the size of farmland cultivated by farmers and their profit margin. Rent paid by farmers is dependent on the location of such land within the urban fabrics. The average monthly rent paid by farmers from all the land use types studied was ₦3,500. A breakdown of this figure showed that in institutional, setbacks, residential, and swamp land, farmers pay an average of ₦4,000, ₦3,100, ₦2,150 and ₦800 respectively. Thus, rent paid on institutional land use was the highest and this was followed by right-of-ways.

Despite the competition for land in the residential areas, 2.1% of the farmers do not pay rent on the land used for urban agriculture, while, 25.8% and 28.6% of the farmers in institutional and setback land use do not pay rent (Table 6). Despite the high rent paid in institutional and setback land use, nevertheless, they still recorded the highest percentage of farmers that do not pay any

rent. The implication is that, it is only in a few institutional and setback land use types that farmers pay and pay exorbitantly using land for urban agriculture. In addition, there appeared to be greater preference for locations where farmers do not pay money, compared to where they pay (Table 6). This explains why 81% of the farmers surveyed are operating on either institutional or setback lands. Furthermore, out of these 81%, 54.4% of them indicated they do not pay for the use of land, while the remaining 26.6% pay rent. In addition, the number of farmers who indicated paying above ₦20,000 are comparatively lower compared to other groups.

There is a significant variations in rent paid across different land use types ($F= 420.74$, $P<0.05$). Thus, land use diversity could be one of the factors accounting for variations in urban agricultural rent pattern. Since rent can serve as disincentive to agricultural production, understanding the role of land use diversity can help in land allocation of urban agriculture that will ensure maximum profit.

Table 6: Variations in Rent across Different Land Uses

	No Payment	N10,000-₦20,000	N20,001-₦40,000	Above ₦40,000	Total
Institutional	25.8	7.4	4.2	0.6	38
Right-of-Ways	28.6	13.2	1.2	0	43
Residential	2.1	7.6	0.3	0	10
Wetlands/Swamp	8.3	0.7	0	0	9

Discussions

The available land for urban agriculture in residential land use is limited, due to large scale migration coupled with intensive competition for land between urbanization and urban agriculture (Mann et al., 2010; Akinmoladun and Adejumo, 2011). Furthermore, the prevailing rent also remained a limiting factor to urban agriculture in the residential land use because of farmer's inability to pay such competing rent. Thus, the increasing competition for land in residential land use, implies that urban agriculture exist at the peril of other competing land use type. Thus, urban agricultural sites in residential land use are ephemeral and may not stand the survival of the fittest game among the various competing uses for urban land in cities. Consequently, urban agricultural sites in residential land use appeared to be ephemeral as farmers keep relocating farmlands due to urban growth pressure. Therefore, space for urban agriculture becomes scarce with decreasing distance to urban centres (Drechsel and Dongus, 2010). Hence, the number of farmers decreases with increasing distance from roads in all the land uses, however, there appeared to be increasing clusters of farmers within the 50 meters corridors of roads in all the land uses (Table 2). The high distance could also be a reflection of the large expanse of land often acquire for most institutional development by government. Accessibility to road network and market is highest in the residential land use and this may translate to higher profitability compared to other land use types, however, because of the smallness number of plots, the anticipated profit is never realised. This problem is further compounded by the constant shifting of farms which does not encourage farmers to invest on agricultural inputs. Thus, despite low rental value in some sites, urban agriculture never attained the highest profitability.

Institutional land use provides opportunity to farm with little or no payment as rent. Despite that this land use recorded unusually high rent in some locations, nevertheless, it provides one of the most ideal space for urban agriculture (Akinmoladun and Adejumo 2011). The unusually large land allocated by government to institutional land use provides access to large plot size, compared to other land use types with the exception of setback

land use. Thus, the unusually large land allocation explains access to large plots of land within institutional land use, most especially within the military formation (barracks). The relative ease of land acquisition within institutional land use also provides ample opportunity for women to be involved in urban agriculture. Most institutional land uses are typically fenced and this ensures that produce from urban agricultural sites are secured from theft. In addition, considerable distance separates urban farm from roads and this ensures that farm produce most of the time, are free from pollution from vehicles. However, one of the major constraints facing urban agriculture in institutional land use is inaccessibility to water. Distance to water is highest in institutional land use, while it ranked second in terms of access to market. One of the incentives to farm in institutional land use is access to free land. However, productivity may be reduced if the topsoil has been scraped during the building construction phase.

The reported lower distance between farm and road network in the residential land use shows the importance of road network in residential development. Indeed, transportation is a major catalyst for urban development. In addition, virtually all farmlands within the residential land use have roads leading to them. Although, most of the roads are in a deplorable condition, nevertheless, greater road network connectivity characterised urban agricultural sites within the residential land use. The longer distance separating farmlands from road network in institutional land use can be explained in terms of the unusually large size of land occupied by some of the government institutions. Often times, the developed part of such land allocated are closest to the road network, while the undeveloped plot are farther away from road network. This long distance imposes additional burden on farmers who may often have to move input and output from such farm sites (Mann et al., 2010). Absence of lands most especially within the metropolitan areas and the adjourning periphery neighbourhoods have increased the number of people that farm within the institutional land use.

Government institutions do not need to be closer to rivers, rather they are sited at considerable distance away from it. None water-logged soils are particularly most suitable for institutional building construction since some of them are storey buildings. However, unused government land (setbacks of utilities) that are closer to water or those with shallow water table are the most preferred for urban agriculture (Drechsel and Dongus, 2010).The distance travel to water is relatively high among farmers located on setbacks of utilities within the metropolis. However, the distance is shorter where such setback are located close to water body. In addition, where set backs are located close to water body or where the water table is shallow, there is an increasing clustering of farmers in such neighborhoods. However, the initial distance to water might be short, overtime, with increasing number of farmers on the site, the distance to water becomes increasingly longer to the farthest farmers. The swamp area has the lowest distance to water because of the swampy nature of the environment, coupled with high water table all year round. The excessive water is a major hindrance to all year round farming because it inhibits productive cultivation of vegetables which is perhaps the most widely grown crop.

Kumari et al (2012) analysed variations in land holdings across different irrigation systems, however, little or no published work exists on variations in land holding across different land use types among urban farmers. The intensive competition for space may account for variation in plot size available to urban farmers. Competition for space among the various land uses influenced size of farmland available for farmers. Expectedly, the increasing urbanization and migration in cities have reduced available spaces and thus, it is almost difficult to find open space within the Lagos metropolis which can be used for urban agriculture (Bryld, 2003; Akinmoladun and Adejumo, 2011). The constraint imposed by space may largely accounts for the small farm

holding among urban farmers in residential neighbourhoods compared to other land use types. The lack of open space is particularly critical in the high density compared to the low density residential neighbourhoods. This is because most of the residents in the low density residential neighbourhoods have a large compound where some of them plant vegetables and cereals, especially where such compound has not been concreted. However, in high density neighbourhoods, the compact nature of buildings, the lack of perimeter fence and presence of free-range livestock inhibit the practise of urban agriculture.

The low rent pay by farmers in residential neighborhoods is due to the landowners focus on land security rather than economic benefits (Drechsel et al., 2006). Profit from urban agriculture cannot adequately pay for the rent accruable in economic terms for the use of such land in an urban area. In addition, the small plot size limits the economics of scale advantage that should accrue to farmers, and this is further worsened by the operational seasonality of most farmers that cultivate within the residential areas. Thus, most farmers cultivate only during the rainy season and allow the land to fallow during the dry season.

Conclusion

Today, multiple factors are at play in determining the pattern of urban agriculture in and around cities(Sinclair, 1967). This paper argues that because urban agricultural land use appears as patches or island within bigger land use types: it tends to be influenced by the characteristics of the larger land use type within which it is situated. The intensive competition and subsequent disappearance and or displacement of urban agriculture from other land uses within which it is situated in urban and peri-urban neighbourhoods can be explained in terms of Charles Darwin's Survival of the Fittest principle. The effects of other land use types on urban agricultural production can however be explained in terms of urban ecological theoretical construct. Thus, the interconnectedness of urban agriculture with other land use types within which it is situated tends to affect its characteristic nature. The ecological theory posited that within city, scarce resources are competed for by the varying social groups and that any social group with the best social adaptation to the urban environment becomes the prevailing one. Competition for land and resources ultimately led to the spatial differentiation of urban space into zones, with the more desirable areas commanding higher rents. There has been an increasing adoption of ecology of cities paradigm which sees landscapes as a socio-ecological system within which humans and their social institutions are integrated with the environment (Alberti et al., 2003;Breuste, 2008). The paper has shown that the land use characteristics within which urban agriculture is located moderate its size, rental cost, profit, accessibility to roads network, while it exacts little or no influence on it with regard to distance from markets and water sources.

Land use characteristics and pattern exact considerable influence on some factors that affect urban agricultural practise. Land use affects the cost of land acquisition, distance to water, and market, and size of plot. Typically, urban agriculture within residential neighbourhoods will ultimately be displaced by residential development, however, with proper nourishment of soils, vacant lands within institutional land use provides opportunity for urban agriculture but are often constrained by shortage of water and relatively long distance from road. Therefore, government support for urban agriculture would need to take cognisance of the limitations and opportunities imposed on urban agriculture by land use diversity in order to reap the maximum benefits from urban agriculture. In addition, private investors should also understand the cost-benefit analysis of urban agriculture within the larger land use within which it is situated. A conclusion from this study is that land used for urban farming will eventually become more valuable for other uses outside of urban agriculture. In addition, the characteristics of land use in the immediate vicinity of urban

farm is capable to exacting considerable influence on some of the factors that directly and indirectly influence urban agriculture. However, with appropriate policies, such land could be salvaged.

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