Ife Social Sciences Review
Faculty of Social Sciences,
Obafemi Awolowo University Ile Ife, Nigeria
Journal homepage: www.issr.oauife.edu.ng/journal

ISSN:0331-3115 eISSN:2635-375X

Urban Encroachment into Agricultural Land in Abeokuta, Nigeria

A. M.Olayiwola[1*] and M. O. Lawal[2]

[1]Department of Geography, Obafemi Awolowo University, Ile-Ife, Nigeria
[2]Department of Geography,Tai Solarin College of Education, Omu-Ijebu, Ogun State, Nigeria
Email: olaadewale@yahoo.com; amolayiwola@oauife.edu.ng; olaadewale1@gmail.com*
michaelbukunmi_lawal@yahoo.com
*Corresponding Author

Abstract

This study identified and assessed the effect of uncontrolled expansion of Abeokuta into some of the neighbouring rural farmlands, between 1966 and 2016. Primary and Secondary data were used for this study. Sources of primary data included 275 copies of household questionnaire that were administered to randomly selected households in eight neighbouring rural communities around Abeokuta. Secondary data included satellite imagery Landsat TM (1986), Landsat ETM+ (2006) and Landsat ETM+ (2016). Results indicate that Abeokuta has been expanding rapidly since 1966. Results show further that the distance between Abeokuta and the neighbouring settlements reduces with the passage of time. By 2016, all the eight neighbouring settlements have been submerged within Abeokuta metropolis, and major impacts of the expansion of Abeokuta include shortage of farmland areas**,** increase in the distance to farmlands**,** reduction in the size of farmlands, rising cost of living, and occupation diversification. In addition, key benefits of the expansion of Abeokuta into the adjourning communities were provision of banking facilities, health and educational institutions, police posts/stations, tarred roads and the extension of electricity to remote areas of communities. The study showed that substantial amount of agricultural land have been lost to urban encroachment, and therefore indicated strong need to delimit urban growth boundary through landuse zoning plans into rural areas in the region.

Keywords: Agricultural lands; urban growth; unabated expansion ; urban encroachment; Abeokuta

Introduction

Expansion of cities is an important causal factor of land use and land cover changes (Agunbiade *et al*., 2012; Foley and Scott, 2014). Major forces of urban growth are many and vary from one part of the world to another; especially since urban growth has been described as a response to changes in economic, demographic, and physical factors (Tripathi and Mahey, 2016). Other forces of urban expansion include concentration of industry, commerce, administration, capital, labour, and technology (e.g. Bugri and Yuonayel, 2016; Ju *et al*., 2018). Studies have also shown that there is a high correlation between population changes and urban growth (Banu and Fazal, 2016) but rural-urban migration has been found to contribute more to urban growth, particularly in developing countries (Wilmoth, 2012; UN, 2015; Karg *et al*., 2019). Consequently, urban setting is no longer considered to be limited to the core city with its surrounding suburbs, because urbanization often creates has created metropolitan region that include spaces outside the borders of cities (Agunbiade *et al*., 2012; Li *et al*., 2014; Woo and Guldmann, 2014; Banu and Fazal, 2016).

Meanwhile, studies have shown that the dynamics of human exploration over the land and intensity of urban development towards adjourning rural communities requires attention, especially in developing countries (Iheke and Ukandu, 2015;Binswanger-Mkhize, 2016; Bugri, 2016; Fenta *et* al., 2017; Lasisi *et* al., 2017; Adedire, 2018; Karg *et al*., 2019). Also, incidence and effectsof urban encorachment into rural lands often tend to vary considerably from one part of the world to another. For instance, whereas in the eastern part of the world,urban encroachment into rural lands has led to unplanned growth and unstopped environmental degradation in many urban areas (Basawaraja *et al*., 2011; Pandey and Seto, 2014; Dadras, 2015; Ju *et al*., 2018), studies showed that urban sprawl on agricultural land in Jordan and Pakistan has led to a decline in the area of land dedicated to the field crops in many parts of the country (Iskandar, 2008; Makhamreha and Almanasyeha, 2011; Malik and Ali, 2015). In China, urbanization has resulted in significant decline in agricultural landuse intensity (Jiang *et al*., 2013; Kang *et al*., 2016; Shao *et al*., 2016; Ju, *et al*., 2018).Also, studies from the United States of America argued that urbanisation is taking place on the most fertile lands and hence has a disproportionately large overall negative impact on the net primary productivity(York and Munroe,2013; USDA, 2016); in the United Kingdom, a large proportion of agricultural lands are transferred to urban uses every year.In fact, urban expansions at the rural-urban fringe have been found to form complex hybrid landscapes (Nabielek *et al*., 2013; Foley and Scott, 2014).

On the other hands, many of the African countries are characterised by rapid urban growth that is usually associated with unplanned development in the perphery that requires high cost of infrastructure. Urban expansion in these countries is at the expense of productive and fertile agricultural farmland (Deep, 2014; Jayne *et al*., 2014; Binswanger-Mkhize, 2016; Bugri, 2016; Fenta*et* al., 2017; Karg *et al*., 2019). In Nigeria, there has been increase in the level of urbanisation since independence in 1960. In many parts of the country, urban development has encroached into rural land thereby resulting in loss of significant proportion of neighbouring farmlands (Oriye, 2013; Salau *et al*., 2013; Ayila *et* al., 2014; Olayiwola and Igbavboa, 2014; Saleh *et al*., 2014;Iheke and Ukandu, 2015; Lasisi *et* al., 2017; Adedire, 2018).

Consequently, it is obvious that the main focus of attention has been on the causes and rates of urban encroachment into rural lands. However, urban expansion and development impacts have been growing in complexity and relevance (United Nations, 2012; Yao, 2017). This is because as urban extends to the periphery and encroaches the rural farmlands, livelihood means of rural people is used up. The present study is a case-study analysis of the effect of urbanisation on adjoining agricultural land in a typical traditional urban centre in Nigeria. Abeokuta, like Oyo, Kano, Jos, Ibadan, Ogbomoso and Umahia are known to be associated with the pre-colonial organisation in Nigeria. The settlements have subsequently become population hubs as urbanisation occurs at increasing trends in them. Results from this study can therefore be used as a hypothesis for evaluation in the settlements and others in part of the sub-Saharan Africa, with similar characteristics. Specific objectives are to (i) characterise the study area in terms of dominant landuse /landcover between 1966 and 2016, for which data were available; and (ii) examine the perception of the residents on the impact urban growth on the neighbouring rural communities.

Study Area

The study was carried out in Abeokuta in the South-Western part of Nigeria. The city is located between latitudes 6º 23'N and 7º 42'N; longitudes 3º 09'E and 3º 58'E (Figure 1). Abeokuta is an important city in Nigeria because of its strategic position. The city is situated at a position, which is close to some of the most important cities in Nigeria (Afolabi *et al*., 2018). Population of the area based on estimates from the National Population Commission(NPC, 1991; 2006) varied from 352,735 in 1991 to 451, 517 in 2006 is about 578,063 in 2018.

Dominant land uses in the area are for residential and commercial purposes characterised by clustered development in the

core area. Large-scale industries and industrial estates are very few in the town; however, there are numerous small-scale industries within the area (Ogunyemi and Oguntoke, 2018).

Agricultural landuse is very minimal within Abeokuta because development in the town has engulfed initial available land for farming. It is worth mentioning that Abeokuta is well served with road networks that link one another (Ogundele *et al*., 2017).Abeokuta had been central to the administration of Egbaland since the era of colonial administration in Nigeria. In 1976, Abeokuta became the capital city of Ogun State and the headquarters of Abeokuta Local Government Council. Thus, it assumed the status of a metropolitan city thereby attracting the necessary development impetuses required for the new roles. This resulted into expansion of the city and, hence, the transformation from agro-economic to a variant of landcover system in a typical urban setting (Lawal-Adebowale, 2017; Ogundele *et al*., 2017).

In terms of its physical environment, the study area is underlain by igneous and metamorphic rocks (Adejuwon, 2005). The major soil in the study area is ferrosol with extensive dense forest covering the sedimentary rock belt. Abeokuta falls within the rain forest zone marked with two seasons; rainy and dry seasons. This city has a tropical climate classified as *Aw* by Köppen and Geiger (Obot *et al*., 2011). While the annual average temperature is about 27.1 °C, the hottest month is March at around 29.1 °C and August is the coldest month of the year at 25.1 °C (Obot *et al*., 2011). Also, the annual average precipitation is about 1238 mm, whereas the least amount of rainfall occurs in January at an average of 13 mm, precipitation reaches its peak in June with an average of 197 mm (Adejuwon, 2005; Obot *et al*., 2011).

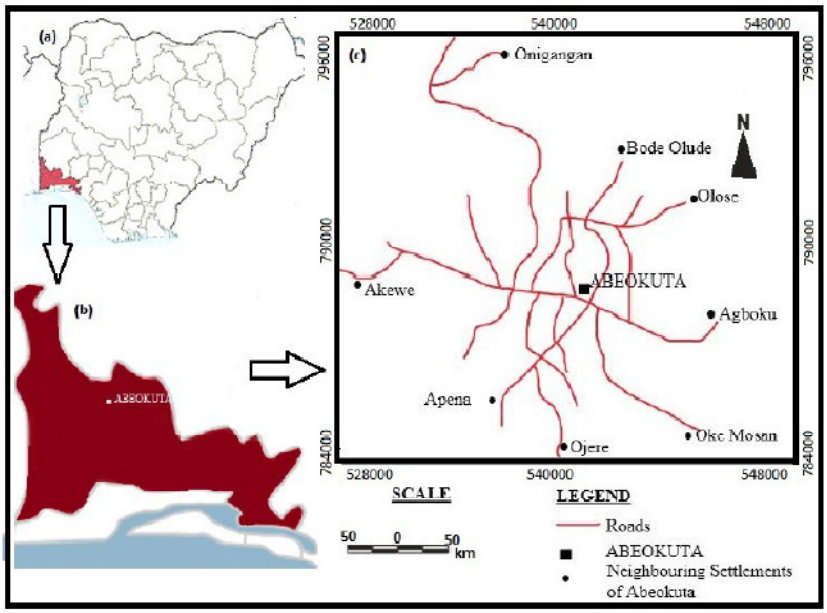

Figure 1: Abeokuta and neighbouring communities (c) in Ogun State (b), Nigeria (a)

Materials and Methods

Data for this study are sourced through household questionnaire, Focus Group Discussion (FGD) and National Population Commission (NPC).Other sources of data include topographical map of Abeokuta (Sheet 260 S. E., 1966), Landsat 5 TM (1986), Landsat 7 ETM+ (2006) and Landsat 8OLI/TIRS (2016) (Table 1). In addition, Global Positioning System (GPS) receiver was used to obtain geographic coordinates of relevant landmarks for ground validations.

The household questionnaire was administered to the household heads in eight neighbouring rural communities of Abeokuta. The communities were selected based on their proximity to and spatial relations with Abeokuta. In addition, the selected communities were the closest settlements to Abeokuta in 1966 (Sheet 260 S. E., 1966). Using systematic sampling technique, a total of 275 samples were selected from an estimated 1,522 households in the eight selected communities (Table 2). Considering the nature and type of data required for this study, the sampled respondents are farmers (whether presently or in the past) of at least sixty years of age. This is because they were considered to possess adequate knowledge of the area.

Table 1: Characteristics of Satellite Imageries

Data	Spatial Resolution	Acquisition Years	Path	Row	Source
Landsat 5 MSS/TM	30m	1986	191	55	http://glcf.umiacs.umd.edu
Landsat 7 ETM+	28.5m	2006	191	55	http://glcf.umiacs.umd.edu
Landsat 8 OLI/TIRS	28.5m	2016	191	55	GLOVIS

Table 2: Characteristics of selected settlements and Sample Selection

S/n	Settlement	Population		No of Households		Sample Size
		1991*	2016**	1991*	2016**	
1.	Bode Olude	320	527	61	101	25
2.	Olose	582	959	102	168	34
3.	Agboku	1,589	2,619	418	689	138
4.	Oke Mosan	112	185	37	61	12
5.	Ojere	147	242	48	79	16
6.	Apena	87	143	31	51	10
7.	Akewe	273	450	97	160	32
8.	Onigangan	162	267	23	38	08
	TOTAL		4,917	817	1,347	275

Sources: *National Population Commission of Nigeria (NPC, 1991)
**Projection based on 1991 National Population Census at 2.7% official annual growth rate for rural settlements in Nigeria (National Bureau of Statistics, 2016

In addition, Focus Group Discussion (FGD) was conducted among community elders to complement data obtained through questionnaire. In each of the eight communities, four samples comprising of both sexes were selected to participate in the FGD. However, unlike the questionnaire administration, the participants in the FGD cut across all ages and

occupations. This is because the effects of urban encroachment affect all individuals within the communities. In order to remain focussed on the subject matter of the study, the four participants in each of the communities include two farmers and two others from other works of life. Furthermore, there was consideration for the roles of the participants in the community; whether leader (local Chief) or other citizens (Table 3).The FGD sessions helped to investigate the changing economic base of the communities, determine their perceptions of the effects of urban expansion on their means of livelihood and to find out the adaptation strategies of households to the effects of urban expansion.

Table 3: Demographics of Participants in Focus Group Discussion

	Bode Olude	**Olose**	**Ojere**	**Apena**	**Akewe**	**Onigan-gan**	**Agboku**	**Oke Mosan**	**Total**
Gender									
Male	3	4	4	3	2	3	2	2	23
Female	1	0	0	1	2	1	2	2	9
Total	4	4	4	4	4	4	4	4	32
Age									
<40	1	0	0	0	0	1	1	0	3
40 – 60	1	2	2	1	0	1	0	0	7
>60	2	2	2	3	4	2	3	4	22
Total	4	4	4	4	4	4	4	4	32
Occupation									
Farming	2	2	2	2	2	2	2	2	16
Civil Servant	1	1	0	1	0	0	1	0	4
Trading	0	0	1	1	1	0	0	0	3
Driving	0	1	0	0	1	1	1	1	5
Artisan	1	0	1	0	0	1	0	1	4
Total	4	4	4	4	4	4	4	4	32
Role in Community									
Community Leader	1	1	1	1	1	1	1	1	8
Citizen	3	3	3	3	3	3	3	3	24
Total	4	4	4	4	4	4	4	4	32

Furthermore, the topographical map of the study area was scanned, georeferenced and digitized in ArcGIS software environment. However, all the imageries used were already geo-referenced and geometrically corrected, thus, they were just projected. Using a combination of bands 5, 4 and 3 of the Landsat images, the portion covered by the study area was extracted using clip tool in ArcGIS 10.5. Also, visual interpretability of the imagery was improved through imagery enhancement, contrast stretching and false colour composites. Using maximum likelihood classification algorithm, Anderson's modified version of supervised classification scheme was adopted to classify the imageries into four landuse/landcover classes (Anderson, 1971). These classes are built-up area, vegetation, bare rocks and water bodies (Table 4).

Table 4: Classification of Landuse and Landcover (Based on Anderson, 1971)

Class Name	Landsat TM 1986		Landsat ETM+ 2006		OLI/TIRS 2016	
	Pa	$\mathcal{U}a$	Pa	$\mathcal{U}a$	Pa	$\mathcal{U}a$
Built-up	100	100	100	95.4	98.2	95.2
Vegetation	100	100.00	99.7	100	98.9	100
Bare Rocks	93.2	98.87	97.4	95.0	90.0	78.3
Water bodies	96.6	97.50	94.0	97.6	89.7	92.3
Kappa Statistics ($\mathcal{K}$)	0.98		0.93		0.99	
Overall Accuracy	96.9%		94.96%		99.3%	

Accuracy assessment was conducted to ensure the level of accuracy and quality of the classification exercise (Ayila *et al*., 2014; Rastandeh and Zari, 2018; Wulder, 2018). Accuracy of the classification was assessed using 60 randomly sampled ground truth points. The overall accuracies of the classification for 1986, 2006 and 2016 are 96.89%, 94.96% and 99.31%, respectively (Table 5). These values indicate that there were high significant agreements between reference points and the extracted classes (Dadras *et* al., 2015; Hakkenberg, 2018;Rastandeh and Zari, 2018).

The changes in landuse/landcover of the area were determined by pixel labelling of Landsat imageries. The built-up area class was carved out from the classified imageries and mapped to display the nature of changes in 1986, 2006 and 2016 (Rastandeh and Zari, 2018). The resulting landcover maps were compared and areas that were not classified as the same at different times were regarded as changed areas (Badreldin and Goossens, 2014; Dadras *et* al., 2015; Wulder, 2018).

Table 5: Image Classification Accuracy Assessment

S/N	Classes	Land use/cover
1.	Built-up Area	Residential, commercial and services, transportation, communications, utilities, industrial and commercial areas
2.	Vegetation	Farmland, plantation, natural vegetation and all other green spaces
3.	Bare Rocks	Sandy areas and bare/exposed rock.
4.	Water Bodies	Rivers, streams, lakes, and reservoirs.

Results and Discussion

Trend in urban expansion between 1966 and 2016

The main focus of this study is the explanation of the effects of urban encroachment into the agricultural lands in Abeokuta. However, there is the need to provide an insight into the general landuse pattern in the area. Figure 2 shows that Abeokuta has been expanding rapidly since 1966. At the initial stage, Abeokuta was distinct from all the adjoining settlements; there was no case of growth incursion into the adjacent lands (Figure 2a). As evident from Table 6, the built-up area of Abeokuta was 10.12% of the total land area in 1966. This expanded to cover 25.99% of Abeokuta land area 1986; 48.76% in 2006 and 80.98% in 2016. On the whole, results show that between 1986 and 2016 vegetation was the most affected landcover in the expansion of Abeokuta. Vegetation land cover reduced from 187.38km² in 1986 to 41.50 in

2016km² (Table 6).Thus, as the new city-edge of Abeokuta is formed, the distance to the neighbouring settlements reduces (Table 7). For instance, in 1966 the closest settlements to the edge of Abeokuta were about 2.9 km away, these are Olose in the north-eastern part and Apena to the southwest (Table 7).By 1986, the expansion of Abeokuta has encroached upon Bode Olude and Akewe. Results further indicate that all the eight neighbouring settlements have been submerged within the expanded Abeokuta metropolis in 2016 (Figure 2; Table7)

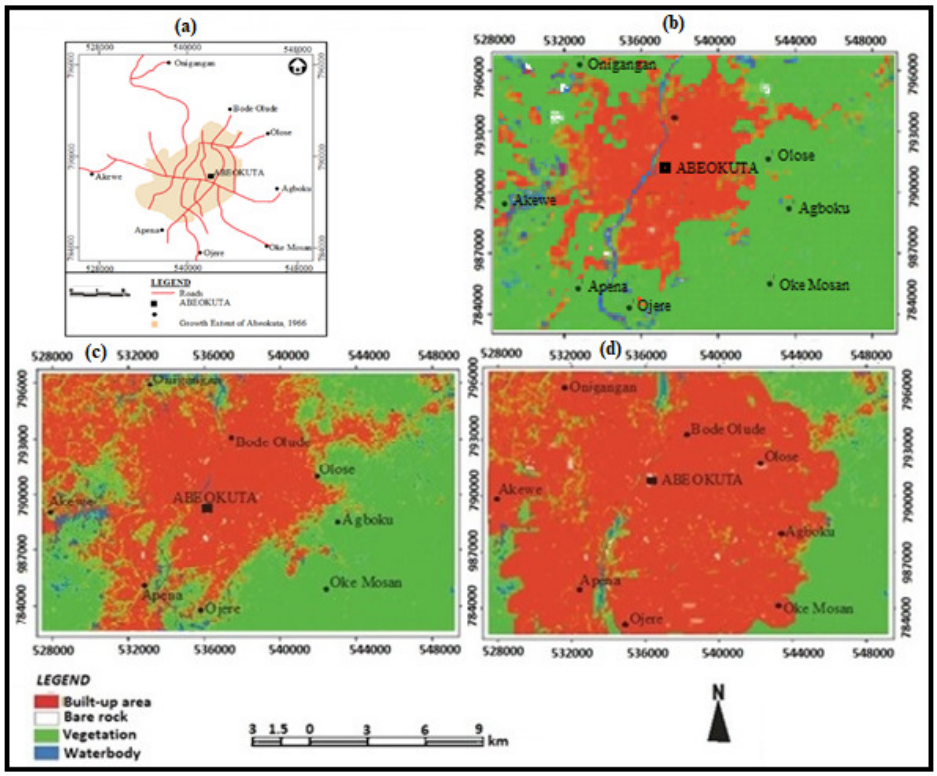

Figure 2: Physical Growth of Abeokuta (a) 1966 (b) 1986 (c) 2006 (d) 2016

Table 6: Land Cover Changes in Abeokuta, 1966-2016

Land Cover	1966		1986		2006		2016	
	Area (km²)	%	Area (km²)	%	Area (km²)	%	Area (km²)	%
Bare Rock	n.a	n.a	2.13	0.77	0.66	0.24	0.59	0.21
Built-up	28.11	10.12	72.21	25.99	135.42	48.76	224.90	80.98
Vegetation	n.a	n.a	187.38	67.47	130.01	46.81	41.50	14.94
Water Body	n.a	n.a	16.02	5.77	11.65	4.19	10.75	3.87
TOTAL	277.74	100.0	277.74	100.0	277.74	100.0	277.74	100.0

Table 7: Location and Distance of Selected Settlements from Abeokuta

S/n	Settlement	Direction from Abeokuta	Distance to the nearest edge of Abeokuta (km)			
			1966	1986	2006	2016
1.	Bode Olude	North	4.4	-3.7	-6.3	-8.2
2.	Olose	Northeast	2.9	1.4	-0.6	-5.4
3.	Agboku	East	3.8	0.9	-1.2	-2.6
4.	Oke Mosan	Southeast	5.3	2.7	1.2	-0.9
5.	Ojere	South	5.2	1.6	0.5	-2.2
6.	Apena	Southwest	2.9	0.8	0.3	-1.1
7.	Akewe	West	4.1	-0.7	-2.2	-4.1
8.	Onigangan	Northwest	7.0	3.2	-1.9	-2.3

Note: Negative sign implies encroachment of Abeokuta on the named settlement

Perception on the impact of urban growth

Causes shortage in farmland areas

Results of the FGD showed that a major physical effect of the expansion of Abeokuta was the incursion onto agricultural land causing a shortage in the farmland areas. Areas bordering the city of Abeokuta were once vibrant agricultural lands, with a variety of cash and food crops such as cassava, maize, locus, bean, rice, cola nut, vegetables and yam. These lands have now been taken over by residential developments. In Olose, one of the elders reported that:

> *The area which is now built-up had been largely composed of farmlands. Pointing to a few kolanut trees, remnants of a once thriving plantation, the elder lamented that "houses have taken over what used to be farmland and farmers have been forced to move further into distant places*".

Similarly, in Apena, one of the areas with the most rapid rate of incursion, an elder who was one of the first people to settle in the area said:

> *"everywhere was used as farmlands, there were only partially completed but occupied buildings, but today there are about 200 buildings excluding the unroofed ones".*

Increase in the Distance to Farmlands

Information from the participants as presented in Table 8 indicates that most of the respondents in Apena, Bode Olude, Agboku and Ojere travelled as far as 6km to 8km to their farmlands (Table 7). Less than 0.1 km (< 0.1) distance column is retained in the table because there were many farmers who worked at their backyards, very close to their houses.

Table 8: Distance to Farmland (in %)

Distance (in km)	Bode Olude	Olose	Ojere	Apena	Akewe	Onigan-gan	Agboku	Oke Mosan
< 0.1	10.4	11.2	10.4	8.6	7.6	9.2	23.6	24.7
0.1 – 2.0	3.7	3.8	2.5	2.1	17.5	16.8	20.3	21.9
2.1 – 4.0	13.2	11.7	10.5	8.3	18.2	19.3	14.2	15.3
4.1 – 6.0	14.7	14.9	11.8	6.7	17.1	17.7	18.1	18.3
6.1 – 8.0	56.2	54.9	63.2	71.4	13.7	12.9	5.2	6.7
8.1 – 10.0	1.8	3.5	1.6	2.9	25.6	23.7	11.6	12.4
>10.0	0.0	0.0	0.0	0.0	0.3	0.4	0.7	0.7
TOTAL	**100**	**100**	**100**	**100**	**100**	**100.0**	**100**	**100**

Specific responses such as *"there is no land for farming again"*, "because *the population is increasing, all the lands have become buildings with no more land around, except in the far places"*(two participants at Oke Mosan), *and "we used to farm nearby land, but now we have been forced to move further away. Because of distance, we go to farm very early in the morning and come back in the evening, just to eat and sleep"*(a participant at Ojere), reveal the extent of the impact of urban growth on the farmlands.

Reduction in the Size of Farmlands

The practise of cultivating large farmlands was gradually disappearing; there has been a general reduction in the actual size of land cultivated by individual farmer. In the periods before 1986, majority of the respondents cultivated less than one hectare of land; none of the respondents in Onigangan and Agboku cultivated more than 5ha and, in Ojere and Apena, none of the respondents cultivated land area greater than 7ha (Table 9). Also, it is evident from Table 9 that the size of farmland cultivated reduced in the period between 1986 and 2016. For instance, more farmers cultivated less than 1ha as the number of those who cultivated more than 5ha reduced. However, there was an exemption in Akewe, where farmers could afford to hire labours for the cultivation of cassava on large scale. This might be a response to the Cassava Revolution Programme promulgated by the Federal Government of Nigeria in 2007.

The most important factor adduced for reduction in the size of land cultivated by individual farmer in the study area was sale of parts of land (40.5%), followed by combination of farming with other types of work (18.8%), old age (15.8%), and increase in land-rent (14.8%). Selling of parts of farmland by farmers was perhaps a response to the increase in land-rent in effect of increase in the demand for land (Figure3).

Table 9: Percentage Variations in the sizes of Farmlands (in hectares, ha)

Settlements	Before expansion became obvious (1986)					1986 –2016				
	< 1	1 – 3	3.1 – 5	5.1 – 7	> 7	< 1	1 – 3	3.1 – 5	5.1 – 7	> 7
Bode Olude	70.8	13.9	8.8	1.5	5	84.6	10.9	3.2	1.3	-
Olose	69.5	12.8	8.6	1.4	7.7	82.3	13.8	2.7	1.2	-
Ojere	72.6	17.8	8.2	1.4	-	89	8.6	2.1	-	-
Apena	71.2	19.2	8.1	1.5	-	89.6	8.3	2.1	-	-
Akewe	57.6	6.1	27.2	6.1	3	59	15.3	12.8	2.6	10.3
Onigangan	62.9	7.2	23.7	5.2	1	58.3	26.5	13.6	1.6	-
Agboku	71.4	7.2	14.3	-	7.1	77.8	5.6	16.6	-	-
Oke Mosan	75.8	7.3	10.1	-	6.8	81.2	5.2	13.6	-	-

Notes:
Dashes (-) imply that the farm sizes were not cultivated in the settlements as at the periods indicated

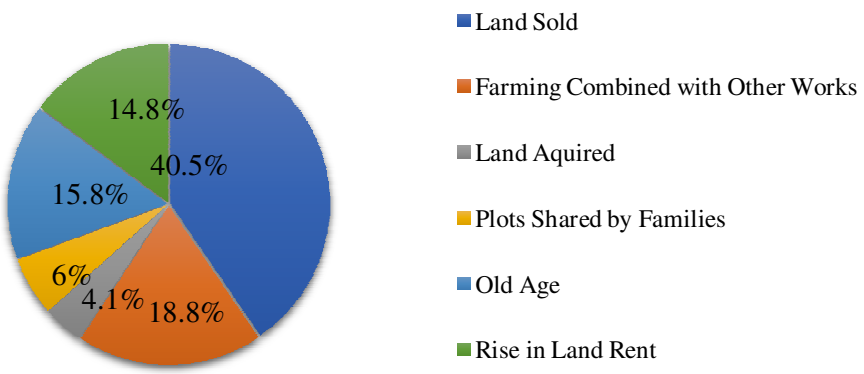

Figure 3: Reasons for reduction in farm size

Rising Cost of Living

Table 10 shows a cross-tabulation of the effects of the expansion of Abeokuta on the cost of living in the neighbouring communities at two inter-temporal periods. It is evident from Table 10 that the cost of accommodation was higher in the period after encroachment of Abeokuta on the settlements. In Onigangan, there were no flat housing type before 1986 and between 1986 and 2006, there were no self-contained apartments.

Also, reports of FGD attested to the increase in house rent as result of the expansion of Abeokuta. In Bode Olude, one High Chief remarked that:

> "*My son* (referring to the field assistant), *we are now part of Abeokuta. I mean just like you move from Ake to Ibara* (two communities within the township of Abeokuta). *Though, it should be expected that there would be increase in house rent, yet it saddens me when my people complain of high house rent. Accommodation is not cheap as it used to be because we are within Abeokuta"*

Also, in Onigangan, participants in the FGD reflected that:

> "*that time* (referring to 1986) *we did not have to travel except when it became necessary, particularly during the festivals or social ceremonies. Sometimes, we visited any of our people hospitalised for one ailment or the other. No, we did not travel much.*"

Occupational Diversification

The combined effect of reduced farmland area and high cost of living is occupational diversification. Some of the farmers changed to food crop production and trading business, while some others diversified into craftsmanship, trading and transport (Table 11). Alternative sources of income include remittance from children, artisan works and the sale/resale of landed property. Furthermore, petty trading is mostly favoured as alternative source of income in Onigangan, Akewe, Bode Olude and Olose.

In addition, some respondents combined farming with other types of business in response to the increasing unprofitability of farming, others have abandoned farming completely. However, one of the community heads cited the following reason to explain why most people abandoned farming, according to him:

> *"those who abandoned farming did so because they had sold off their land, and were not willing to cultivate rented farmland which would make them sub-servant farmers (a status associated with alien migrant farmers who were once labourers in other farms but now rented farms of their own from land owners) in their own community"*

Table 10: Average Cost of Living

Year/Item	Bode Olude	Olose	Ojere	Apena	Akewe	Onigan-gan	Agboku	Oke Mosan
	Cost of Living (in $, ₦ in parenthesis)							
Before expansion became obvious (1986)								
a. House Rent (per annum)								
i. Single Room	2.67 (960)	2.52 (906)	2.33 (840)	2.50 (900)	2.50 (900)	1.67 (600)	2.33 (840)	2.33 (840)
ii. Flat	13.33 (4,800)	12.50 (4,500)	10.00 (3,600)	10.00 (3,600)	8.33 (3,000)	- (-)	10.00 (3,600)	8.33 (3,000)
iii. Shop	3.33 (1,200)	3.33 (1,200)	3.33 (1,200)	2.67 (960)	3.33 (1,200)	1.67 (600)	3.33 (1,200)	2.50 (900)
b. Feeding (per person/day)	0.33 (120)	0.25 (90)	0.28 (100)	0.25 (90)	0.25 (90)	0.20 (72)	0.26 (95)	0.28 (100)
c. Transport (per person/day)	0.17 (60)	0.17 (60)	0.17 (60)	0.17 (60)	0.17 (60)	- (-)	0.17 (60)	0.17 (60)
From 2016, after expansion								
a. House Rent (per annum)								
i. Single Room	33.33 (12,000)	30.00 (10,800)	30.00 (10,800)	28.33 (10,200)	33.33 (12,000)	20.83 (7,500)	23.61 (8,500)	26.67 (9,600)
ii. Flat	417.00 (150,000)	333.33 (120,000)	333.33 (120,000)	208.33 (75,000)	208.33 (75,000)	166.67 (60,000)	277.78 (100,000)	277.78 (100,000)
iii.Self-contained Room	166.67 (60,000)	133.33 (48,000)	133.33 (48,000)	97.22 (35,000)	97.22 (35,000)	- (-)	104.17 (37,500)	97.22 (35,000)
iv. Shop	33.33 (12,000)	23.33 (8400)	26.67 (9,600)	16.67 (6,000)	16.67 (6,000)	16.67 (6,000)	23.33 (8400)	23.33 (8400)
b. Feeding (per person/day)	5.56 (2,000)	4.17 (1,500)	4.17 (1,500)	2.78 (1,000)	2.78 (1,000)	2.78 (1,000)	2.78 (1,000)	2.78 (1,000)
c. Transport (per person/day)	0.56 (200)	1.00 (360)	1.00 (360)	1.00 (360)	1.39 (500)	1.67 (600)	1.00 (360)	1.00 (360)

Dashes (-):- items that were not available in the settlement as at the periods indicated

Table 11: Alternative Sources of Income for Farmers (in %)

Communities	Petty Trading	Sale of Land	Remittances	Transport Business	Others	Total
Bode Olude	47.2	6.9	23.6	7.0	15.3	28.7
Olose	46.5	7.8	24.3	6.8	14.6	24.2
Ojere	27.5	30.0	22.5	7.5	12.5	16.3
Apena	26.4	29.7	21.2	6.5	16.2	13.1
Akewe	50.0	-	37.5	6.3	6.3	7.5
Onigangan	51.3	-	38.7	5.8	4.2	4.3
Agboku	5.0	-	37.5	37.5	37.5	3.8
Oke Mosan	3.0	-	36.8	34.3	25.9	2.1
Total	41.3	12.3	25.6	6.4	14.4	100

.

Benefits of urban expansion into rural lands in the study area

In addition to the effects of the expansion of Abeokuta into the adjourning communities, there are a number of benefits derived from the encroachment. Among these are provision of banking facilities, educational institutions, police posts/stations, tarred roads and the extension of electricity to remote areas of communities. The effect of urban lifestyles of the more educated newcomers is an important factor contributing to increase in demand for western education in the sampled communities. Another major positive benefit of urban expansion into rural lands in the study area include availability of professionals, particularly, medical personnel who have become consultants and service providers in all health-related areas for the benefit of community members. They provide treatment for common ailments such as malaria, diarrhoea, etc., and prescribe (and most times dispense), common drugs from their mini chemist shops or bags/boxes. In some cases, antenatal and midwifery services are provided for women who could not afford the cost of healthcare in government or private hospitals.

Conclusion

This study attempts to assess the effects of urban encroachment into agricultural lands in Abeokuta, Nigeria. The study was conducted through questionnaire administration, FGD as well as landuse/landcover information from Landsat imageries of the study area. Results indicate that due to the persistent expansion of Abeokuta, increasing amounts of agricultural land is being lost to urban encroachment. The problem is observed in various directions of the study area but more serious in the left flank; from the northern part through the west to the southwest, where farmland is disappearing at phenomenal rates. In addition, as the urban population increases more land is required for shopping centres, office blocks, and a host of other infrastructural facilities regarded as marks of a modern city. Moreover, industrial development and expansion of the residential areas to accommodate the teaming urban residents have further claimed a substantial amount of land in the area. The net result is a general reduction in the amount of land available for farming. In consequence, there is increase in the distance to farmlands, and general rise in the cost of living, particularly, house rents.

The requirements of planning and policy design specify the need to examine the effects of and reactions to urban infringement on the neighbouring rural communities. Nonetheless, explicit community reports should bestressed for instant action. In the attempt to produce an efficient landuse pattern that will preserve areas of amenity and minimise unnecessary encroachment, there is the need to delimit urban growth boundary. Similarly, it is necessary to develop landuse zoning plans that will serve as limit and control to urban development. In addition, there should be a policy directed towards monitoring of settlement growth. Furthermore, Regional Planning Programme should be set up geared towards restructuring urban developments in accordance with the overall physical plan.

References

Adedire, F. M. (2018). Peri-urban Expansion in Ikorodu, Lagos: Extent, Causes, Effects, and Policy Response. *Urban Forum*, 29(3): 259-275.

Adejuwon, J. O. (2005). *An Introduction to Geography of the Tropics*. Hong Kong: Nelson

Afolabi, O.J., Oyetubo, O.A. and Oluwaji, O. A.(2018). Implications of highway development and expansion on urban resident in Nigeria: a case study of Abeokuta Metropolis. *Nigerian Journal of Technology*, 37(2): 302-308.

Agunbiade, M. E., Rajabifard, A. and Bennett, R. (2012). The dynamics of city growth and the impact on urban land policies in developing countries. *International Journal of Urban Sustainable Development*, 4(2): 146-165. DOI: 10.1080/19463138.2012.694818

Anderson, J. R. (1971). Landuse classification schemes used in selected recent geographic applications of remote sensing, *Photogramm. Eng*., 37(4): 379-387.

Ayila, A. E., Oluseyi, F. O., & Anas, B. Y. (2014). Statistical Analysis of Urban Growth in Kano Metropolis, Nigeria. *International Journal of Environmental Monitoring and Analysis*, 2(1): 50-56. https://doi.org/10.11648/j.ijema.20140201.16.

Badreldin, N., & Goossens, R. (2014). Monitoring land use/land cover change using multi-temporal Landsat satellite images in an arid environment: A case study of ElArish, Egypt. *Arabian Journal of Geosciences*, 7(5): 1671–1681. https://doi.org/10.1007/s12517-013-0916-3.

Banu, N., and Fazal, S. (2016). *Livelihood and Wellbeing in the Urban Fringe*. Springer International Publishing.

Basawaraja, R., Chari, K. B., Mise, S. R., and Chetti, S. B. (2011). Analysis of the impact of urban sprawl in altering the land-use, land-cover pattern of Raichur City, India, using geospatial technologies. *Journal of Geography and Regional Planning*, 4(8): 455-462.

Binswanger-Mkhize, H. P., Johnson, T., Samboko P. C. and You, L. (2016). The Impact of Urban Growth on Agricultural and Rural Non-farm Growth in Kenya." Tata-Cornell Institute for Agriculture and Nutrition (TCI).

Bugri, J. T. and Yuonayel, E. M. (2016). Traditional Authorities and Peri-Urban Land Management in Ghana: Evidence from Wa. *Journal of Resource Development and Management*, *13*, 68-79.

Dadras, M., Shafri, H. Z. M., Ahmad, N., Pradhan, B., & Safarpour, S. (2015). Spatio-temporal analysis of urban growth from remote sensing data in Bandar Abbas city, Iran. *Egyptian Journal of Remote Sensing and Space Science*, 18(1): 35–52.

Deep, S. (2014). Urban sprawl modeling using cellular automata. *Egyptian Journal of Remote Sensing and Space Science*, 17(2), 179–187. https://doi.org/10.1016/j.ejrs. 2014.07.001.

Fenta, A. A., Yasuda, H., Haregeweyn, N., Belay, A. S., Hadush, Z., Gebremedhin, M. A., and Mekonnen, G. (2017). The dynamics of urban expansion and land use/land cover changes using remote sensing and spatial metrics: the case of Mekelle City of northern Ethiopia. *International Journal of Remote Sensing,* 38(14), 4107–4129.

Foley, K. and Scott, M. (2014). Accommodating New Housing Development in Rural Areas? Representations of Landscape, Land and Rurality in Ireland. *Landscape Research*, 39(4): 359- 386.

Hakkenberg, C. R., Dannenberg, M. P., Song, C.and Ensor, K. B. (2018). Characterizing multi-decadal, annual land cover change dynamics in Houston, TX based on automated classification of Landsat imagery. *International Journal of Re mote Sensing,* 40(2):1–26.

Iheke, O. R. and Ukandu, I. (2015). Effect of Urbanization on Agricultural Production in Abia State. *International Journal of Agricultural*

Science, Research and Technology in Extension and Education Systems, 5(2): 83-89.

Iskandar, L. (2008). Where do Arabs eat, Jordan… Urbanization eats wheat lands [Online] Available: http://www.sauress.com/albilad/4125, (accessed 04 October 2018)

Jayne, T. S., Chamberlin, J. and Headey, D. D. (2014).Land pressures, the evolution of farming systems and development strategies in Africa: A synthesis. *Food Policy*, 48: 1-17. doi:10.1016/j.foodpol.2014.05.014

Jiang, L., Xiangzheng, D. and Seto, K. C. (2013). The impact of urban expansion on agricultural land use intensity in China. *Land Use Policy*, 35: 33-39.

Ju, H., Zhang, Z., Zhao, X., Wang, X., Wu, W., Yi, L. and Zuo, L. (2018). The changing patterns of cropland conversion to built-up land in China from 1987 to 2010. *Journal of Geographical Sciences*, 28(11): 1595-1610.

Kang, L., Ma, L. andLiu, Y. (2016).Evaluation of farmland losses from sea level rise and stosurges in the Pearl River Delta region under global climate change, *Journal of Geographical Sciences*, 26(4): 439-56.

Lasisi, M., Popoola, A., Adediji, A., Adedeji, O. and Babalola, K. (2017). City Expansion and Agricultural Land Loss within the Peri-urban Area of Osun state, Nigeria. *Ghana Journal of Geography, 9*(3): 132-163.

Lawal-Adebowale, O. A.(2017). Effectiveness and sustainability of remedial actions for land restoration in Abeokuta urban communities, Ogun state, Nigeria. *Journal of water and land development*, *32*(1): 53-61.

Li, G., Fang, C. and Pang B. (2014). Quantitative measuring and influencing mechanism of urban and rural land intensive use in China. *Journal of Geographical Sciences*, 24(5): 858 - 874

Makhamreha, Z. and Almanasyeha, N. (2011). Analyzing the State and Pattern of Urban Growth and City Planning in Amman Using Satellite Images and GIS. *European Journal of Social Sciences*,24(2): 225-264.

Malik, R. and Ali, M. (2015). The Impact of Urbanization on Agriculture Sector: A Case Study of Peshawar, Pakistan. *Journal of Resources Development and Management*, 8: 79-85.

Nabielek, K., Kronberger-Nabielek, P., and Hamers, D. (2013). The rural-urban fringe in the Netherlands: recent developments and future challenges. SPOOL, 1(1).

National Bureau of Statistics (2016). Annual Abstract of Statistics 2016, Federal Republic of Nigeria. http://www.nigerianstat.gov.ng/. Accessed 8th December, 2018.

National Population Commission of Nigeria (NPC, 1991). *Census Report*. Nigeria: Federal Office of Statistics.

National Population Commission of Nigeria (NPC, 2006). *Census Report*. Nigeria: Federal Office of Statistics.

Obot, N. I., Emberga, T. T. and Ishola, K. S. (2011). 22 Years Characterized Trends of Rainfall in Abeokuta, Nigeria. *Research Journal of Applied Sciences*, 6(4): 264–271.

Ogun State Government (2007). *Ogun State in Maps*. Ogun State Ministry of Lands and Physical Planning.

Ogundele, F.O., Ojo, L., Adewale, N.T. and Njar, N. G.(2017). Effect of land use change on contamination factors and degrees of contamination in soil of Abeokuta and Shagamu in Ogun State, Nigeria.*Confluence Journal of Environmental Studies*, Kogi State University, Nigeria, 11(2): 79-86.

Ogunyemi, A. and Oguntoke, O.(2018). Environmental Audit of Integrated Farm Industry Settlement in Abeokuta, Ogun State, Nigeria. *Environment and Natural Resources Journal*, 16(1): 31-38.

Olayiwola, A. M, and Igbavboa, E. O. (2014). Land Use Dynamics and Expansion of the Built-Up Area in Benin City, Nigeria, *Mediterranean*

Journal of Social Sciences, Rome-Italy, 5(20): 2506-2516.

Oriye, O. (2013). Urban expansion and urban land use in Ado Ekiti, Nigeria. *American Journal of Research Communication*, 1(2): 128-139.

Pandey, B. and Seto K. C. (2014). Urbanization and Agricultural Land Loss in India: Comparing Satellite Estimates with Census Data. *Journal of Environmental Management*, 148: 53-66.

Rastandeh, A. and Zari, M. P. (2018). A spatial analysis of land cover patterns and its implications for urban avifauna persistence under climate change. *Landscape Ecology*, 33(3): 455-474.

Salau, T. I., Lawanson, T. O. and Odumbaku, O. (2013). Amoebic Urbanization in Nigerian Cities: The Case of Lagos and Ota. *International Journal of Architecture and Urban Development*, Islamic University of Iran, 3(4)

Saleh, Y., Badr, A., El-Banna, F. and Shahata, A. (2014). Agricultural land use change and disappearance of farmlands in Kaduna Metropolis, Nigeria. *Science World J.*,9(1): 1-7.

Shao, J., Zhang, S. and Li, X. (2016). Effectiveness of farmland transfer in alleviating farmland abandonment in mountain regions. *Journal of Geographical Sciences*, 26(2): 203-218.

Tripathi, S. and Mahey K. (2016). Urbanization and Economic Growth in Punjab (India): An Empirical Analysis. *Urban Research & Practice*, 1-24.

United Nations (2012). *World Urbanization Prospects: the 2011 Revision.* Department of Economic and Social Affairs, Population Division, United Nations.

United Nations (2015). *World Population Prospects,2015 Revision*. New York: Department of Economic and Social Affairs (DESA).

United States Department of Agriculture (2016). Land use, Land value and Tenure. *United States Department of Agriculture: Economic Research Service.*http://www.ers.usda.gov/topics/farmeconomy/land-use,-land-value-tenure/major-land-uses.aspx (viewed October 5, 2018).

Wilmoth, J. (2012). *World Population Prospects,2012 Revision*. New York: United Nations, Department of Economic and Social Affairs (DESA).

Woo, M. and Guldmann, J. M. (2014). Urban containment policies and urban growth. *International Journal of Urban Sciences*, 18(3),309-326.

Wulder, M. A., Coops, N. C., Roy, D. P., White, J. C. and Hermosilla, T. (2018). Land cover 2.0. *Int. Journal of Remote Sensing,* 39(12), 4254–4284.

Yao, Y., Liu, X., Li, X., Liu, P., Hong, Y., Zhang, Y., & Mai, K. (2017). Simulating urban land-use changes at a large scale by integrating dynamic land parcel subdivision and vector-based cellular automata. *Int. Journal of Geographical Information Science*, 31(12), 2452-2479.

York, A. M. and Munroe, D. K. (2013). Land-Use Institutions and Natural Resources in Fast- Growing Communities at the Urban-Rural Fringe. *Human-Environment Int.*, 1, 295-318.