SOCIO ECONOMIC IMPACT OF URBAN SPRAWL ON AGRICULTURAL LAND IN LAPAI LOCAL GOVERNMENT AREA, NIGER STATE, NIGERIA

ETUDAIYE MUSTAPHA MUHAMMED, M. A. EMIGILATI
Department of Geography, Federal University of Technology Minna, Niger State, Nigeria.

ABSTRACT

Urban expansion constitutes one of the key agents of landuse change with the impact felt at local, regional and global levels. This study assesses urban encroachment on agricultural land in Lapai Local Government Area of Niger State, Nigeria using Remote Sensing and Geographic Information techniques. Four imageries of LandSat TM 1988, LandSat ETM 1998 LandSat 7 2008 landsat 8 2018 were processed, classified using supervised classification using ArcGIS 10.4 to assess the total spatial loss of agricultural land to urban expansion. The findings revealed that the study area witnessed a significant reduction and increase in agricultural land and built-up respectively. The socio-economic impacts of urban expansion into agricultural land was derived through the administration of questionnaires to people within the study area, the results gotten showed that the area has experienced an unprecedented rate of urbanization and urban encroachment into agricultural lands which has subjected the area to some negative environmental and socio-economic impacts such as a decrease in the average crop yield, though the impacts are not so severe due to the persistence and emergence of agricultural lands in some areas. It is recommended that urban spreading to agriculture land should be controlled as this will have serious repercussions on food security. Urban expansion cannot be stopped, but with proper management and planning it can be directed in a desirable and sustainable way.

Keywords: Urban expansion, Agricultural land, Remote sensing and GIS, Lapai, Landsat

INTRODUCTION

The world is rapidly urbanizing, and it has witnessed a tremendous shift of its population from being predominantly rural to predominantly urban in the last two decades (De Sherbinin, 2007).

Rapid expansion of urban centers in the world at large and specifically in developing countries has continued to pose great challenges that evoke interests

from ecologists, planners, civil engineers, sociologists, administrators and policy makers on how much expansion is taking place, the effects on agricultural land and possible solution. Urbanization is phenomenon through which the productive agricultural land, forests, surface water bodies and ground water prospects are being irretrievably lost (Mittermeier, 2013).

Nigeria, one of the most urbanized countries in Africa with estimated urbanization rate of 3.5% annually has witnessed tremendous urban expansion over the years and is losing about 400,000 hectares of vegetation annually (Adesina, *et al*, 1999; CIA World Factbook, 2010).

Land-use land-change can influence environmental and ecological changes which con tributes to global warming. (Cassman, et. al 2005) the loss of agricultural land as a result of urbanization and other course have the potential to undermine the long-term harmony of humans, their environment and threaten food scarcity. Hence the need for knowledge on the magnitude, pattern and type of land-cover changes to shape and project future land development is very important. Land cover refer to the physical and biological material at the surface of the earth. Land cover include water, vegetation, bare soil, and artificial structures. (Glenn, 1984). Remote Sensing and GIS technology has been applied by various researchers to investigate the effects of urbanization on landuse/landcover variables and to quantify urban growth in different parts of the world. Remote Sensing and Geographical Information Systems (GIS) as modern technologies are increasingly used due to their cost effectiveness and technological soundness to develop useful sources of information and to support decision making in connection with a wide array of urban applications (Li and Yeh 1998).

The knowledge about urban growth, landuse and landcover changes has become increasingly important as all nations plan to overcome the problems of haphazard, uncontrolled development, and deteriorating environmental quality (Hardy, Anderson and Witmer, 2016). All these pose a formidable challenge in many developing countries. Hence there is a need for quantitative and qualitative information on the environmental consequences of expansion of cities in Nigeria.

STUDY AREA

Lapai is a local government area in Niger state, Nigeria. It adjoins the Federal Capital Territory. It is located between latitude 8°20'N and 9°20'N, longitude 6°30'E and 6°50'E, its head quarter is in the town of lapsing on the A124 highway in the west of the area. It has an area of 3,051km^2 and a population of 164,400 at the projection of population in 2016. It has an area of 3,051km^2 and a population of 164,400 at the projection of population in 2016. According to the national population commission of Nigeria, the population progression of lapai local government area is 164,400. With the Gbagyi and nupe people being the major inhabitants. There are other tribes like the Yorubas, Igbos, edo and others due to socio economic factors. The people's occupation and business varies majority of the population are involved in farming and fishing. Three major soil types can be found in the study area. These includes the ferruginous tropical soils, hydromorphic soils and ferrosols. The southern guinea Savannah vegetation covers the entire landscape of the state. Like other states of similar vegetation, it is characterized by woodlands and tall grassed interspersed with tall dense species.

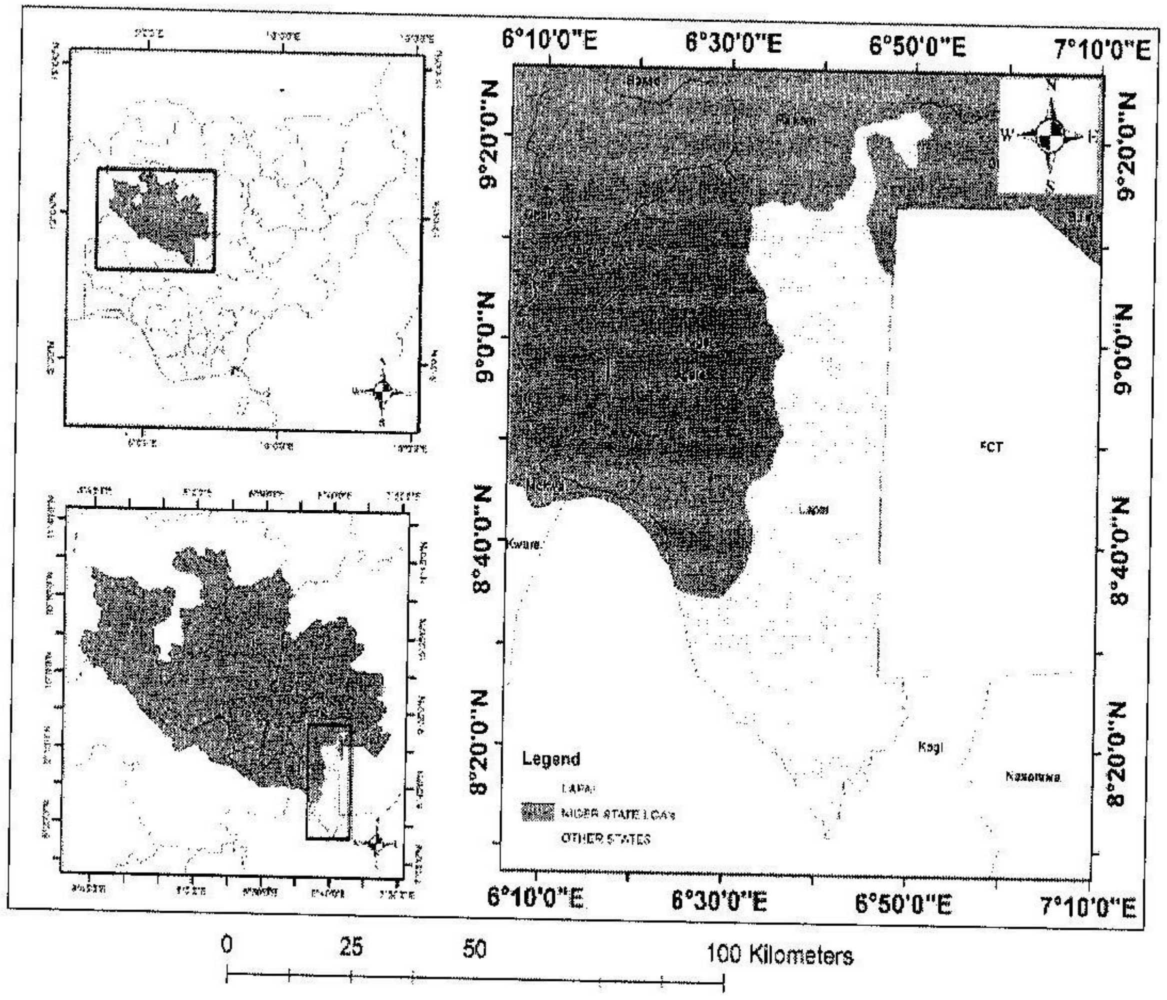

Figure 1: Lapai Local Government Area, Niger State.
Source: Authors GIS mappings using Arcmap 10.4

STATEMENT OF THE RESEARCH PROBLEM

Cities in developing countries are experiencing the most rapid spatial expansion of all regions which is largely a result of necessity, people move to the city in

search of better employment and opportunities (Menon, 2004). This leads to an increase in size well beyond the limits of the city and the preference of living at the outskirts of the city, with open spaces at reasonable distances from cities. Often, these expansions are situated on agricultural land and lead to other problems associated with food supplies (Redman and Jones, 2005).

Over the last four to five decades, there has been a worldwide increase in awareness on the effect of land use agricultural production and studies on land use/land cover change analysis. There is however extremely low level of research attention on land use land cover studies in most parts of North-Central Nigeria and the country in general. Also, most of the few studies carried out so far on land use land cover analysis and change detection relied heavily on one factor approach and depended on analogue rather than modern digital image interpretation and analytical procedure which is known to produce a better result.

Lapai is associated with high degree of urban expansion which have led to a loss of different land-use types, most importantly agricultural lands. The rapid urban expansion can be attributed to the presence of a university (Ibrahim Badamosi Babangida University).

LITERATURE REVIEW

The term urbanization as traditionally measured by demographers is urban population divided by total population of a region. Urbanization is also defined as the annual rate of change of the percentage of people living in urban areas, or the difference between the growth rate of urban population and that of total population. (Naab, 2013).

According to Food and Agriculture Organization, FAO (2014), Agricultural land refers to the share of land area that is arable, under permanent crops, and under permanent pastures. Historically, urban development (driven by the population increase) and agriculture are competing for the same land: cities expansion has typically take place on former agricultural use (Antrop, 2000; 2004).

Rimal (2012) analyzed the urbanization trend and transition of cultivated land in Pokhara in the time period of 1977, 1990, 1999 and 2010 by utilizing remote sensing and GIS. Supervised image classification of Landsat images was applied to classify the images to different land use categories. Within the study period, urban area had covered 6.33% but it increased to 51.42% in 2010 whereas cultivated land had decreased from 60.73% to 20.27%. The study concluded that urbanization and high population rise are the vital agents behind the loss of farmland of the area.

Oloukoi (2014) assessed the effects of urban expansion of Ile-Ife city and appraised the changes that occurred in the landscape from 1986 to 2009. The study used Landsat and IKONOS images, GPS coordinates and topographic maps and found that land consumption rate progressed from 1.1% in 1986 to 1.2% in 2002 and remained stable till 2009.

Mundhe and Jaybhaye (2014) assessed the impact of urbanization on landuse/landcovers in Pune city by analyzing the changes that occurred in land use /land cover (LU/LC) over a time span of the last four decades using modern technology like remote sensing and Geographical Information Systems. Using supervised classification of satellite images it has been found that the built-up area of Pune city increased 1973 to 2011 by 43.43 percent from 28.50 km^2 to 155.99 km^2. Also, the areas under vegetation, water bodies, agricultural land and fallow land have been decreased.

Kavitha (2015) in the paper "urban expansion and loss of agricultural land; A case of Bengaluru city" observed that the cultivated land across India has fragmented significantly resulting in change in landuse. The agricultural land was found to shrink due to rapid urbanization. The increase in built up had reduced the agriculture land by 212.49 square kilometers.

Shalaby (2010) studied the Urban Sprawl Impact Assessment on the Fertile Agricultural Land of Egypt Using Remote Sensing and Digital Soil Database in Qalubiya Governorate. The use of GIS, made it possible to point out the risk of urban expansion on the expense of the highly capability soil class.

Enaruvbe and Atedhor (2015) examined agricultural land use change because of urban encroachment into the agricultural landscape in Asaba between 1987 and 2013. The results showed that cultivation and settlement increased by 1.4% and 1.5% respectively in the first interval and cultivation increased by 0.5% while settlement, forest and water decreased by 0.2%, 0.1% and 1% respectively in the second interval.

Literature gap

From the reviewed literatures, different methods of analysis were used to assess the impact of urbanization on loss of agricultural land. This research aims not to only measure the spatial trends in urban and agricultural landuse landcovers but also to investigate for other possible impacts urbanization may have, such as land degradation, soil erosion etc. The study also utilizes an analytical approach that will identify the amount of land gained or lost by one landuse landcover to another.

MATERIALS AND METHOD

Data: The data used was acquired from Global Positioning System (GPS) and questionnaire. The secondary data sources include satellite images and

administrative boundary data. The satellite images used were Landsat MSS image of 1988, Landsat 7 image of 1998, Landsat 7 ETM+ of 2008 and Landsat 8 operational land imager (OLI) of 2018.

Software: The software used for this research include;

1. **ArcMap 10.4**: This is a program from the ArcGIS team that enables for the compilation, analysis and distribution of geographic data; and managing geographic information in a database. The image classification was carried out using this software.
2. **Microsoft Excel and Word 2013**: These software aided in the compilation of results and the theoretical aspects of the study. Excel was used for the statistical analysis as well.
3. **Idrisi Selva**: The Clark labs Idrisi Selva edition software was used for land change analysis by utilizing the land change modeler module.
4. **Erdas Imagine 2014**: This software was used essentially to generate the accuracy assessment report on the classified images.

The methods are as follows;

To identify land use and land cover of the study area between 1988 and 2018

To achieve this objective, the researcher used remote sensing images to acquire the LULC changes in Lapai from 1988 – 2018. Image classification and time series comparison on the images was carried out on the images.

Data collection: Remotely sensed images such as LANDSAT MSS 1988, LANDSAT 7,1998, LANDSAT 7 ETM+, 2008, LANDSAT 8 OLI, 2018. These images were obtained from earthexplorer.usgs.gov website and were used to acquire LULC changes in Lapai from 1988-2018.

Data Analysis: The following analysis was carried out on the data collected to achieve this objective;

a) Image enhancement.
b) Image subsetting
c) Data processing
d) Supervised image classification

Examine the trends in changes between built-area and agricultural land

In order to achieve the trend in land cover for this research, the Change analysis was utilized, this aided in showing the amount of land gained or lost by individual landuse landcover, the contributors to the loss of the landuse landcover and the amount of land that persists for each land use land cover. This aided in showing the area of land gained or lost by agricultural land and how urban growth has contributed to it in the study area.

Data collection: Classified images was used to check the trends between built up areas and agricultural lands over the coverage period.

Data Analysis: Land Change Modelling

Socio-economic effects of Urbanization on agricultural lands

The socio-economic effects of urbanization on agricultural lands within Lapai was determined through the administration of questionnaires. The questionnaires were distributed to residents of the study area in order to appraise their various views about the existence and rate of effects of urbanization on agricultural lands and the environment in general. The responses received from the residents were computed and displayed with the aid of charts and were explained through descriptive statistics. The amount of questionnaires distributed was determined by the calculated sample size.

Data collection: The tool that was used to collect information is questionnaire. A questionnaire is a research instrument consisting of a series of questions for the purpose of gathering information from respondents. Data can be collected relatively quickly because the researcher would not need to be present when the questionnaires were completed. This is useful for large populations when interviews would be impractical. This is beneficial as it means both quantitative and qualitative data can be obtained.

RESULTS AND DISCUSSION

This section highlights the spatial gains and losses per landuse landcover class as well as the net change that was experienced by each LULC class and also the extent of contribution to loss of agricultural land by other LULC classes between the period of 1988-2018.

Spatial Variation In Landuse Landcover Between 1988 and 1998

1988 1998

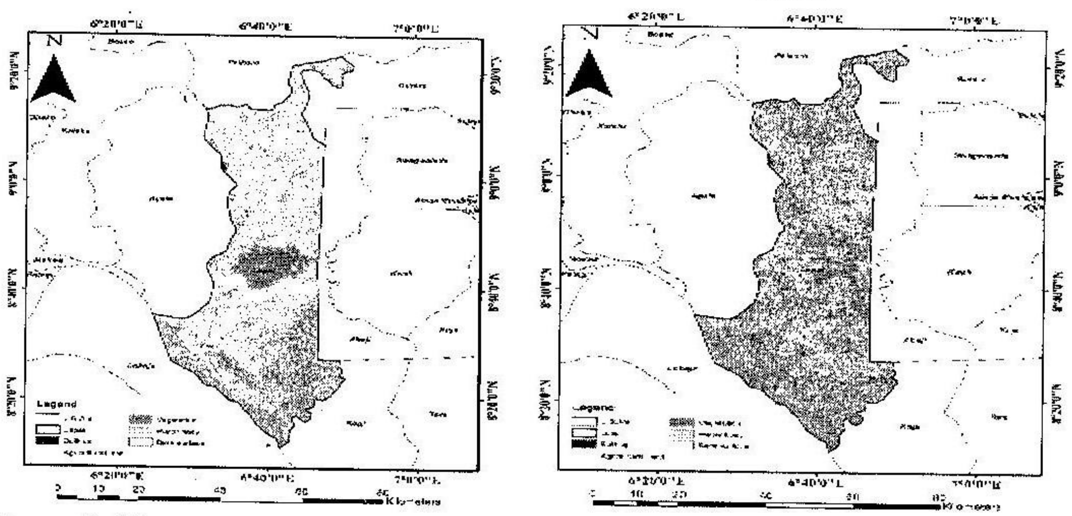

Figure 2: LULC Maps for 1988 and 1998 respectively
Source: Authors data analysis, 2019

THE 7TH INTERDISCIPLINARY ACADEMIC CONFERENCE
Book of Proceedings; Harvard Research and Publications International on Inclusive and Integrated Strategies for African Development: Multidisciplinary Approach, Vol. 7 No. 1. 15th August, 2019- Conference Hall, University of Abuja Teaching Hospital, Gwagwalada, Abuja FCT, Nigeria

Between the years 1988 and 1998, built up experienced a loss of approximately -39.18sq.km and gained a total of approximately 106.29sq.km, agricultural land experienced a loss of approximately -556.3sq.km and gained a total of approximately 354.3sq.km, vegetation experienced a loss of approximately -351.56sq.km and gained a total of approximately 862.36sq.km, the water body experienced a loss of -7.08sq.km and gained a total of approximately 5.19sq.km and the bare surface experienced a loss of approximately -1233.38sq.km and gained a total of approximately 59.35sq.km. As shown in Table 1

Table 1: Spatial gains and losses of LULC between 1988 and 1998

LULC	Losses (sq.km)	Gains (sq.km)
built up	-39.18	106.29
agricultural land	-556.3	354.3
Vegetation	-351.56	862.36
water body	-7.08	5.19
bare surface	-1233.38	59.35

Source: Authors Landuse landcover change analysis using Idrisi Selva software, 2019

The net change represents the difference between the spatial gains and losses experienced by different LULCs, between the years 1988 and 1998, built up experienced a positive change of 67.11sq.km, the agricultural land experienced a negative change of -202 sq.km, vegetation experienced a positive change of 510.81sq.km, water body experienced a negative change of -1.88sqkm and bare surface experienced a negative change of -1174.03sq.km. As shown in Table 2

Table 2: Net change in LULC between 1988 and 1998

LULC	Net change (sq.km)
built up	67.11
agricultural land	-202
Vegetation	510.81
water body	-1.88
bare surface	-1174.03

Source: Authors Landuse landcover change analysis using Idrisi Selva software, 2019

Between the years 1988 and 1998, built up contributed to a loss of 38.7sq.km of agricultural land, vegetation contributed to a loss of 63.43sq.km of agricultural land, water body contributed to a loss of 0.83 sq.km of agricultural land and bare surface contributed to a loss of 99.04sq.km of agricultural land. As shown in Table 3.

Table 3: Contribution to loss of agricultural land by other LULCs between 1988 and 1998

LULC	Loss (sq.km)
built up	38.7
agricultural land	0
vegetation	63.43
water body	0.83
bare surface	99.04

Source: Authors Landuse landcover change analysis using Idrisi Selva software, 2019

Spatial Variation In Landuse Landcover Between 1998 and 2008

1998 2008

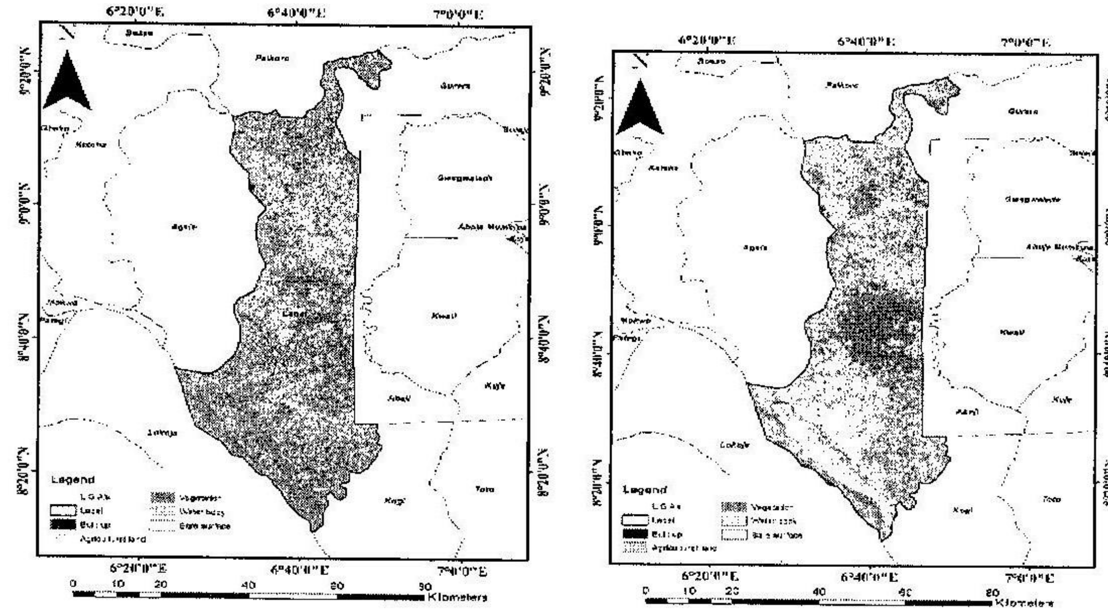

Figure 3: LULC Maps for 1998 and 2008 respectively
Source: Authors data analysis, 2019

Between the years 1998 and 2008, built up experienced a loss of approximately -49.44sq.km and gained a total of approximately 110.18sq.km, agricultural land experienced a loss of approximately -807.24sq.km and gained a total of approximately 572.24sq.km, vegetation experienced a loss of approximately -

773.1sq.km and gained a total of approximately 564.09sq.km, the water body experienced a loss of -11.67sq.km and gained a total of approximately 38.57sq.km and the bare surface experienced a loss of approximately -256.96sq.km and gained a total of approximately 544.97sq.km. As shown in Table 4.

Table 4: Spatial gains and losses of LULC between 1998 and 2008

LULC	Losses (sq.km)	Gains (sq.km)
built up	-49.44	110.18
agricultural land	-807.08	572.24
Vegetation	-773.1	564.09
water body	-11.67	38.57
bare surface	-256.96	544.97

Source: Authors Landuse landcover change analysis using Idrisi Selva software, 2019

Between the years 1998 and 2008, built up experienced a positive change of 60.73sq.km, the agricultural land experienced a negative change of -234.84sq.km, vegetation experienced a negative change of -209.01sq.km, water body experienced a positive change of 26.9sqkm and bare surface experienced a positive change of 288.01sq.km. As shown in Table 5.

Table 5: Net change in LULC between 1998 and 2008

LULC	Net change (sq.km)
built up	60.73
agricultural land	-234.84
Vegetation	-209.01
water body	26.9
bare surface	288.01

Source: Authors Landuse landcover change analysis using Idrisi Selva software, 2019

Between the years 1998 and 2008, built up contributed to a loss of 101.44sq.km of agricultural land, vegetation contributed to a loss of 61.29sq.km of agricultural land, water body contributed to a loss of -7.98sq.km of agricultural land and bare surface contributed to a loss of 80.09sq.km of agricultural land. As shown in Table 6.

Table 6: Contribution to loss of agricultural land by other LULCs between 1998 and 2008

LULC	Loss (sq.km)
built up	101.44
agricultural land	0
Vegetation	61.29
water body	-7.98
bare surface	80.09

Source: Authors Landuse landcover change analysis using Idrisi Selva software, 2019

Spatial Variation In Landuse Landcover Between 2008 and 2018

2008 2018

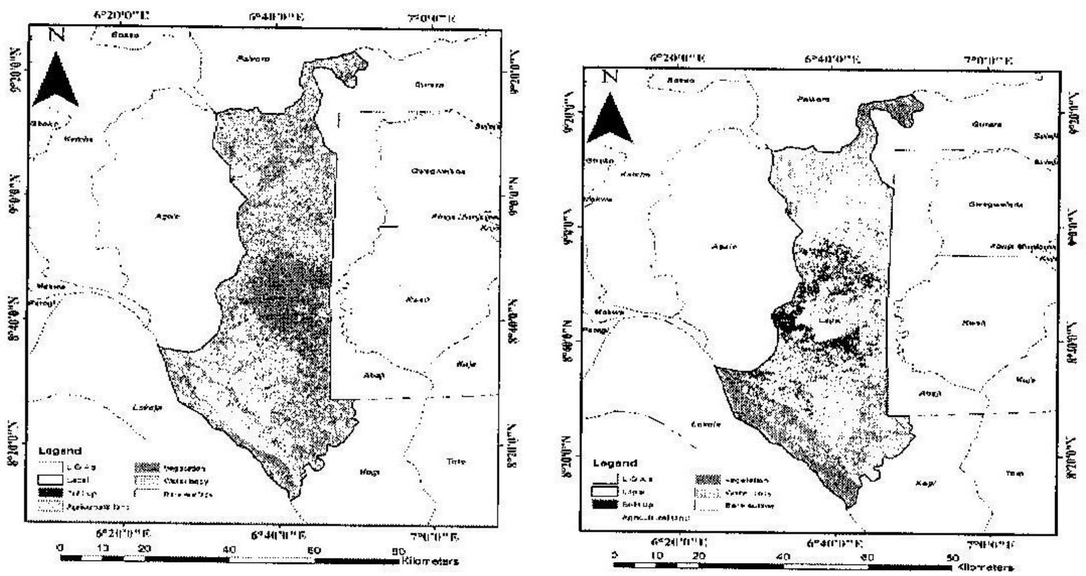

Figure 4: LULC Maps for 2008 and 2018 respectively
Source: Authors data analysis, 2019

Between the years 2008 and 2018, built up experienced a loss of approximately -44.62sq.km and gained a total of approximately 403.54sq.km, agricultural land experienced a loss of approximately -863.47sq.km and gained a total of approximately 429.39sq.km, vegetation experienced a loss of approximately -444.44sq.km and gained a total of approximately 342.8sq.km, the water body experienced a loss of -32.63sq.km and gained a total of approximately 14.36sq.km and the bare surface experienced a loss of approximately -726.74sq.km and gained a total of approximately 921.8sq.km. As shown in Table 7.

Table 7: Spatial gains and losses of LULC between 2008 and 2018

LULC	Losses (sq.km)	Gains (sq.km)
Built up	-44.62	403.54
agricultural land	-863.47	429.39
vegetation	-444.44	342.8
water body	-32.63	14.36
bare surface	-726.74	921.8

Source: Authors Landuse landcover change analysis using Idrisi Selva software, 2019

Between the years 2008 and 2018, built up experienced a positive change of 358.93sq.km, the agricultural land experienced a negative change of -434.07sq.km, vegetation experienced a negative change of -101.65sq.km, water body experienced a negative change of -18.27sqkm and bare surface experienced a positive change of 195.06sq.km. As shown in Table 8.

Table 8: Net change in LULC between 2008 and 2018

LULC	Net change (sq.km)
Built up	358.93
agricultural land	-434.07
Vegetation	-101.65
water body	-18.27
bare surface	195.06

Source: Authors Landuse landcover change analysis using Idrisi Selva software, 2019

Between the years 2008 and 2018, built up contributed to a loss of 217.91sq.km of agricultural land, vegetation contributed to a loss of 230.35sq.km of agricultural land, water body contributed to a loss of -0.21sq.km of agricultural land and bare surface contributed to a loss of 385.61sq.km of agricultural land. As shown in Table 9.

Table 9: Contribution to loss of agricultural land by other LULCs between 2008 and 2018

LULC	Loss (sq.km)
Built up	117.91
agricultural land	0
Vegetation	90.77

water body	-0.21
bare surface	225.61

Source: Authors Landuse landcover change analysis using Idrisi Selva software, 2019

Spatial Variation In Landuse Landcover Between 1988 and 2018:

1988 2018

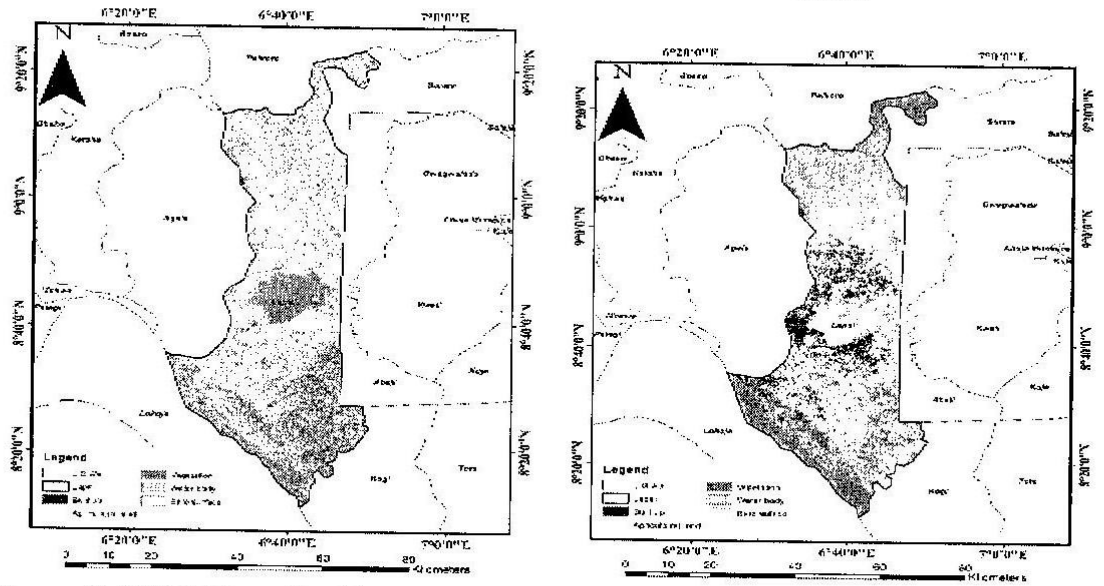

Figure 5: LULC Maps for 1988 and 2018 respectively
Source: Authors data analysis, 2019

Table 10: Spatial gains and losses of LULC between 1988 and 2018

LULC	Losses (sq.km)	Gains (sq.km)
built up	-127.05	592.35
agricultural land	-542.16	143.4
vegetation	-739.07	339.23
water body	-6.11	32.86
bare surface	-609.86	818.9

Source: Authors Landuse landcover change analysis using Idrisi Selva software, 2019

Between the years 1988 and 2018, built up experienced a positive change of 465.3sq.km, the agricultural land experienced a negativetive change of -388.76sq.km, vegetation experienced a negative change of -399.85sq.km, water body experienced a positive change of 26.75sqkm and bare surface experienced a positive change of 209.04sq.km. As shown in Table 11.

Table 11: Net change in LULC between 1988 and 2018

THE 7TH INTERDISCIPLINARY ACADEMIC CONFERENCE
Book of Proceedings; Harvard Research and Publications International on Inclusive and Integrated Strategies for African Development: Multidisciplinary Approach, Vol. 7 No. 1. 15th August, 2019- Conference Hall, University of Abuja Teaching Hospital, Gwagwalada, Abuja FCT, Nigeria

LULC	Net change (sq.km)
built up	465.3
agricultural land	-388.76
Vegetation	-399.85
water body	26.75
bare surface	209.04

Source: Authors Landuse landcover change analysis using Idrisi Selva software, 2019

Between the years 1988 and 2018, built up contributed to a loss of 241.82sq.km of agricultural land, vegetation contributed to a loss of 66.04sq.km of agricultural land, water body contributed to a loss of -2.43sq.km of agricultural land and bare surface contributed to a loss of 96.33sq.km of agricultural land. As shown in Table 12.

Table 12: Contribution to loss of agricultural land by other LULCs between 1998 and 2018.

LULC	Loss (sq.km)
built up	241.82
agricultural land	0
Vegetation	66.04
water body	-2.43
bare surface	96.33

Source: Authors Landuse landcover change analysis using Idrisi Selva software, 2019

Socio economic impact of urban encroachment into Agricultural land on the environment

This section addresses the responses derived from the administered questionnaires. The responses serve as primary data and forms the basis for the conclusion drawn with regards to this particular objective. A total of 156 questionnaire were distributed and the target respondents were mostly male and female between the ages of 30-60 who engage in agricultural activities and conversant with the spatial dynamics of the region as a consequence of the duration of their stay in the study area. In summary, the information derived from the data collated in the administered questionnaire has shown that the study area has experienced an increase in population within the coverage period leading to urbanization and urban encroachment into agricultural land. The increase in population can be attributed to varying pull factors, however, despite the encroachment into agricultural land, agricultural land still persists, this is done mostly by relocation to new locations, expansion of existing agricultural land and conversion of other LULC's to agricultural land either on a permanent or temporary basis. The persistence of agricultural land was because of the various benefits it serves to the indigenous people of the study area and its historic and cultural values. From the responses, it was also derived that the encroachment of settlements into agricultural land has negative impacts on the environment in the sense that less agricultural land means less cover for the soil in the area, the agricultural plants serve to an extent as wind breaks and erosion control measures. The exposed top soil makes it more vulnerable to erosion, subsequent degradation and increase in soil aridity, also the reduction in agricultural land has also to an extent led to a decrease in soil fertility. However these impacts have been judged to not be extremely severe but severe and barely severe in some cases. The decrease in available agricultural land has subsequently led to a decrease in the average seasonal crop yield. A focus group discussion with some of the natives revealed that in past years there was enough land for a typical yam farmer to make up 5000 heaps for planting, however that has decreased in recent times but not significantly. A decrease in the crop yield ultimately means a decrease in income for commercial farmers and decrease available food for subsistent farmers.

Discussion of findings

This research provide insight on the socio-economic impacts of urban expansion of agricultural land in Lapai Local Government Area using Remote Sensing and GIS and primary data acquisition. This study attempted to capture as accurate as possible the five major land uses types in the study area as they change through time. The study used Remote Sensing and GIS as an analytical tool with satellite images used for mapping land use types, rate and extent of urban growth, spatial loss and conversion of agricultural land to other land use and urban expansion within the study period, it also utilized the administration of questionnaire to residents of the study area in order to gain their insights on the impacts of urban encroachment into agricultural land on the environment.

As shown from the classified images and landuse statistics depicting the LULC gains and losses, net change and contribution to loss of agricultural land, land use types had changed significantly over the coverage period (1988 – 2018). The statistics indicated that the growth rate of built up area came at the expense of agricultural land. It shows a decline in agricultural land between 1988 and 1998 with agricultural experiencing a net change of approximately -202sq.km of land

THE 7TH INTERDISCIPLINARY ACADEMIC CONFERENCE
Book of Proceedings; Harvard Research and Publications International on Inclusive and Integrated Strategies for African Development: Multidisciplinary Approach, Vol. 7 No. 1. 15th August, 2019- Conference Hall, University of Abuja Teaching Hospital, Gwagwalada, Abuja FCT, Nigeria

and built up experiencing a net change of 67.11sq.km, within this period, built up led to a 38.7sq.km loss of agricultural land, vegetation led to a 63.43sq.km loss of agricultural land, water body led to a 0.83sq.km of agricultural land and bare surface led to a 99.04sq.km loss of agricultural land. Between the years 1998 and 2008 agricultural land experienced a net change of approximately -234.84sq.km of land and built up experiencing a net change of 60.73sq.km, within this period, built up led to a 101.44sq.km loss of agricultural land, vegetation led to a 61.29sq.km loss of agricultural land, water body lost -7.98sq.km to agricultural land and bare surface led to a 80.09sq.km loss of agricultural land. Between the years 2008 and 2018 agricultural land experienced a net change of approximately -434.07sq.km of land and built up experiencing a net change of 358.93sq.km, within this period, built up led to a 117.91sq.km loss of agricultural land, vegetation led to a 90.77sq.km loss of agricultural land, water body lost -0.21sq.km to agricultural land and bare surface led to a 225.61sq.km loss of agricultural land. Between the years 1988 and 2018 agricultural land experienced a net change of approximately -388.76sq.km of land and built up experiencing a net change of 465.3sq.km, within this period, built up led to a 241.82sq.km loss of agricultural land, vegetation led to a 66.04sq.km loss of agricultural land, water body lost -2.43sq.km to agricultural land and bare surface led to a 96.33sq.km loss of agricultural land.

From the statistics it was found that the greatest change to agricultural land occurred between the years 2008-2018 and throughout the coverage it can be seen that built up contributed steadily to agricultural land loss. An increase in bare surface can be associated with an increase in built up activities and this also contributed to agricultural land loss.

From the administered questionnaire, it was shown that the area has experienced an unprecedented rate of urbanization and urban encroachment into agricultural lands for a number of listed reasons. This has subjected the area to some negative environmental impacts such as erosion, land degradation, soil infertility etc. due to the exposure of the soil surface. However, these impacts are not so severe to a catastrophic stage and this could be attributed to the persistence of agricultural land within the region whether through relocation or expansion of agricultural land in some areas. The area has also experienced some socioeconomic impacts due to the encroachment of urbanization into agricultural lands, the average crop yield over the years has experienced a decrease and has consequently led to slight lifestyle changes.

The GIS based analysis of urban expansion over the land use modifications has also indicated that urban growth has basically taken place haphazardly on agricultural land because it is the suitable available land. This means land use has been changing from predominantly agricultural uses to non-agricultural uses, such that provision of residential and recreational space, transportation facilities, and industrial space is clearly dictated by the urbanization phenomenon.

CONCLUSION AND RECOMMENDATIONS

This research work showcases the ability of GIS and Remote Sensing in analyzing spatial-temporal dynamics of urban growth. Lapai Local Government Area has emerged from being predominantly rural area three decades ago to a city with an appreciable urbanization level. The result has shown that the area has lost quite significant portion of its agricultural land to urban expansion. Built - up has gained an appreciable spatial amount of the total coverage over the study period. Therefore, there is a need to an understanding of structural urban dynamics in order to have absolute foundation for the formulating sound and effective urban policies. Such policies must be contemporary to turn potential crises into opportunities as failure maybe too devastating. Hence, the challenge is the sustainability of agricultural land (and in extension agricultural activities) in the face of declining agricultural land and urbanization. This feat can be achieved via the integration of agricultural landscapes into urban land use planning systems and as crucial part of urban development since urban growth and expansion is inevitable.
The recommendations of the study include incorporation of social amenities into rural planning framework to reduce emigration, sustainable proper management and planning of urban expansion, control and plan urban expansion through the use of remote sensing and GIS techniques as monitoring systems, adoption of advanced agricultural practices and taking proactive measures towards a better understanding of the changing landuse pattern of the area so as to be better equipped in order to manage various environmental challenges that might be associated with urban expansion.

REFERENCES

Adesina, F.A; W.O. Siyanbola; F.O. Oketola; D.A. Palermo; L.O. Ojo and A.O. Adegbulugbe (1999) Potentials of agroforestry for climate change mitigation in Nigeria, some preliminary estimates; Global Ecology and Biogeography Letters, Vol 8, 163 – 173.

American Journal of Social Issues and Humanities Vol. 3, Iss. 4, July 2013, pp. 200 – 212

and trends (eds Hassan R., Scholes R., AshN.), pp. 745-794. Washington Dc; Island

THE 7TH INTERDISCIPLINARY ACADEMIC CONFERENCE
Book of Proceedings; Harvard Research and Publications International on Inclusive and Integrated Strategies for African Development: Multidisciplinary Approach, Vol. 7 No. 1. 15th August, 2019- Conference Hall, University of Abuja Teaching Hospital, Gwagwalada, Abuja FCT, Nigeria

Antrop, M. (2000). Changing patterns in the urbanized countryside of Western Europe Landscape Ecology vol. 15(3), pp.257–270

Cassman et al., (2005) Cultivated Systems in Ecosystems and human Well-being; current status

CIA World Fact book - www.cia.gov/library/publications/the-world factbook/fields/2212.html

De Sherbinin A. (2007) "Population – Development – Environment Dynamics in the

De Sherbinin, A, and Martine, G (2007) Urban Population, Development and Environment Dynamics, CICRED Policy Paper Series, Paper No. 3, Paris, CICRED.

Developing World" In de Sherbinin, A., A. Rahman, A. Barbieri, J.C. Fotso, and Y. Zhu (Eds.). 2009. Urban Population-Environment Dynamics in the Developing World: Case Studies and Lessons Learned. Paris: Committee for International Cooperation in National Research in Demography (CICRED)

Enaruvbe, G. O. (2015). SPATIAL ANALYSIS OF AGRICULTURAL LANDUSE CHANGE IN ASABA, SOUTHERN NIGERIA. Ife Journal of Science vol. 17, no. 1 (2015), 65-71.

Food and Agriculture Organization of the United Nations Statistics Division (2014) In Max Roser (2015) – Land Use in Agriculture. Retrieved from: http://ourworldindata.org/data/food-agriculture/land-use-in-agriculture/ on 17th March, 2015

Francis Zana Naab, R. D. (2013). Urbanisation and its impact on agricultural lands in growing cities in developing countries: a case study of tamale in ghana. Modern Social Science Journal, 2 (2013), NO.2,256-287, 257-262.

Glenn, A., (1984). Urbanization of the Non-Farm Population. A Reserch Note on the Convergence of Rich and Poor Nations" KoninKhjke Brill NV. Leiden

Joseph Oloukoi, R. O. (2014). Geospatial analysis of urban sprawl in Ile-Ife city, Nigeria. South African Journal of Geomatics, Vol. 3, No. 2, August 2014, 128-142.

Kavitha A, S. R. (2015). Urban expansion and loss of Agriculture land - A case of Bengaluru city. INTERNATIONAL JOURNAL OF GEOMATICS AND GEOSCIENCES Volume 5, No 3, 2015, 492-497.

Li, X. and Yeh, A. G. O. (1998). Principal Component Analysis of stacked Multitemporal
Images for the Monitoring of Rapid Urban Expansion in the Pearl River Delta.
International Journal of Remote Sensing, 19, 1501–1518.

Nitin N. Mundhe, R. G. (2014). Impact of urbanization on land use/land covers change using Geo-spatial techniques. INTERNATIONAL JOURNAL OF GEOMATICS AND GEOSCIENCES Volume 5, No 1, 2014, 50-58.

Olawole M.O, F.A Adesina Msimanga L, and Adegboyega S.A (2011) Monitoring and Assessing Urban Encroachment into Agricultural Land - A Remote Sensing and GIS Based Study of Harare, Zimbabwe. Ife Journal of Science vol. 13, no. 1 (2011)

Peters W. ed 2000. Green Cities – Urban Environment Solutions, Global Issues – An electronic Journal of the US Department of State. March 5 (1) 1 – 39. Press

Redman, Charles, and Jones, Nancy S (2005) "The Environmental, Social and Health Dimensions of Urban Expansion", Population and Environment, 26(6): 505-520.

Rimal, B. (2012). Urbanization and the Decline of Agricultural Land in Pokhara Sub-metropolitan City, Nepal. Journal of Agricultural Science; Vol. 5, No. 1; 2012, 54-55, 58-64.

Shalaby, A. &. (2010). Urban Sprawl Impact Assessment on the Fertile Agricultural Land of Egypt Using Remote Sensing and Digital Soil Database, Case study: Qalubiya Governorate. US-Egypt Workshop on Space Technology and Geo-information for Sustainable Development, Cairo, Egypt 14-17 June, 2010, 1-11.