



DETERMINING THE IMPACT OF LAND USE CHANGE ON CROP AND SOIL AGRICULTURE IN OBIO/AKPOR LGA RIVERS STATE FROM 2000 TO 2020

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Abstract: The study was aimed to determine the impact of land use change on Pls just your results Is agriculture in Obio/Akpor Local Government Area of Rivers state from 2000 to 2020. The design for the study was Cross-Sectional research design which involved the use of questionnaire and remote sensing data. Descriptive analysis was employed for the questionnaire data and the rate of land use change for 2000-2020 was calculated. The results showed that between year 2000 and year 2010 the change and percentage change of built up area land use were +219.45 km² and +362%, while the vegetation cover land use recorded a change and percentage change of -53.39 km² and -29%. Between year 2010 and 2020 the change and percentage change of built up area land use were +70.64 km² and +25%, while the vegetation cover land use recorded a change and percentage change of -37.23 km² and -28%. The total change between 2000 to 2020 shows that the change and percentage change of built up area land use were +290.09 km² and +387%, while the vegetation cover land use recorded a change and percentage change of -90.62 km² and -57%. It is recommended that information should be provided on the nature, causes and impacts of land use changes on crop and soil agriculture through seminars and awareness programmes; and legislation that backs land use should be enforced by the appropriate bodies/organisations and adequate monitoring of land use should be ensured.

Introduction

Land Use and Land Cover (LULC)

Although the terms 'land use' and 'land cover' are sometimes used interchangeably, each has a distinct meaning. Land cover is the bio-physical layer covering the earth surface, while land use represents the human utilization of the land cover. Land cover includes earth's land surface distribution of vegetation, water, desert and ice as well as the biota, soil, topography etc. in the immediate subsurface, and it also includes human activity areas, such as settlement, mine exposure etc. (Lambin, et al., 2003; Oumer, 2009). On the other hand, land use is attributed to how humans exploit the land cover to serve their own purposes and

Includes features such as residential zones, agricultural farms, logging areas etc. (Zubair, 2006; Oumer, 2009). In this context, land use influences the changes in land cover; therefore, LULC change can be defined as the modification of surface features on earth's landscape

which is realized by the difference in their surface appearance assessed at two different times (Ayele, 2011). The current global condition of mass environmental change and sustainability issues elucidates the gravity of LULC change detection research in different parts of the world. Though LULC changes entail both natural (e.g. weather, flooding, earthquake etc.) and anthropogenic causes, the ever-increasing demography and of the mushrooming population has designated the anthropogenic influences as the most dramatic (Turner, et al., 2007; Foley, et al., 2011; Weinzettel, et al., 2013). At present, the undisturbed pristine areas cover less than 50% of the total

earth's landscape; forest cover is only 30% which was around 50% some 8000 years ago (Oumer, 2009). Diverse and intense anthropogenic activities around the world are attributed for most of these LULC changes. For this reason, research is conducted around the world to study this dynamic LULC alteration and devoted efforts

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are underway to explore its connection with the disturbances happening in the earth system.

Statement of Problem:

Africa has the fastest rate of deforestation in the world (Chirwa & Adeyemi, 2019). Competing land uses (agriculture and human settlements mainly) are contributing to the decline of forest and woodland areas and the rising demand for fuel wood and charcoal is also a major cause of deforestation. Over harvesting, agricultural encroachment and unregulated burning are believed to be contributing to the decline of many species in the wild. Depletion and degradation of the natural resource base intensifies competition to less stressed areas (Obayelu, 2014). Nonetheless, the point being made is that the environment is so valuable and the inhabitants so precious that the future need not be left to chance or to some curious form of evolution. This research therefore seeks to determine the impact of land use cover change on crop and soil agriculture in Obio/Akpor Local Government Area of Rivers State from 2000 to 2020 and its contributions to the emerging patterns in global land cover/land use studies. In addition, the study examines the need for proper management of land and the importance of the availability of detailed, accurate and up-to-date geoinformation in the proper management of land in Obio/Akpor Local Government Area of Rivers State.

Aim and Objectives of Study:

The objective of this study is to determine the impact of land use change on crop and soil agriculture in Obio/Akpor Local Government Area of Rivers state from 2000 to 2020.

To assess the impact of land use change on crop and soil agriculture between 2000 to 2020.

To determine the level of awareness of the communities towards land use change and the threats (like increase in price of crops as well threat to food security) faced by the environment due to over exploitation.

To identify factors contributing to land use changes in Obio/Akpor Local Government Area.

MATERIALS AND METHODS

Area of Study

Obio-Akpor LGA is one of the 23 local governments of Rivers state, found in the south southern part of Nigeria, otherwise called the Niger Delta Region of Nigeria, located approximately between latitude 40 45" N through 40 56" N and longitude 60 52" E through 70 6" E. It has a general elevation of less than 15.24m above mean sea level (Oyegun & Adeyemo, 1999). It is bounded by Ikwerre LGA to the north, Port Harcourt LGA to the south, to the east, Oyigbo LGA and to the West, Emohua LGA as shown in figure 1. Obio-Akpor, Port Harcourt, and Eleme LGAs, make up the Port Harcourt metropolis which is on a firm ground and about 66km from the Atlantic Ocean (Oyegun & Adeyemo, 1999).

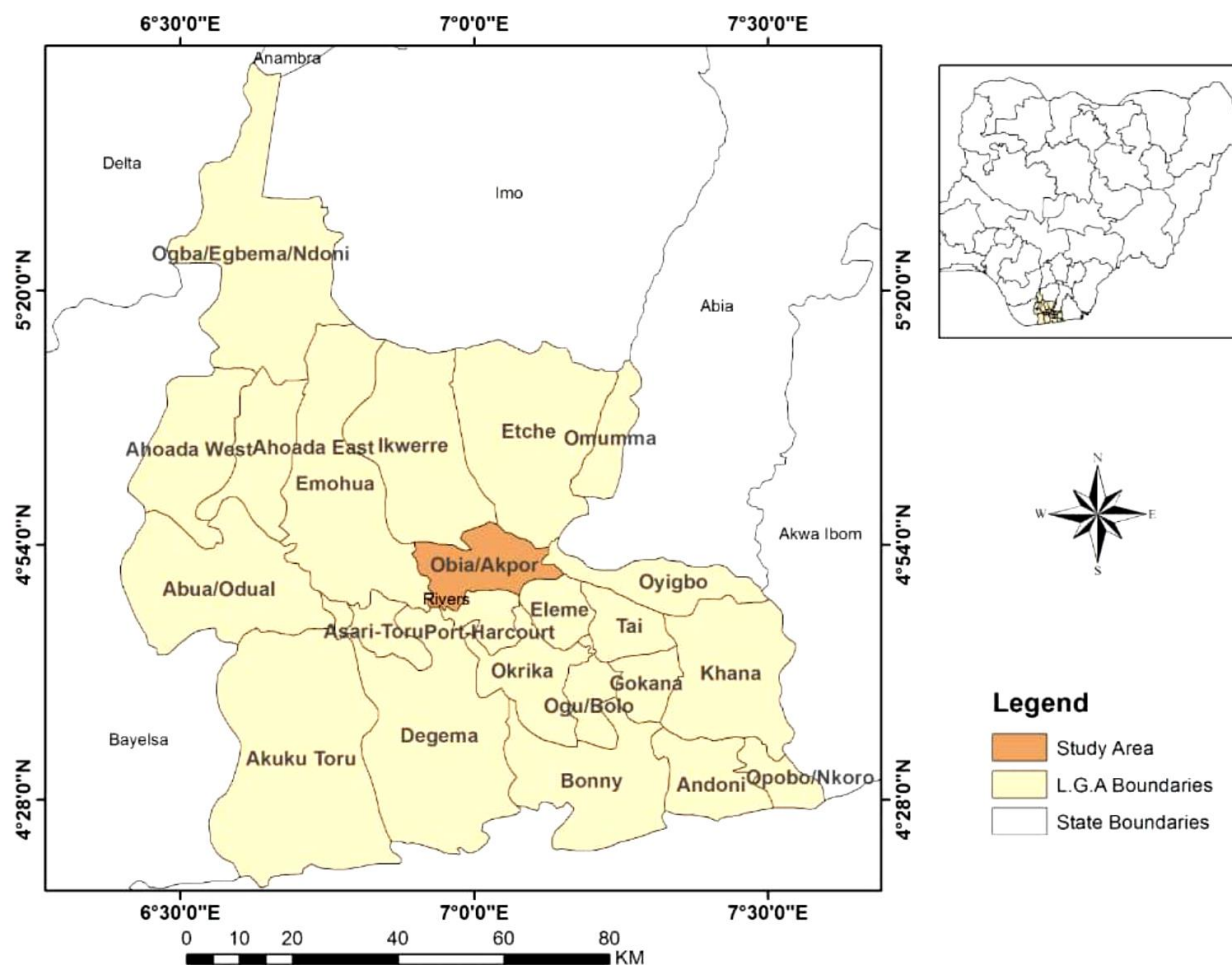


Figure 1: Map showing study area in Rivers State

Source: Wizer & Wali, 2020

It is one of the major centres of economic activities in Nigeria, and a major city in the Niger Delta said to be the richest LGA in Rivers State. The LGA is rich with land and natural resources, such as land, soil, vegetation, water, coal, petroleum, gas, animals, wildlife, air, wind and atmosphere, clay, sand and gravel (Wokocha & Omenihu, 2015). The Local government is one of the Agricultural Zones of Agricultural Development Programs of Rivers State. Crops such as yam, cassava and vegetables are mostly cultivated in this area.

The area is influenced by urbanization and urban sprawl whereby smaller communities have merged together and

formed a megacity. The reason is due to the high influx of people resulting in the rapid growth of the population. This, in turn, is largely due to the expansion of the oil and allied industries, which have also attracted many varied manufacturing industries. The population of the area, therefore, increases on a daily basis. It has an average of 2.82% growth rate which puts the population of the LGA as at 2006 to be 464,789 people (National Bureau of Statistics, 2006). It is made up of the Ikwerres and has the LGA headquarters at Rumuodumanya (Mamman, Oyeboji, & Petters, 2000).

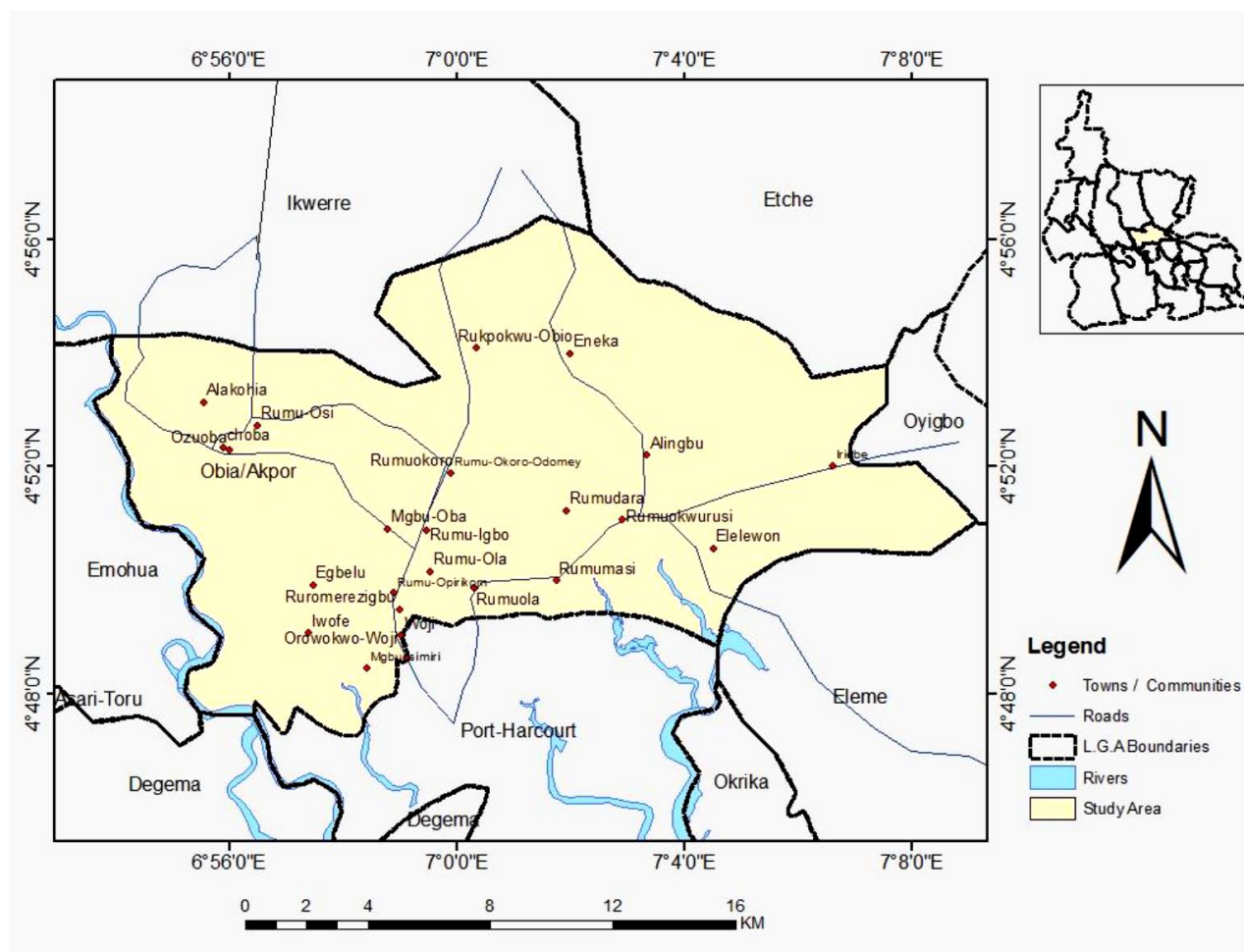


Figure 2: Map showing study area (Obio/Akpor Local Government Area)

Source: Wizer & Wali, 2020

Research design:

The research design for this study is Cross-Sectional research design, which involves the collection of data from a population at a specific point in time through the use of questionnaire and remote sensing data. Cross section survey is concerned with finding out if an activity is related to the case being investigated. The reason for the choice of this design is because it makes use of data collected at a define time.

Population of the Study:

The population which the researcher will use of in collecting data needed for the study are residents in Obio/Akpor Local Government Area of Rivers state.

Sample size and Sampling techniques:

Sample size is the selection of some elements that make up a population. Random sampling technique will be used to select Ten (10) communities out of the Eighty-nine (89) communities in the local government area and an accidental sampling technique will be used to target 100 residents in the study area.

Data Collection Instrument:

The primary source of data will be from direct field observation reconnaissance survey to get a general idea of the area features, satellite images and questionnaire for socio-economic survey. The questionnaire will be made up of closed ended questions. It will be divided into two parts, part A aimed at collecting respondents' personal data, while part B will be formed in such a way as to give the respondents opportunity to respond if they strongly agree (SA), Agree (A), disagree (D), or strongly disagree



(SD) to the research items listed. The secondary data will be sourced from journals, textbooks, articles, magazines, gazette and other publications.

Method of Data analysis:

The images which represent specific periods will be used to study land use changes within the study area. The

$$\text{Change} = \text{Current Year} - \text{the Previous Year}$$
$$\% \text{ change} = \frac{\text{Current Year} - \text{Previous Year}}{\text{Previous}} \times 100$$

DISCUSSION

The data is presented in simple tables and percentages and arranged in the order which the research questions appeared in chapter one of the study. One hundred (100)

results gotten from the questionnaire will be presented in tables with sample percentage used to analyses the data generated in this study. The rate of land use change for 2000-2020 will be calculated using

copies of Questionnaires were distributed around while a total of Ninety-six (96) questionnaires were recovered.

Data Presentation:

Table 1: Administration of Questionnaires

Questionnaire Distributed	Questionnaire Returned	Percentage of Returned Questionnaire
100	96	96

The above table signifies that a total of 95% of the distributed copies of the questionnaires were recovered and used for the analysis of this research. The 4% which

are not accounted for were either counted as void or was not returned and will not be a part of the research.

Table 2: Occupation of respondents:

Value	Frequency	Percent
Farmer	10	10%
Trader/Business	27	28%
Pensioner	8	8%
Employed	31	32%
Unemployed	20	21%
Total	95	100

Table 2, showed that the highest number of respondents were employed at 31(32%), Trade/Business 27(28%), Unemployed 20 (21%), Farmer 10 (10%) and Pensioner 8 (8%).

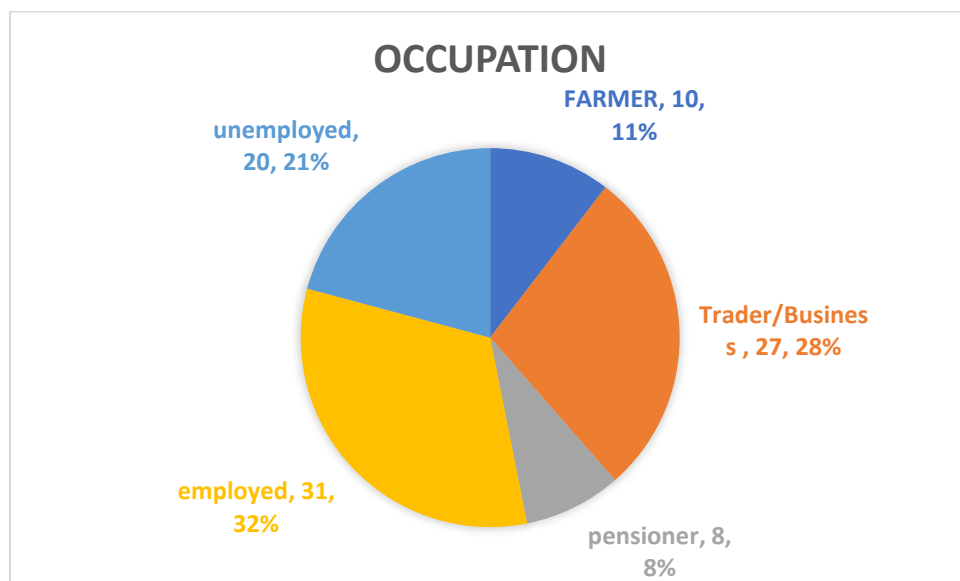


Figure 1: Occupation of respondents

Table 3: Number of years' resident in Obio/Akpor LGA

Value	Frequency	Percent
1-5 years	8	8%
6-10 years	15	16%
11-15 years	29	30%
16-20 years	32	33%
21 years and above	12	13%
Total	96	100.0

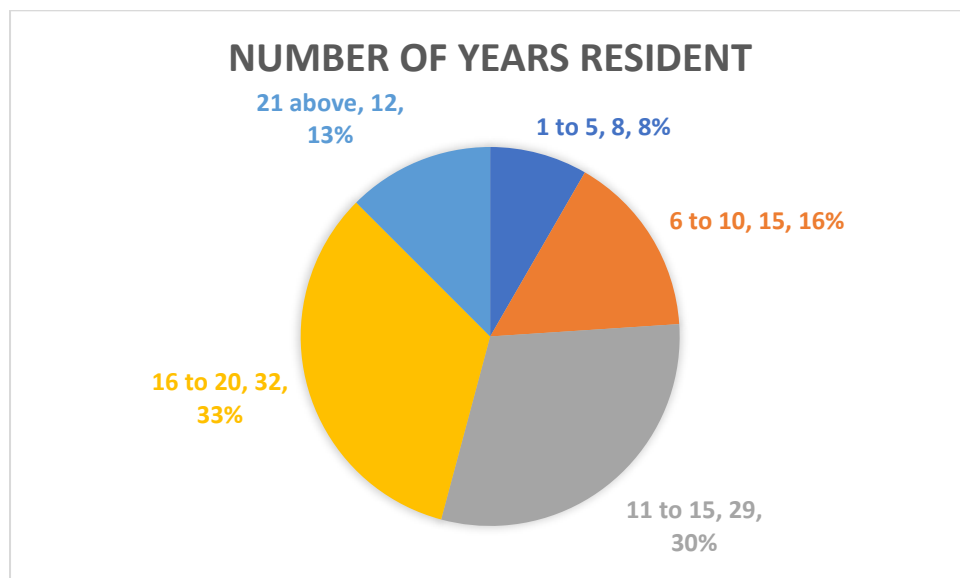


Figure 3: Number of years' resident in Obio/Akpor LGA

From the Table 3 above, 16-20 years 32(33%) had more respondents followed by 11-15 years 29(30%), 6-10 years 15(16%), 21 years and above 12(13%) and 1-5 years 8(8%).



Table.4: General Questions

Item No.	Item Description	YES	MAYBE	NO
1	Have you noticed an increase in the price of agricultural produce in Obio/Akpor Local Government Area of Rivers State from year 2000-2020?	67 (70%)	11 (11%)	18 (19%)
2	Does Obio/Akpor Local Government Area lack proper town planning and allocation of land?	43 (45%)	24 (25%)	29 (30%)
3	Would you still want to live in this area for the next ten years?	40 (42%)	20 (21%)	36 (38%)
4	Are you aware of any sensitisation programme on the impact of land use on agriculture?	10 (10%)	3 (3%)	83 (86%)

The results from respondents and discussion with the residents in Table 4 during the study indicated that there is a significant evidence of residents noticing the increase of the price of agricultural produce in Obio/Akpor Local Government Area of Rivers State from year 2000-2020 (70%); lack of proper town planning and allocation of

land in Obio/Akpor Local Government Area (45%), as well as majority of the residents would want to live in the area for the next ten years (42%) and they are not aware of any sensitisation programme on the impact of land use on agriculture (10%).

Table 5: Factors that contributed to land use change in Obio/Akpor Local Government Area of Rivers State from year 2000-2020

Item No.	Item Description	SA	A	D	SD
5	Urbanisation	50 (52%)	23 (24%)	7 (7%)	16 (17%)
6	Deforestation	46 (48%)	27 (28%)	4 (4%)	19 (20%)
7	Population growth	61 (64%)	20 (21%)	3 (3%)	12 (13%)
8	Poverty	19 (20%)	23 (24%)	32 (33%)	22 (23%)
9	weak land governance institutions	34 (35%)	26 (27%)	16 (17%)	20 (21%)
10	unsustainable land use	40 (42%)	13 (14%)	27 (28%)	16 (17%)

The results in Table 5 indicates the responses of the residents towards factors that contributed to land use change in Obio/Akpor Local Government Area of Rivers State from year 2000-2020. Urbanisation (52%), deforestation (48%), population growth (64%), poverty

(20%), weak land governance institutions (35%) and unsustainable land use (42%) have significantly contributed to the land use change in Obio/Akpor Local Government Area of Rivers State from year 2000-2020.



Table 6: Impact of land use change on crop and soil agriculture in Obio/Akpor Local Government Area of Rivers State from year 2000-2020

Item No.	Item Description	SA	A	D	SD
11	Increase in price of goods	56 (58%)	23 (24%)	5 (5%)	12 (12%)
12	Natural resource degradation	35 (36%)	28 (29%)	20 (21%)	13 (14%)
13	Shortage of farm lands	49 (51%)	27 (28%)	7 (7%)	13 (14%)
14	Threat of natural disasters like drought, erosion and flood	23 (24%)	13 (14%)	34 (35%)	26 (27%)
15	Reduction of wetlands that support crops like rice	34 (35%)	27 (28%)	15 (16%)	20 (21%)
16	Blockage of natural waterways thereby hindering aquaculture and irrigation	42 (44%)	23 (24%)	14 (15%)	17 (18%)

The results in Table .6 indicates the responses of the residents towards impact of land use change on Agriculture in Obio/Akpor Local Government Area of Rivers State from year 2000-2020. The respondents strongly agreed that increase in price of goods (58%), natural resource degradation (36%), shortage of farm lands (51%), reduction of wetlands that support crops like rice (35%) and blockage of natural waterways

thereby hindering aquaculture and irrigation (44%) are the significant impacts of land use change on Agriculture in Obio/Akpor Local Government Area of Rivers State from year 2000-2020 while they disagreed that threat of natural disasters like drought, erosion and flood (35%) is not an impact that yield to land use change on Agriculture in the area.



FIG 4 Land use change in Obio/Akpor Local Government Area

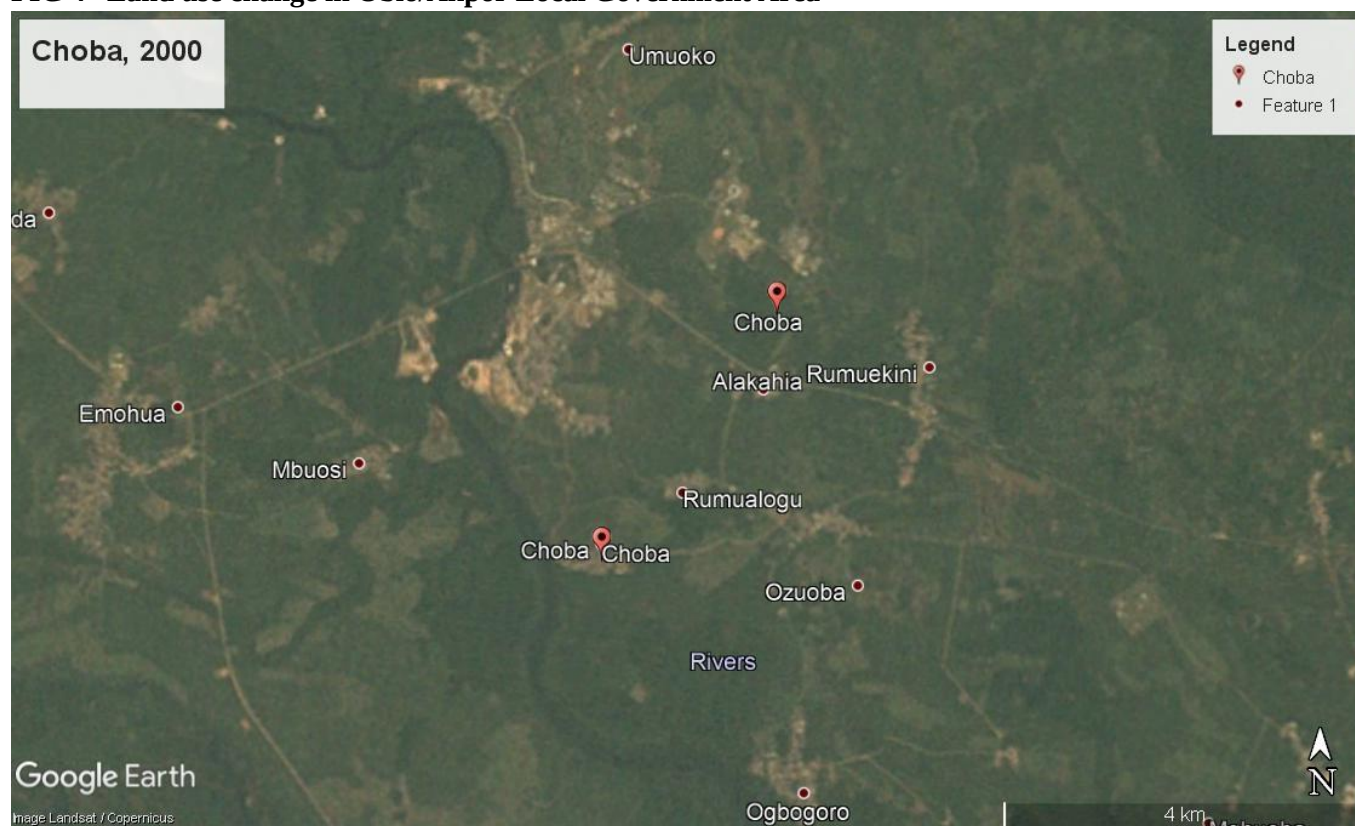


Figure 4: Aerial map of Choba, Obio Akpor LGA in year 2000

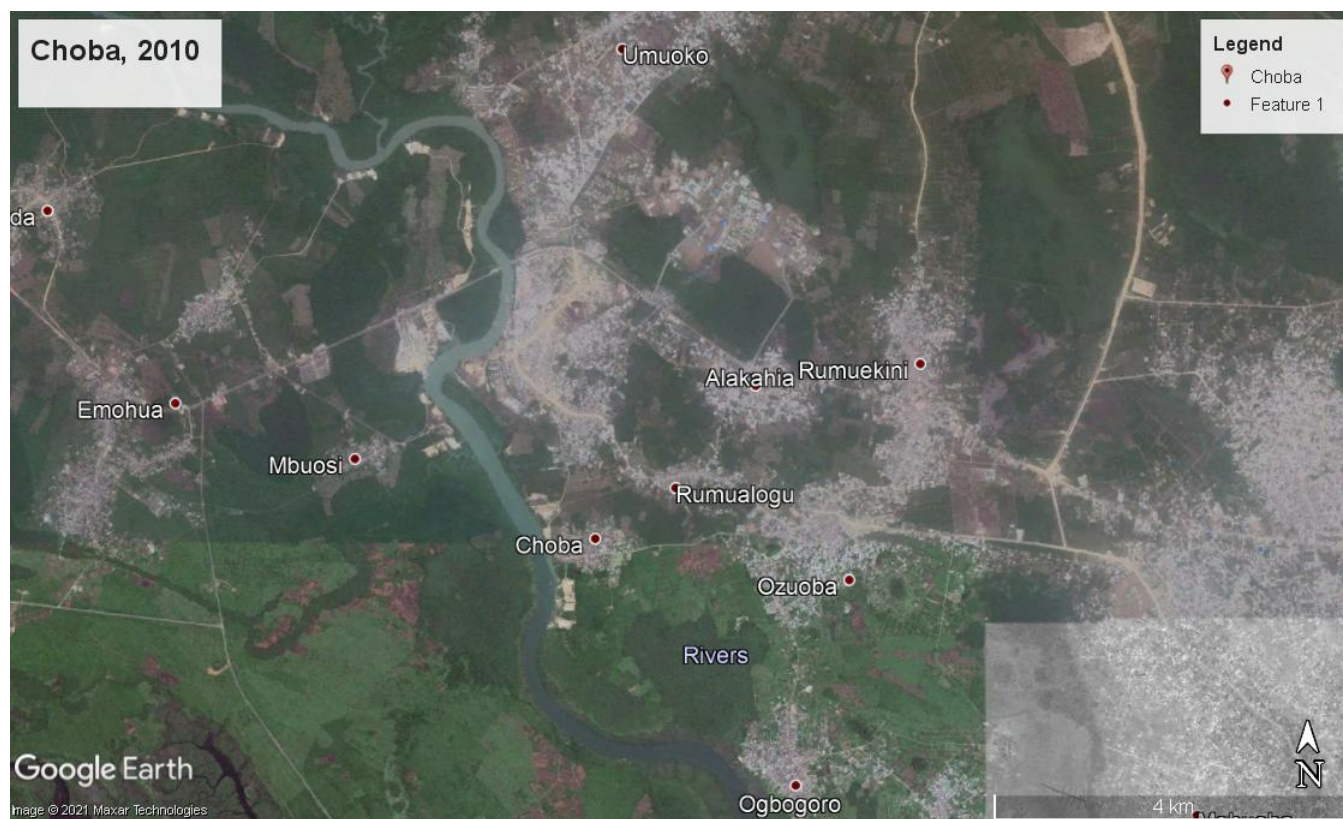


Fig: 5: Aerial map of Choba, Obio Akpor LGA in year 2010



Figure 6: Aerial map of Choba, Obio Akpor LGA in year 2020



Table 7 Land use Types and Vegetal Cover changes between 2000 and 2020 in Obio/Akpor LGA

Land use types	2000 (Sq.km)	Percentage (%)	2010 (Sq.km)	Percentage (%)	2020 (Sq.km)	Percentage (%)
Built Up Area	60.69	22%	280.14	62%	350.78	70%
Farmlands	16.43	6%	25.15	6%	32.13	6%
Water Body	6.03	2%	14.66	3%	23.43	5%
Vegetation Cover	187.33	69%	133.94	30%	96.71	19%
Total	270.48		453.889		503.05	

*Sq. Km =Km²

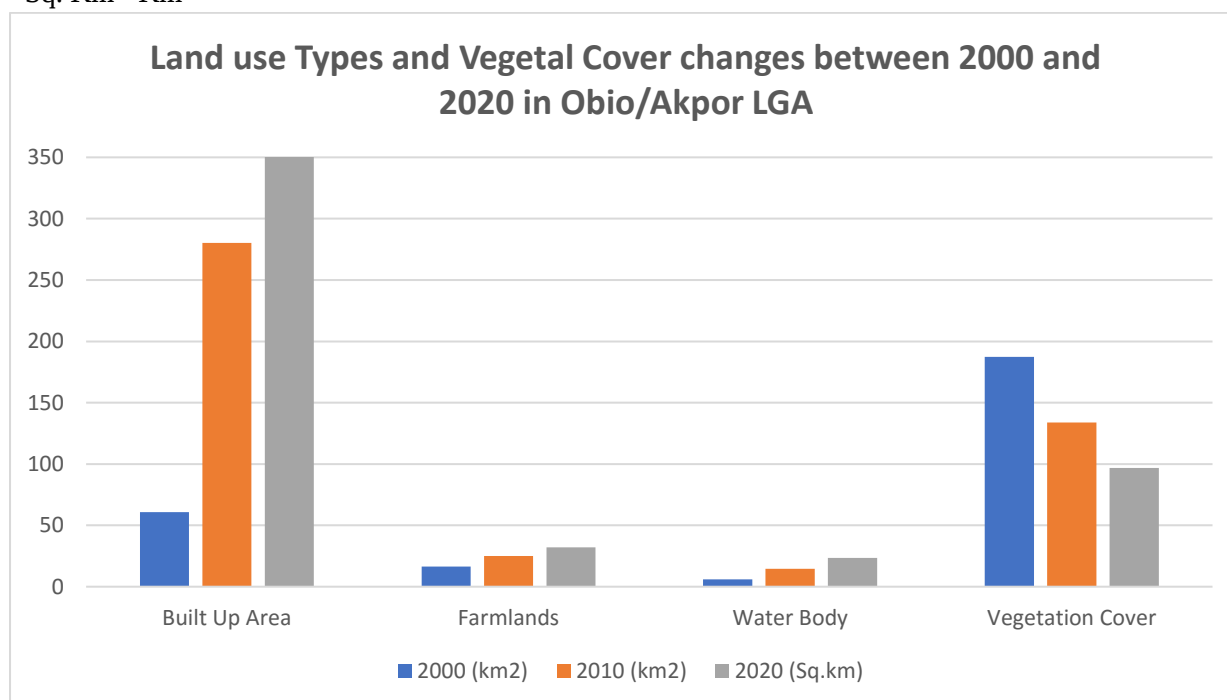


Figure 6: Land use Types and Vegetal Cover changes between 2000 and 2020 in Obio/Akpor LGA

Results showed that in the year 2000, built occupied a total land area of 60.69 km² which was 22%. Farmlands showed that 6% of 16.43 km² from the total land mass of 270.48 km² were taken up by farming practices scattered around the LGA. The information for the spatial coverage of water bodies revealed that it occupied 6.03

km² which was 2% from the total land mass of Obio/Akpor LGA in 2000. However, vegetal cover occupied the highest land area/spatial coverage which was 187.33 km² in 2000 and this was 69% of the total land makes in Obio/Akpor LGA.



The results compiled for the year 2010, revealed that built up area increased almost five (5) times its size. The recorded size for built up area in than year 2010 was 280.142 km² which now increased from 22% to 62%, showing a periodic change of 40% increase between year 2000 and year 2010. The spatial coverage for the scattered farmlands in Obio/Akpor LGA also increased from 16.43 km² to 25.149 km² which means that the periodic change was from 6% to 6%. This showed a periodic change of 0% between the year 2000 and year 2010. The spatial coverage of water bodies also experienced a slight increase from 6.03 km² to 14.66 km² between 2000 and 2010. This showed a periodic change from 2% to 3% which is 1% change between the year 2000 and year 2010. This may be attributed to the introduction of fish ponds by residents as a form of farming practices.

The area coverage of vegetal cover reduced significantly as it was recorded that the total land coverage of 187.33 km² in year 2000 was depleted to 133.94 km² in year 2010. This indicated a reduction in size by 53.39 km²

between year 2000 and year 2010. Thus, a drop in size from 69% to 30% which is 39% between year 2000 and year 2010 was observed for vegetation cover in the study area.

The spatial coverage of land use types and vegetation cover also varies in the year 2020. The results revealed that built up area land use increased further from 280.14 km² to 350.8 km² which was from 62% to 70% between year 2010 and year 2020. The size of farmland reduced increased from 25.15 km² to 32.13 km² between year 2010 and 2020. This may be attributed to the fact that forest has been cut down and awaiting to be built up are now used for farming in the interim.

The analysis for water body revealed than there was further increase between year 2010 and year 2020. It was recorded that water bodies increased from 14.66 km² to 23.43 km², it recorded a periodic change of 2% to 3%. However, the size of vegetation cover experienced further reduction from 133.94 km² in year 2010 to 96.71 km² in year 2020. It recorded a periodic change of 30% to 19%.



Table.8 Percentage Change in Land use types/ Vegetation cover between year 2000 to year 2020

Land use types	2000 (km ²)	2010 (km ²)	Change (km ²)	% change	2010 (km ²)	2020 (km ²)	Change (km ²)	% change	Total change (km ²)	Total % change (2000-2020)
Built Up Area	60.69	280.14	+219.45	+362%	280.142	350.78	+70.638	+25%	+290.09	+387%
Farmlands	16.43	25.15	+8.72	+53%	25.149	32.13	+6.981	+28%	+15.7	+81%
Water Body	6.03	14.66	+8.63	+143%	14.662	23.43	+8.768	+60%	+17.4	+203%
Vegetation Cover	187.33	133.94	-53.39	-29%	133.936	96.71	-37.226	-28%	-90.62	-56%

*- negative sign means reduction; + positive sign means increase



The information for the percentage (%) change and trend in land use change of identified land use types and vegetal cover is displayed on Table 4.5. The results showed that between year 2000 and year 2010 the change and percentage change of built up area land use were +219.45 km² and +362%, while the vegetation cover land use recorded a change and percentage change of -53.39 km² and -29%. Between year 2010 and 2020 the change and percentage change of built up area land use were +70.64 km² and +25%, while the vegetation cover land use recorded a change and percentage change of -37.23 km² and -28%. The total change between 2000 to 2020 shows that the change and percentage change of built up area land use were +290.09 km² and 387%, while the vegetation cover land use recorded a change and percentage change of -90.62 km² and -56%.

Discussion of Findings:

The study revealed that the land use change increased the cost of agricultural produce (crops) and its production, in the area from year 2000-2020, that there is a lack proper town planning and allocation of land in area and there is no sensitisation programme on the impact of land use on crop and soil agriculture in Obio/Akpor Local Government Area of Rivers State. It was also observed that factors that contributed to land use change in Obio/Akpor Local Government Area of Rivers State from year 2000-2020 are urbanisation, deforestation, population growth, poverty, weak land governance institutions and unsustainable land use. The study noted the impacts of land use change on crop and soil agriculture in Obio/Akpor Local Government Area of Rivers State from year 2000-2020 in which they are: increase in price of goods, natural resource degradation, shortage of farm lands, reduction of wetlands that support crops like rice and; blockage of natural waterways thereby hindering aquaculture and irrigation.

CONCLUSION

The study aimed at determining the impact of land use change on crop and soil agriculture in Obio/Akpor Local Government Area of Rivers state from 2000 to 2020. The specific objectives were to: assess the impact of land use change on crop and soil agriculture between 2000 to 2020, determine the level of awareness of the communities towards land use change and the threats (like increase in price of crops as well threat to food

security) faced by the environment due to over exploitation and; identify factors contributing to land use changes in Obio/Akpor Local Government Area.

The research was done using Cross-Sectional research design through the use of questionnaire for data collection on socio-economic points and remote sensing data. Frequency and percentages were used in analysis of response from questionnaire and the change and percentage change in the three years (2000, 2010 and 2020) used for the study were calculated.

From the study the findings are;

Land use change increased the price of agricultural produce in the area from year 2000-2020, that there is a lack proper town planning and allocation of land in area and there is no sensitisation programme on the impact of land use on agriculture in Obio/Akpor Local Government Area of Rivers State

Factors that contributed to land use change in Obio/Akpor Local Government Area of Rivers State from year 2000-2020 are urbanisation, deforestation, population growth, poverty, weak land governance institutions and unsustainable land use.

Findings also noted that the impacts of land use change on crop and soil Agriculture in Obio/Akpor Local Government Area of Rivers State from year 2000-2020 in which they are: increase in price of goods, natural resource degradation, shortage of farm lands, reduction of wetlands that support crops like rice and; blockage of natural waterways thereby hindering aquaculture and irrigation.

Understanding how the land use changes influence crop and soil agriculture will enable planners to formulate policies to minimize the undesirable effects of future land use changes. Land use changes as noted in this study increase deforestation, poverty, un-sustainable land use, leaching and increase in price of crops. The study concluded that if the trends of land use change continue, sooner or later there will be no forests remaining and the paved areas will also continue to increase in the study area. Since the current land-use practices are not desirable as they accelerate land-cover shrinkage, there is a need to deal with all the driving factors behind these changes to reverse the situation and restore the status crop and soil agriculture in the area.

Recommendations



From the research conducted, the following recommendations are proposed;

Information should be provided on the nature, causes and impacts of land use changes on crop and soil agriculture through seminars and awareness programmes.

Legislation that backs land use should be enforced by the appropriate bodies/organisations and adequate monitoring of land use should be ensured.

A harmonized legal and institutional framework should be created for the management land in the area.

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Questionnaire

Section A

Please indicate by a tick (✓) against your choice or fill the following required

Name of community resident in -----

Occupation:

Farmer ()

Trader/Business Person ()

Pensioner ()

Obayelu, A.E. (2014). Assessment of Land Use Dynamics and the Status of Biodiversity Exploitation and Preservation in Nigeria. *Journal for the Advancement of Developing Economies*, 7.

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Employed ()

Unemployed ()

Number of years' resident in Obio/Akpor LGA

1-5 years ()

6-10 years ()

11-15 years ()

16-20 years ()

21 years- above ()

Section B

Please tick the column which is appropriate to you using the following:

Yes, Maybe, No

Item No.	Item Description	YES	MAYBE	NO
1	Have you noticed the increase of the price of agricultural produce in Obio/Akpor Local Government Area of Rivers State from year 2000-2020?			
2	Does the Obio/Akpor Local Government Area lack proper town planning and allocation of land?			
3	Would you still want to live in this area for the next ten years?			
4	Are you aware of any sensitisation programme on the impact of land use on agriculture?			

Please tick the column which is appropriate to you using the following:

SA – Strongly Agree, A – Agree, D – Disagree, SD – Strongly Disagree

Item No.	Item Description	SA	A	D	SD
	Factors that contributed to land use change in Obio/Akpor Local Government Area of Rivers State from year 2000-2020				
5	Urbanisation				
6	Deforestation				
7	Population growth				
8	Poverty				
9	weak land governance institutions				
10	unsustainable land use				
	Impact of land use change on Soil and Crop Agriculture in Obio/Akpor Local Government Area of Rivers State from year 2000-2020				
11	increase in price of goods				
12	natural resource degradation				
13	shortage of farm lands				
14	Threat of natural disasters like drought, erosion and flood				
15	Reduction of wetlands that support crops like rice				
16	Blockage of natural waterways thereby hindering aquaculture and irrigation				