Mapping of Land use and Change Detection Analysis of Yewa South Local Government of Ogun State, Nigerian

Ojo, S. Aderemi[1], Joseph O. Olusina[2]*, Ben U. Ngene[1]
[1]Department of Civil Engineering, Covenant University, Ogun State. Nigeria.
[2]Department of Surveying & Geoinformatics, University of Lagos, Akoka. Nigeria.
*Email: jolusina@unilag.edu.ng

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Abstract: The intensive use of land through dynamic human activities have been a significant threat to the agricultural products in Nigerian and Yewa South Local Government Area. This has become a worrisome to environmentalists, and land use planners due to its impact on natural environments. Increasing population, human activities and the way people request on controlled land and soil resources for agriculture and expansion of building activities has also brought about the need to study the changes of land use land cover of the study area. It is on this note that the spatiotemporal change of land use/land cover (LULC) of the study area was mapped out with a classification technique based on Landsat images of 2000, 2006, 2011, 2015 and 2019. These images were imperiled to supervised and unsupervised classification for change detection using the maximum likelihood technique in Envi 5.0 software. The image was classifying into five different classes of LULC (vegetation, wetland, waterbody, agricultural land, and built-up). The LULC classification results revealed that the agricultural land use type was extensively used in the study area, with the percentage ranging from 33.82% (222.17km^2) in 2000 to 66 56% (436.84km^2) in 2011. Changes in the patterns of land use/land cover are a reflection of increasing anthropogenic pressure on the landscape. The result of classification shows that there was a substantial increase in the agricultural area and in the settlement area with a decrease in vegetation. The results obtained indicated that agricultural land conversion and modification were intensifying due to an increase in the human population. GIS and remote sensing technologies have proven to be a quick, low-cost and effective tool for studying the land use land cover change in an area over many years.

Keywords: Land use, Agriculture, Maximum Likelihood, Environment, Satellite imagery.

1. Introduction

Land use/land cover change , the allied environment loss and disintegration are major causes of species loss and of ecosystems. (Halmy et al., 2015). Such changes are caused by deforestation, overpopulation, pollution and global warming. that play a major part in the environment, and have momentous effects on the ecosystems and consequently have a great impact on the global climate changes (Foley et al., 2005). The rapid political, socio-economic, demographic, and agricultural experienced and Population growth during recent decades has led to an increased demand for land use/land cover for cereals, legumes and livestock products **(**Tiffen, & Gittins, 2004**).** The consequence is a change in land use/land cover (LULC) including the loss of forests, the expansion of agricultural land, settlements, and increased land degradation. Land degradation has already become an issue of growing concern throughout Nigeria and the study area. It is very imperative to distinguish between land use /land cover. Land use documents the system of using the land. It detailed the specific purpose of land such as transportation, building agricultural, commercial and residential, while land cover designates the physical land form such as forest, grassland, water, wetland, shrubs and developed. It shows an extent at which a region is covered by land and water. However, land use and land cover change are driven by non-interactions between. population, technology, and economy on one side and physical appearance of the land such as. soil, topography, and climate in another hand (Lambin et al., 2001)**.**

Among the local Government in Ogun State, Yewa South Local Government Area plays a dominant role in farming, especially in rice, cocoa, palm oil, and livestock. According to Ogun State website, Agriculture is the primary activity of Yewa South LGA, and they contribute about 70% of food produced to Ogun State. The practice of agriculture is through subsistence farming, and this causes the farmer with physical energy and rudiment tools such as cutlass and hoes. Moreover, only about 3% of arable land in the study area is under irrigation (Asare and Botchway, 2019). This prompt the state Government to the establishment of the Ogun/Osun river basin Authority to monitor farmers' activities in Yewa South Local Government Area. Although the farmers contributed about 70% of food production to Ogun State, they still found it difficult to adapt effectively to the environmental climate change, and their land is deteriorating. These changes have been a significant threat to agriculture. Even the clearing of land and bush burning is another threat that has given rise to greenhouse pollution in the atmosphere.

For proper planning, management and the use of land cover, data on the amount of resources of land is very important. It is also vibrant for the land manager, decision-maker, and urban planner to effectively manage the cost and method of land cover change detection as it can clearly divulge three-dimensional shapes of land cover change in a geographic zone and in a stable way. The use of satellite data is now prerequisite in monitoring the use of land and land-cover changes with a virtuous technique. This has been demonstrated by remote sensing techniques in urban mapping (Batty, 2008).

There are many techniques used for land use/land cover change detection. The study is trying to validate the use of multitemporal satellite imageries in change detection analysis in Yewa South of Ogun State

To achieve this, four short-term objectives was explored:

(i) different Land use/land cover types and pattern in Yewa South Local Government from 2000 to 2019 was classified
(ii) the extents of rapid change, degree of change from 2000 to 2019 was determined
(iii) past and present condition of land cover to understand the dynamics and movement of change was evaluated.
(iv) Finaly, the thematic maps and statistical data of the study area between three epochs 2000. 2006, 2011, 2015 and 2019, and the trends of change would be accomplished.

2. Methodology

This session is devoted to research materials and methods adopted in data processing. Analysis, display result and reportage. It involves image processing, image classification, LULC change detection and preparation of thematic map. The method employes the techniques of satellite Remote Sensing with Geographic Information Systems in the generation and analysis of geospatial data on LULC dynamics. Figure 2 illustrates the framework of the methodology process.

2.1 Study Area

The study is Yewa South Local Government in Ogun State, Nigeria. The area is situated in the Longitudes 2°47.4′E and 3°6.8′E of the Greenwich Meridian and Latitudes 6°37.8′N and 6°55.7′N of the Equator as shown in Fig.1. The mean annual rainfall and the mean annual temperature of the study area are about 14500.5 mm and 25.2°C respectively. It is neither very hot in summer nor horribly cold in winter. The topography is very unequal. Lowlands and small basins are the major landforms of the area. The vegetative cover are of the shrub lands and semi natural vegetation: also included in the vegetative cover are mixed forest, palms, herbs, and grassland lands (Ogunyemi et al., 2014).

The study region is populated with Residential, Commercial, Industrial, and Transportation Facilities. The soils type is clay and loamy Soils with erosion and water loss. The study area is gifted with satisfactory climatic settings for cultivated pursuits throughout the year. Its tropical nature ensures that the raining season starts in March and ends in November and it naturally precedes a dry season. Notwithstanding the huge outflow of fertile land with large deposit of inorganic soil make business and agriculture remains the largest employer of labour with a few people engages in mechanized farming while others engages in trading activities. The study area is confined by Ifo and Ado – Odo/Ota Local Government in the East Area while Ipokia Local Government in the West and in the north by Yewa North. The population of the study area is about 150,850 and the total area of of the study area is about 629.381 in square kilometers. The study area is alienated (Ilaro I, Ilaro II, Ilaro III, Iwoye, Idogo, Owode I, Owode II, Ilobi/Erinja, Oke – Odan and Ajilete town (Ojo et al., 2019).

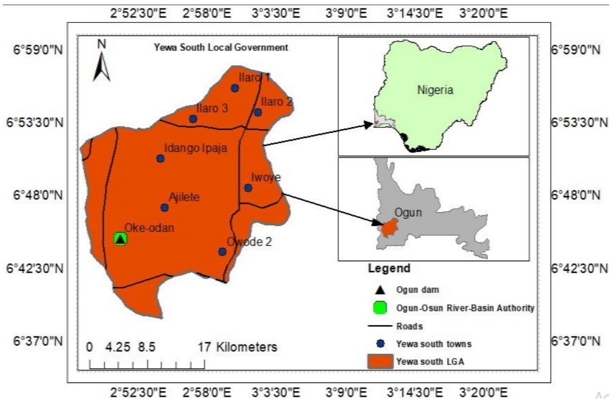

Figure 1. Map of Yewa South Local Government, Nigeria

2.2 Data acquisition

Data acquisition basically involves all the methods utilized in obtaining or acquiring data for the project. The Landsat 7ETM+ and Landsat 8 OLI/TIRS imageries with path and row of 191, / 55 covering the project area (Yewa South Local Government Area) were downloaded from the United States Geological Survey (USGS) website (www.earthexplorer.usgs.gov). The imageries were extracted to tiff formats and the detailed of image properties with a resolution of 30 m are summarized in Table 1.

2.3. Research Methodology

The framework of the methodological process for the image processing, image classification, change detection, and preparation of the thematic map is shown in Figure 2. The goal of image processing is to let images appear as if they were acquired from the same sensor.

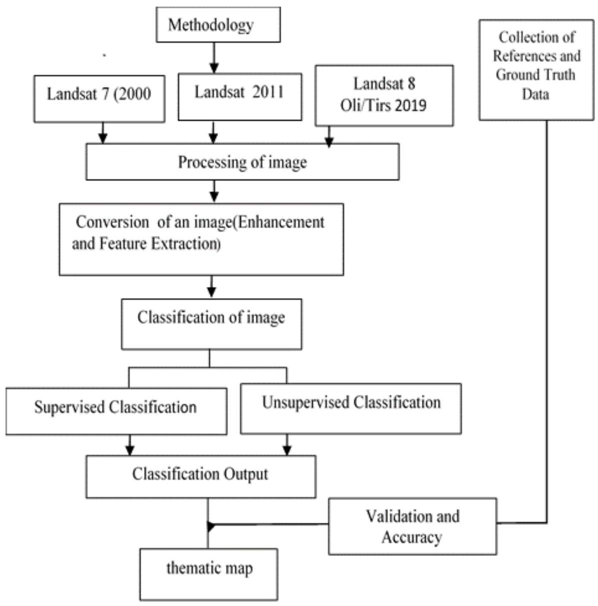

Figure 2. Digital image processing flow chart

Table 1. Sources of the Image and features

Data type	Date	Spectral resolution	Acquisition source	Map Projection	Datum	Data format	Spatial Resolution
LANDSAT 7ETM+	06/02/2000	7 bands	USGS	UTM Zone 31	WGS1984	GeoTIFF	MS: 30m Pan: 15m
LANDSAT 7ETM+	07/12/2006	7 bands	USGS	UTM Zone 31	WGS1984	GeoTIFF	MS: 30m Pan: 15m
LANDSAT 7ETM+	16/01/2011	7 bands	USGS	UTM Zone 31	WGS1984	GeoTIFF	MS: 30m Pan: 15m
Landsat 8 OLI/TIRS	26/12/2015	11 bands	USGS	UTM Zone 31	WGS1984	GeoTIFF	MS: 30m Pan: 15m
LANDSAT 8	22/01/2019	11 bands	USGS	UTM Zone 31	WGS1984	GeoTIFF	MS: 30m Pan: 15m

2.4 Method of Digital image processing (Image preProcessing)

Data processing is technique of converting the raw data into a reasonable layout. The metadata file of each scene (2000, 2006, 2011, 2015 & 2019) were loaded into ENVI environment (in ENVI 5.3) for processing. Pre-processing operations, sometimes referred to as image restoration and rectification, are intended to correct for sensor- and platform-specific radiometric and geometric distortions of data. These operations have been executed by the United States Geological Surveys (USGS) before availability for public access. Radiometric errors due to variations in scene illumination and viewing geometry, atmospheric conditions, and sensor noise and response have been corrected by USGS.

2.5 Image Enhancement and land use/ land cover Classification

The Landsat images were converted into digital format and enhanced image or some useful information were obtained from it. The enhanced images were classified using supervised and unsupervised classification scheme. For the improvement of classification accuracy, the spatial resolution of the multispectral images (layer-stacked images) of all the epochs of the study area were improved from 30 meters to 15 meters by executing a panchromatic sharpening process. The Panchromatic sharpening algorithm used in the ENVI environment was the Gram-Schmidt Spectral sharpening which employs the insertion of the low-resolution image (Multispectral image) and the high-resolution image (Panchromatic band). The image enhancement in the form of pan-sharpening was done for all the epochs .The subset of the multispectral images of the study area for this research was overlaid on the image scenes of the landsat products (Landsat 7ETM+ and Landsat 8 OLI/TIRS) and The subset of the study area was created,

The Nigeria administrative map as downloaded in form of shapefile from DIVA-GIS was brought into the ArcMap 10.3.1 environment where the clipping tool was used to extract the study area (Yewa-South Local Govt. Area) from the Nigeria shapefile map containing all the states and local government areas. This was done in preparation for the spatial subset tool utilization during image classification. , Training sites were created to identify homogeneous groups of pixels, which represent various land cover classes of interest in the study area. The combine process of visual image interpretation of tones/colours, patterns, shape, size, and texture of the imageries and digital image processing was used for the identification.(Adeoye et al.,2012). Supervised classification scheme was used to classified land use land cover types. The classes are vegetation, wetland, waterbody, built-up and agricultural land as described in table 2.

Table 2. Land use/Land cover classification scheme

S/N	Class	Description
1	Vegetation	Cropland and pasture fields, grassland, greenhouses, and fallow land
2	Wetland	Marsh or swamp
3	Waterbody	Sea, rivers, ponds and a small lake
4	Built-up	Residential, commercial and industrial areas,
5	Agricultural land/Crop land	Farmlands

After classification, the feature classes were transferred to ArcGIS 10.3.1 for editing, elimination of spurious clusters and refinement of the output. The exported classification files from ENVI software were added to the ArcGIS software environment for post-classification operations, which include statistics generation, editing of classes, and removal of misclassified sections due to the imperfection of the classification algorithms and aggregation of features. Due to the duration of the vectorization process in ENVI, a raster to polygon conversion tool was used in the ArcGIS environment. Each land cover class was converted to polygon

2.6 Ground truthing

Ground truth refers to the collection of information at a particular location. It allows satellite image data to be related to real features and materials on the ground. The collection of ground-truth data enables the calibration of remote-sensing data and aids in the interpretation and analysis of what is being sensed (Carter, 2010). Ground truth was done on-site. Two hundred fifty geographical coordinates of the ground points that are being studied on the remotely sensed digital image were collected with Garmin e Trex 20x *GPS* receiver with an instrument's accuracy of ±3 m. This was compared with the coordinates of the pixel being studied in the remote sensing image. This was used in the calibration, verification, and validation of remote sensing data and image classification assessment. Having completed the necessary editing and ground-truthing, specific colours were used for the classes as selected from the ramp of colours in ArcGIS. The colours include Quetzel green for wetland, Tsavorite green for agricultural land, Fir green for vegetation, Cretan blue for a waterbody, and Mars red for built-up as shown in figure 3.

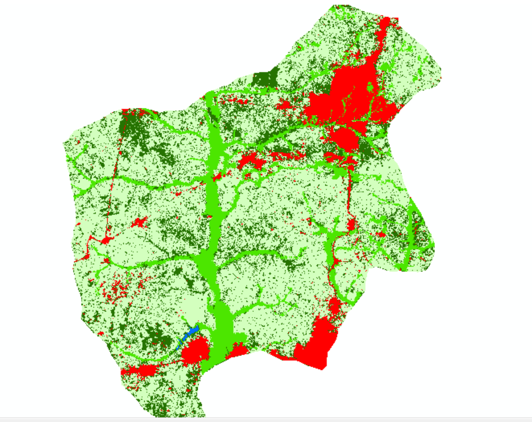

Figure 3. Edited classification for 2019

2.7 Accuracy assessment

Classification of LULCs in remote sensing Software, requires the user to ground truth the results through accuracy assessment (Foody, 2002). Accuracy assessment is use to determine level of classification of geographical data that are expected to be true. One of the method to quantity the accuracy of a classified map is to generate a set of casual points from the field data and relate it to the classified data in a confusion matrix. Since there has not been any comprehensive study of the LULC classification for the study area, there were none of the accuracy assessment check list data in the form of previous land use map. The Garmin GPS receiver was used to obtain the ground control points during field operations. The control points obtained from each classis were compared for the accuracy assessment. Confusion matrices and Kappa test were used to derive measures of classification accuracy (Rosenfield and Fitzpatrick-Lins, 1986). Kappa statistic was calculated using the formula reported as (Gwet, 2002; Viera and Garrett, 2005). Equation 1 was used to determine the accuracy assessment.

$$K = \frac{No.of\ k\ raters\ agree\ P(A) - no.\ of\ k\ rates\ P(E)}{1 - no.\ of\ k\ rates\ P(E)} \quad (1)$$

The accuracy of the classifications was assessed independently for each scene, using the available reference data for the respective target scene. The classification data was successful with overall accuracy ranges from 74% overall accuracy to 81% accuracy on average. The validation analyses were performed separately for 2000, 2006, 2011, 2015 and 2019. and the resultant pixel agreements are shown in tables 3 to 7.

Table 3. Accuracy Assessment for 2000

		Ground Truth				
2000	Class	Agricultural Land	Wetland	Waterbody	Vegetation	Built-up
Land Cover Classification output	Agricultural Land	13	0	0	5	0
	Wetland	1	7	0	4	0
	Waterbody	0	0	1	0	0
	Vegetation	3	1	0	14	1
	Builtup	0	0	0	0	1
	Class Total	17	8	1	23	2

Overall accuracy = 70.59%

Table 4. Accuracy Assessment for 2006

		Ground Truth				
2006	Class	Agricultural Land	Wetland	Waterbody	Vegetation	Built-up
Land Cover Classification output	Agricultural Land	19	0	0	8	0
	Wetland	0	8	0	0	0
	Waterbody	0	0	1	0	0
	Vegetation	1	0	0	10	0
	Builtup	0	0	0	3	1
	Class Total	20	8	1	21	1

Overall accuracy = 76.47%

Table 5. Accuracy Assessment for 2011

		Ground Truth				
2011	Class	Agricultural Land	Wetland	Waterbody	Vegetation	Built-up
Land Cover Classification output	Agricultural Land	24	0	0	6	1
	Wetland	0	6	0	0	0
	Waterbody	0	0	1	0	0
	Vegetation	0	0	0	12	0
	Built-up	0	0	0	0	1
	Class Total	24	6	1	18	2

Overall accuracy = 86.27%

Table 6. Accuracy Assessment for 2015

		Ground Truth				
2015	Class	Agricultural Land	Wetland	Waterbody	Vegetation	Built-up
Land Cover Classification output	Agricultural Land	15	0	0	4	0
	Wetland	1	6	0	2	0
	Waterbody	0	0	1	0	0
	Vegetation	8	0	0	12	0
	Built-up	0	0	0	0	2
	Class Total	24	6	1	18	2

Overall accuracy = 70.59%

Table 7. Accuracy Assessment for 2019

		Ground Truth				
2019	Class	Agricultural Land	Wetland	Waterbody	Vegetation	Built-up
Land Cover Classification output	Agricultural Land	22	0	0	4	0
	Wetland	0	7	0	1	0
	Waterbody	0	0	1	0	0
	Vegetation	6	0	0	5	0
	Built-up	0	0	0	1	4
	Class Total	28	7	1	11	4

Overall accuracy = 76.47%

2. 8 Land use/land Cover Change Detection Analysis

The classification shapefiles of the epochs were presented in ArcGIS in Figure 4 and the area was calculated using the "calculate geometry" function to populate the field with area values. The area values for all the classes were obtained and displayed in Microsoft excel worksheet for the calculation of the changes that have occurred over the years. The change detection statistics put into consideration the class totals, class changes, and the image difference presented in pixel counts, percentages, and area in square kilometers.

2.9 Change Detection and Analysis

The procedure of Rawat and Kumar (2015) was used to carry out a pixel-based comparison to achieve a post-classification detection analysis for the period of study (2000 – 2019), Five different lustrum image data were compared. A change matrix was generated using Envi 5.3 software (Weng, 2001) and the overall result in each category of 2000, 2006, 2011, 2015 and 2019 were compiled, respectively.

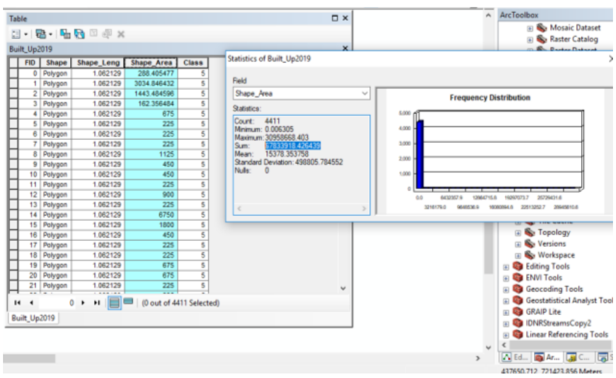

Figure 4. Calculate Geometry and Statistics for Area computation

2.10 Land use/land cover change

To obtain the magnitude of Land use change, the following formula are used: (Othow, Gebre, & Gemeda,2017)

$$\text{Percentage cover per class} = \frac{\text{count per class}}{\text{summation of count}} \text{ x } 100\% \quad (2)$$

$$\text{The magnitude of change} = \Delta_2 - \Delta_1 \quad (3)$$

The yearly rate of LULC change for each land-use type, R (km^2/year), as given by

$$p\% = \frac{(\Delta_2 - \Delta_1)}{\Delta_1} \, x \; 100\% \quad (4)$$

Where p% represents the percentage change in the area of land use and land cover class type between the initial time Δ_1 and time period Δ_2
Δ_1 = area of land use and land cover type at the initial time,
Δ_2 = area of land use and land cover type at final time

3. Results

3.1 Land Use/ Land Cover maps

Five different classes of land use/land cover maps were classified successfully with overall accuracy ranges from 70% to 86%. All LULC map are colorized to illustration the changes in LULC classes between year 2000 and 2019, as well as whether the class was of a "change" or "no-change" type. From the Land Use Land Cover (LULC) maps, a better understanding of the current landscape and land utilization aspects of the environment would be determined. The land use/land cover maps are shown in Figure 5 to Figure 10.

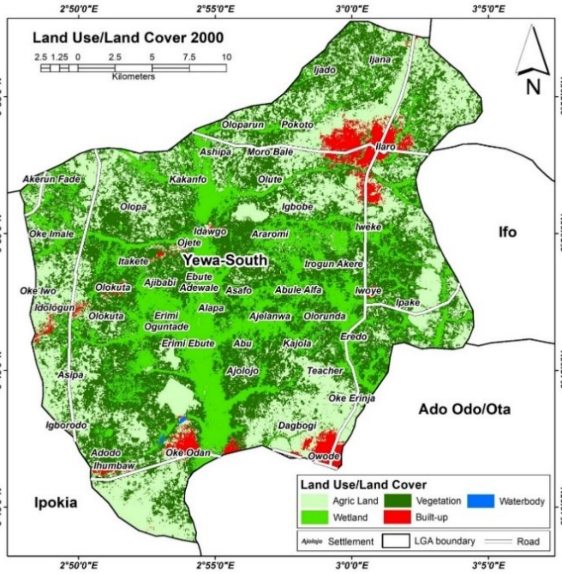

Figure 5. Land use/land cover map showing the spatial pattern and dynamic for the year 2000.

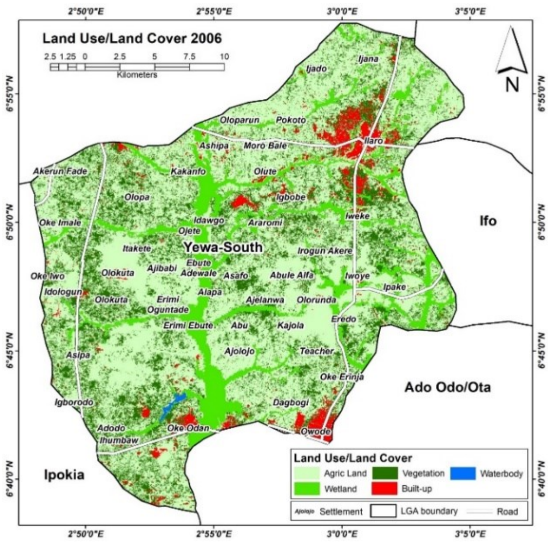

Figure 6. Land use/land cover map showing the spatial pattern and dynamic for the year 2006.

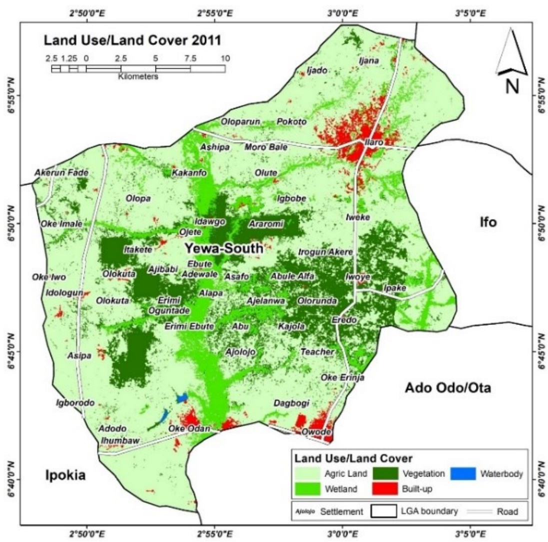

Figure 7. Land use/land cover map showing the spatial pattern and dynamic for the year 2011.

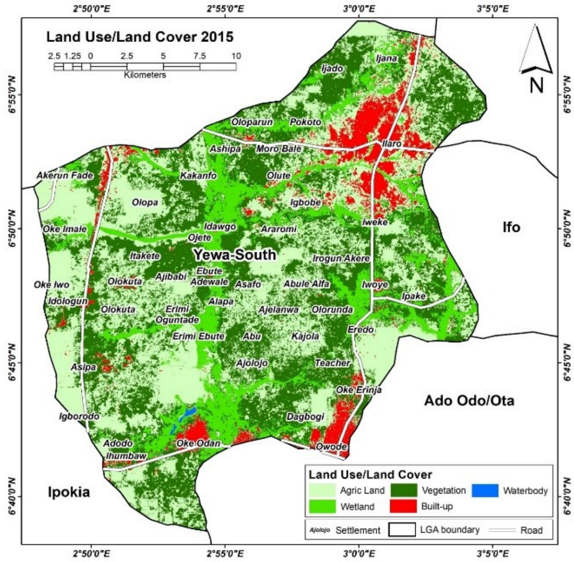

Figure 8. Land use/land cover map showing the spatial pattern and dynamic for the year 2015.

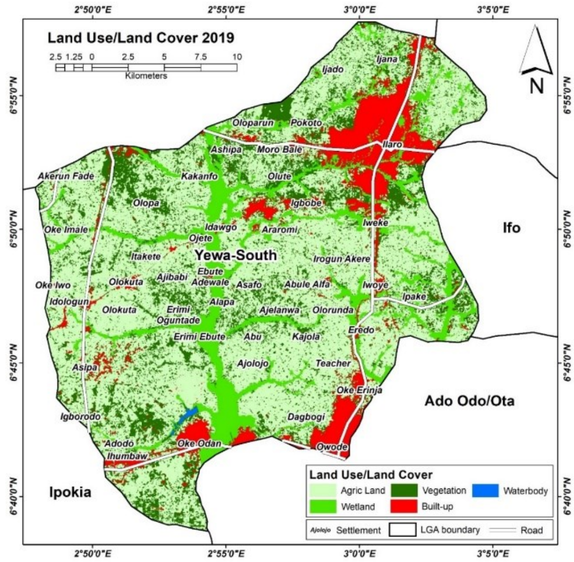

Figure 9. Land use/land cover map showing the spatial pattern and dynamic for the year 2019.

Figure 10 to figure 12 shows the spatial pattern and dynamics of land cover between year 2000 to 2019. The area, percentage of change, the annual rate of change in Kilometer per year as well as Land use/land cover in (km^2) and % changed during the last nineteen years (2000-2019) in Yewa South Local Government Area.

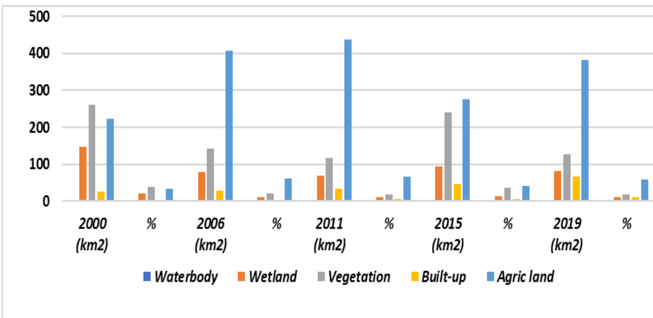

Figure 10. Area and percentage of change in different land use/land cover categories in Yewa South Local Government Area between year 2000 to 2019

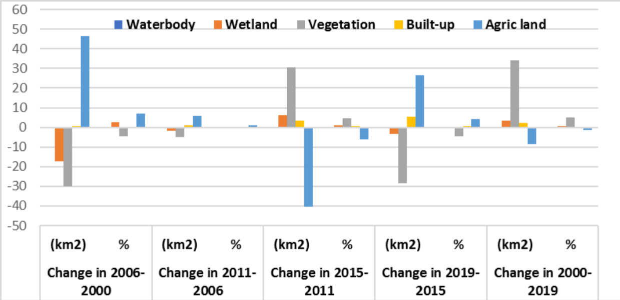

Figure 11. Land use/land cover change in (km^2) and % changed between years 2000-2019 in Yewa South Local Government Area

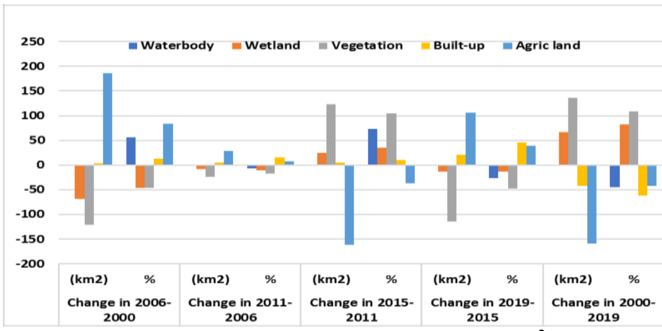

Figure 12. Annual rate of change in LULC (km^2/year) of the study area

Table 8. Area and percentage of Land use/land cover change in Yewa South Local Government

Land cover	2000 (km^2)	%	2006 (km^2)	%	2011 (km^2)	%	2015 (km^2)	%	2019 (km^2)	%
Waterbody	0.318	0.05	0.495	0.08	0.461	0.07	0.797	0.12	0.582	0.09
Wetland	147.100	22.39	78.044	11.88	69.147	10.53	93.643	14.26	80.527	12.26
Vegetation	262.012	39.89	141.346	21.52	117.269	17.87	240.043	36.54	125.974	19.18
Built-up	25.281	3.85	28.377	4.32	32.643	4.97	46.743	7.12	67.834	10.33
Agric land	222.174	33.82	408.453	62.10	436.836	66.56	275.570	41.96	381.764	58.14
Total	656.885	100.00	656.715	100.00	656.356	100.00	656.796	100.00	656.681	100.00

Table 9. Illustration of Land use/land cover change in (km^2) and % changed

Land cover	Change in 2006-2000		Change in 2011-2006		Change in 2015-2011		Change in 2019-2015		Change in 2000-2019	
	(km^2)	%	(km^2)	%	(km^2)	%	(km^2)	%	(km^2)	%
Waterbody	0.18	55.66	-0.03	-6.87	0.34	72.89	-0.22	-26.98	-0.26	-45.36
Wetland	-69.06	-46.94	-8.90	-11.40	24.50	35.43	-13.12	-14.01	66.57	82.68
Vegetation	-120.67	-46.05	-24.08	-17.03	122.77	104.69	-114.07	-47.52	136.04	107.99
Built-up	3.10	12.25	4.27	15.03	4.33	10.22	21.09	45.12	-42.55	-62.73
Agric land	186.28	83.84	28.38	6.95	-161.27	-36.92	106.19	38.54	-159.59	-41.80

Table 10. Annual rate of change in LULC (km^2/year) of the study area

Land cover	Change in 2000-2006		Change in 2006-2011		Change in 2011-2015		Change in 2015-2019		Change in 2019-2000	
	(km^2)	%	(km^2)	%	(km^2)	%	(km^2)	%	(km^2)	%
Waterbody	0.04	0.01	-0.01	-0.001	0.08	0.01	-0.054	-0.008	-0.01	-0.002
Wetland	-17.26	2.63	-1.78	-0.27	6.12	0.93	-3.28	-0.50	3.50	0.53
Vegetation	-30.17	-4.59	-4.82	-0.73	30.69	4.67	-28.52	-4.34	34.01	5.18
Built-up	0.77	0.12	0.853	0.13	3.53	0.54	5.272	0.803	2.240	0.341
Agric land	46.57	7.07	5.677	0.892	-40.32	-6.15	26.549	4.045	-8.400	-1.280

4. Discussions

4.1 Area change and rates of change in land use/land cover types

The results of the land cover maps shown the spatial pattern and dynamic of the study area from 2000 to 2019 are in figures 5 to 9, while agricultural land use/land cover statistics and change in magnitude and annual rate are shown in tables 8 to 10. The study clasified five periods of land use /land cover based on the supervised and unsupervised classification method. Tables 8 to 10 showed the time-based changes in waterbodies, wetland, vegetation, built up land and agricultural land. These were obtained from five periods Landsat images. The Land cover pattern has shown much and steady increase for some classes. The result of this finding is also indicated that large-scale agriculture is their prominent work in the study area and leading to forest destruction. From the classification, it is cleared that agric land type was extensively used in the study area with percentage ranging between 33.82% and 66 56% and from 2000 to 2011. The trend in Agric land had an apparent decrease in year 2015 to 41.96%. and later pick up to 58.14% in 2019. This might be due to the increased in population. The water bodies was steadily increased throughout the past nineteen years from 2000 to 2019. This was due to increase in rainfall and this motivate the farmaer to cultivate more product in the farm. On the contrary, wetland decreases from 2000 with 22.39% to 2011 with 10 53% and this contribute greatly to the consistently increased in agriculture and built-up for residential. The rapid increasd in the population during the year study period was aattributed to the expansion of farmland where many farmers obtained land for for large scale agriculture. One can deduce that farmland is the most predominant LULC category in the study area.

Vegetation land cover has a total area of 262.012km^2 at (39.89%) of study area in2000 and later in 2006 and 2011 it shows a steady declined from 141.346km^2 (21.52%) to 117269km^2 (17.87%) The degree of the land use land cover type from 2000-2006 is (-120.666) with change in percentage (-18.37%) and annual decreasing rate (-4.59/year). Similarly, change in percentage of this land cover category between 2006-2011 has also shown a thesame trend and it decreased to (-24.077km^2) at percentage rate (-3.65%) with annual decreasing rate (-0.73/year) in the study area. But there is an increased of 122.774km^2 at percentage rate of 18.67% between 2011-2015 with annual increasing rate of change of 4.67%/year and later decreased in magnitude of -114.069km^2 at percentage rate of -17.36% between 2015-2019 with annual decreasing rate of 5.18% per year. This stagy declined in vegetation cover could be best linked to data obtained. The result of this finding is also indicated in the studies conducted that large-scale agriculture is their prominent work in the study area

4.2 Abridged discussion on the Land cover variation

The Land cover pattern has shown much and steady increase for some classes. The built-up class which consists of the built-up and bare land was adopted. The built-up class has increased steadily across the years due to urbanization in recent times. The Waterbody increased between 2000 and 2002. The waterbody in year 2000 was covered by wetland or hyacinths resulting in reduced coverage of the waterbody. The variation in the waterbody area was due to the fluctuation in the wetland coverage over the water. The process of eutrophication (growth of plants in water) resulting from anthropogenic activities such as farming caused the trend in the waterbody changes. The wetland has decreased over the years due to the steady increase in vegetation class and increased built-up. The sudden rise in 2015 was due to the heavy rainfall experienced in 2014 which led to flooding thereby restoring the wetland which had been lost over the years. Increased Agricultural land between 2000 and 2011 was due to the increased farming activities between the period as farmlands constituted a major part of the vegetation class. Further variation was due to socio-economic development resulting from land fallowing. Farmers sometimes leave the land to fallow and later proceed with farming activities. The major feature identification pattern that distinguishes it from other forms of vegetation is the pattern which interprets the recession of farming activities

Though, there was Increased in Agricultural product between 2000 and 2011 but that increment is not up to the expectation required due to the intensive use of land through population increase, dynamics human activities, and climate changes, there is a direct significant impact on the surrounding ecosystem. Based on the findings from this study, it is recommended that Governments at all levels should raise awareness campaigns on adaptation strategy in rural areas through meetings, local radio, framing messages, drama, flyers, posters, workshops, and video, amongst others to improve in their farming activities. Governments at all levels should encourage communities to improve on land clearing methods and stop deforestation and should cultivate the land without completely depleting soil resources and protect crop canopy. It is essentially recommended that a comprehensive land information management system of the study area should be put in place and integrated with the general land use plan of Ogun State and implemented effectively. Such a land information system should, as a matter of concern, constitute a significant factor of land-use change and integrate them accordingly.

5. Conclusions

The present study highlighted the consequence of land use/land cover change detection method in understanding the ecological conditions that have occurred due to human activities in the study area. The study covered a period of nineteen years from 2000 to 2019 during which significant environmental, vegetation and human changes have occured. The study established that the land use and land cover practices in the study area have greatly changed within the pass 19 years. The events of land use were more to agricultural production since the area is an agrarian community. Conclusively, the use of Remote Sensing (RS) and Geographical Information System (GIS) are very useful to evaluate spatial phenomena over time scale which is not feasible to try using conventional mapping methods

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