

CHAPTER FIFTEEN

A GIS BASED ANALYSIS OF URBAN ENCROACHMENT INTO AGRICULTURAL LAND IN UYO, SOUTH EASTERN NIGERIA.

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INTRODUCTION

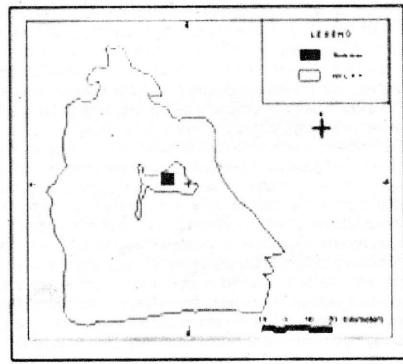
wo-thirds of the world's population is expected to live in urban areas with 80% of the urban residents living in developing countries by 2025 (Ifpri, 1996). This exploding urbanization means both good and bad news. On the one hand is the fact that urbanization constitutes to the national economic and social development of nations. However the speed of urbanization makes it impossible for governments to follow the growth with water, food, energy, housing and other basic amenities.

The link between urbanization and agricultural development has long been established. According to ERS (2002) urbanization brings high rate of growth in land values, increased marketing opportunities, increased access to labour, increased amenity values of farmland and farm assets, and provision of potential retirement income to farmers. That urbanization provides economic benefits to agricultural producers is undisputable, but, there are also negative consequences. Conversion to urban uses is largely irreversible as rural land uses once converted to urban seldom revert to rural. Also continued encroachments of new urban areas into agricultural regions create tension between the new inhabitants and the agricultural production operative that struggle to survive in the same location (nationalaglawcenter, nd; ERS, 2002).

Loss of farmland as a result of urbanization has spurred in most countries

farmland preservation as a result of public concern for food security, preservation of rural lifestyle, environmental protection and the protection of urban sprawl (nationalaglawcenter, nd). For an example, there is growing concern about the disappearance of farmland in some parts of the United States of America (USA). Interest in protecting farmland arises form market and non-market benefits (ERS, 2002). Non-market amenities that have often been ignored include:

- Environmental amenities: open space, soil conservation biodiversity, wildlife habitation, recreational opportunities, scenic vistas, isolation groundwater recharge.
- Rural development amenities: rural income and employment, viable rural communities, diversified local economy,
- Social amenities: maintaining traditional country life, maintaining a small farm structure and maintaining cultural heritage.



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Monitoring of environmental alterations often involve the description of vegetation which may be combined with land use cover monitoring to produce land cover maps (Marsh, 1998, p 338). The aim of such an exercise is to document the distribution and makeup of land use cover at any point in time. Monitoring land use change through time usually involve the use of land use maps, aerial and satellite imageries which reachers use to compare land use patterns for one time period with another based on available reference materials. In recent years applications of Remote Sensing (RS) and Geographic Information System (GIS) techniques have allowed the use of efficient tools for rapid and effective digital data analysis suited to modern land use planning (Delorme, 1998). This is because modern approaches to land use change detection in a more complex and rapidly changing environment like an urban center often involve the use of the computer. Studies like Nzekwe (1999) and Adeniyi (1980) illustrate this.

Nzekwe (1999) used two sets of data (1973 aerial photograph and 1994 satellite imagery of SPOT Xs on the scale of 1:25,000 and 1:50,000 respectively) in the study of change detection in Badagary area of Lagos. Two maps produced were digitally analyzed by GIS techniques to show that built up area increased by 31.8% while land cultivation fell by 41.8°. Adeniyi (1980) combined computer techniques with manual interpretation in the change detection studies of metropolitan Lagos (See Lo, 1986). The result showed that residential land use change increased rapidly with the lateral expansion of the city.

Akpan (2003) investigated the rate of expansion of urban land use and its impact on agriculture in Uyo. He examined the aerial photograph of 1969, 1978 and 2001 and came to a conclusion that expansion of the urban center had consumed farmlands. The implication of this expansion on market gardening in Uyo urban has been investigated by Joe (2003) and Ukpong and Moses (2001).

Ukpong and Moses (2001) investigated the effect of intensive cultivation of talinum triangulare crop on the nutrient status of market golden soils in Uyo. They link the increasing importance of market gardening in Uyo urban

to the rapid increase in population of the city. Diminishing land area available for agriculture has led to reduction of land follow form 10 to 20 years, to 5 years, hence the continuous cropping of available land in order to feed the ever growing population. The study concluded that regular applications of mineral fertilizers and organic had benefited soils in the city.

AIM AND OBJECTIVES OF THE STUDY

The main aim of this paper is to analyze the urban encroachment into agricultural lands in Uyo urban using GIS techniques. The objectives of the paper include: to map the land use cover of the study area for two sequential years, 1978 and 2004; to estimate the land use change for the two time periods; to monitor the agricultural changes in the two time periods, proffer reasons and implications for the changes and suggest remedial measures

STUDY AREA

The area of study for this work is Uyo urban. It is the capital of Akwa Ibom State. Uyo assumed this status since 1987 when Akwa Ibom State was created. Uyo is located at the central part of Akwa Ibom State and lies within latitudes 4°.50′N and 5°7′N and longitudes 7°45′E and 8°05′E. Uyo is bounded on the north by Itu Local Government Area (LGA), on the east by Uruan and on the South and west by Ibesikpo Asutan and Abak LGAs, respectively.

The relief of the area is almost flat except towards the northern extreme of the town where there is a ravine. The area is drained by Ikpa River that flows from the North to the Southern part of the area.

Uyo is within the man modified rainforest zone now called oil palm bush. In the urban center, this vegetation type is disappearing owing to intense use of land for farming road construction, building of houses etc.

Uyo has two distinct time seasons namely: dry and wet seasons. While the dry season starts from November to March, the wet season starts from April to October. Specifically, form the 18 year data of the University of Uyo Metrological Station (1982-2000) the annual rainfall ranges from 1905mm to 2668.7mm with a mean annual value of 2248.2mm. in terms of temperature; the area records the mean monthly value of 26.8°C

MATERIALS AND METHODS

In an attempt to ascertain urban encroachment into agricultural lands in Uyo , the following data sets, sources, methods of collection and analysis were utilized.

Datasets and sources

- Aerial photographs: This study utilized aerial photographs of Uyo urban collected form the Akwa Ibom State Ministry of Lands and Housing. The photographs used were for 1978 and 2002. The land use maps produced were derived from these photographs.
- ii) Field survey: In order to geo-reference the maps produced form the aerial photographs, global positioning system (GPS) was used to collect data on the coordinates of some known points. The coordinate system used here was Universal Transferred Mercator (UTM).

DATA CAPTURE GEO-REFERENCING

The aerial photographs were arranged and interpreted and the results were used to produce the analogue land use maps for 1972 and 2002. The maps were then scanned into the computer and accessed in ArcMap GIS where the geo-referencing (using the GPS coordinates) was carried out.

MAP DIGITIZING AND COMPILATION

In order to prepare a digital land use map of the area, the geo-referenced maps were then digitized in Arcview 3.1 version. Here also, the actual map compilation was done, the result of which are the land use maps shown in Figures 2 and 3.

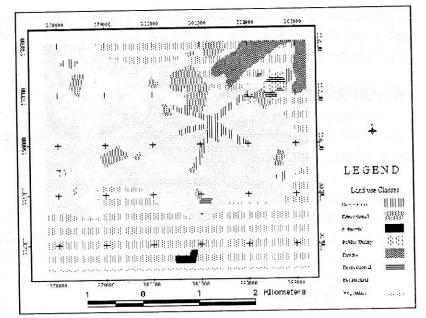


FIG. 2: UYO URBAH SHOWING LANDUSE TYPES (1978)

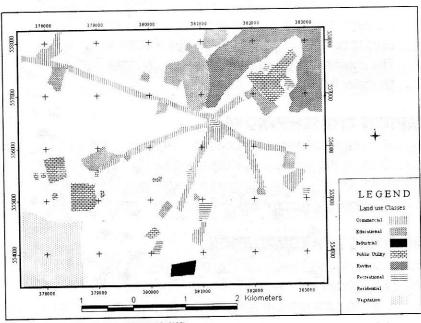


FIG.3: UYO URBAN SHOWING LANDUSE TYPES (2002)

MAP OVER LAY

This is an aspect that has to do with land use change detection analysis. To achieve this, the land use map for 2002 was over laid on that of 1978 thus producing a land use change map shown in Figure 4.

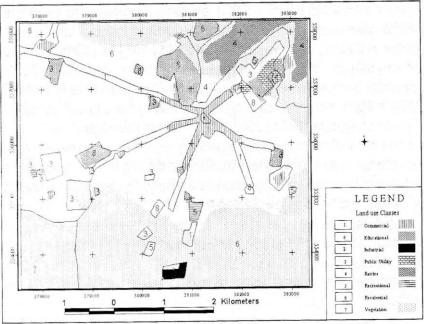


FIG.4: UYO URBAN SHOWING OVERLAY OF 1978 & 2002 LANDUSE

ode	Landuse	1978		2002		Land use change	
		Area (km²)	%	Area (km²)	%	Are (km²)	%
	Commercial	0.81	2.82	1.64	5.71	0.83	29.43
	Industrial	0.10	0.35	0.12	0.42	0.02	20
-	Public utility	0.27	0.94	1.00	3.48	0.73	27.37
	Ravine	1.00	3.48	1.85	6.45	0.85	85
	Recreational	0.100	0.35	0.21	0.73	0.11	110
	Residential	14.61	50.90	19.13	66.66	4.52	30.94
	Vegetation	10.59	36.90	1.43	4.98	-9.16	86.50
	Educational	1.22	4.26	3.29	11.46	2.07	48.59
	Total	28.70	100	28.70	100	1. 1. 1. 1.	1
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Source: Image Classification Min. of Lands and Housing, Uyo/Authors. GIS Analysis: Authors.

RESULTS AND DISCUSSION

Figures 2 and 3 show the land use cover map of the study area for 1978 and 2002. The analysis summarized in Table 1 shows a total area coverage of 28.7km² comprising eight (8) land use classes. In 1978 while residential land use covered 140.61km² (50.9%), by 2002, it increased to 19.13 km² (66.66%). Vegetation covered 10.59km² (36.9%) of the total land area in 1978 but in 2002, it decreased to 1.43km² (4.98%). The ravine occupied 1km² (3.48%) in 1978. This increased to 1.85km² (6.45%) in 2002. Commercial land use increased form 0.81km² (2.82%) in 1978 to 1.64km² (5.71%) in 2002. Increases were also registered by Educational, Industrial and public utility from 1978 to 2002 in term of area coverage.

Form the analysis above only vegetation registered a decrease in area hence change in a negative direction. Thus confirming the trend worldwide of the loss of farmland and vegetation as a result of growth in urbanization (ERS, 2002, and National law Center, nd.)

In USA, the massive urban sprawl that emerged after world war II resulted in the destruction of most existing vegetation. Initially according to March (1998), much of the growth was absorbed by abandoned farmland, but as the development rate and land values increased, active farmland were equally absorbed.

Of importance to policy makers is the fact that the developing world is now experiencing urbanization in the way developed countries did in the past with the urban population doubling and tripling, (Ifpri, 1996). This has meant the destruction of farmlands and vegetation as seen in the USA is the past.

In Nigeria, according to Inyang (2002) food production rates have failed to match the phenomenal population growth rates. Hence, the unchecked urban encroachment into the vegetation in Uyo is cause for concern. The result of the over lay analysis in Figure 4 reveals that residential and commercial land use and the ravine have deeply eaten into areas that could be used for agricultural purposes.

As the city grows, continuous destruction of farmlands has resulted. This trend has continued in the past few years. For an example, the execution of government-backed projects including the relocation of the motor parks to the outskirts of the town and the AKIIPOC Shelter Afrigue Housing Estate

at Mbiabong Etoi has meant the destruction of farmlands and allied vegetal cover.

A change of approach is required as in the case of industrialized countries of the world that has witnessed a less all-consuming approach towards the landscape in suburban development in recent years (March, 1998). This has been stimulated by he enactment and enforcement of environmental regulations especially wetland and protected species ordinances; and, public pressure particularly from nongovernmental organizations. Also there has been the realization by experienced developers that features like woodlots, wetlands and old hedgerows actually have economic value (March, 1998).

CONCLUSION AND RECOMMENDATION

Unchecked encroachment of urban development into agricultural lands has both social and economic implications hence, there is the need for the conscious monitoring of the urban space so as to minimize the negative consequences of urban development. Vegetal buffer zones should be created around our cities to serve as a check against encroachment. An active civil society is also needed so that appropriate organs of government would enact adequate regulations that would help minimize the destruction of vegetation around our urban centers.

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