URBAN AGRICULTURE AND WETLANDS UTILISATION IN OSUN STATE: A POLYCENTRIC ENVIRONMENTAL PLANNING PERSPECTIVE

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Abstract

Wetlands represent environmental resources that need to be utilized and conserved yet it is one of the most threatened components of nature. To address this challenge using a polycentric planning approach, this study evaluates the urban agriculture and wetland utilization in Osun State, Nigeria. One hundred and fifty questionnaires were administered to wetland users using snowballing method. Information obtained with the questionnaire includes the level of education of respondents, the purpose of utilization of wetlands, monthly income from wetland utilization, and the level of environmental education of the users. Information obtained was subjected to descriptive statistics such as percentages and frequency counts. It was observed from the study that about 60% are male while the predominant use of wetlands is fish farming. To optimize the use of wetlands as well as conserve the same, polycentric planning is advanced.

Keywords: Urban agriculture, Wetlands, Polycentric planning, Osogbo

1. Introduction

The popularity of urban agriculture has increased considerably in the last few years as concerns about the environment have combined with increased interest in health and community-building issues, giving rise to support for food systems in metro areas as an integral part of a sustainable development path for cities (Hendrickson & Porth, 2012). City planners, managers, advocates and practitioners are also taking advantage of this rise to provide alternatives to the usage of wetlands to aid sustainable local or regional food systems thus providing food, employment, beauty and alleviating poverty for their growing populace. The increasing appreciation of wetlands can be traced to their identification as a potential resource for all-season farming, poultry support, market gardening, fish farming, green pastures for grazing animals, and raw materials for handcraft (Gasu *et al.*, 2007; Mashi & Ishaya, 2008; Fadare *et al.*, 2010; Gasu, 2011; Gasu, 2022). Wetlands are highly productive and valuable ecosystems as they provide several ecological and economic (goods and services) functions that are of value to humans (Barbier, 1991).

Wetland is known as *Fadama* in Hausa, *Akpauru* in Igbo and *Akuro* in Yoruba (Gasu, 2022). Wetlands offer sanctuary to a wide variety of plants, invertebrates, fishes, amphibians, reptiles and mammals, as well as to millions of both migratory and sedentary waterbirds (de Groot 2007). They are also important global resources, sinks and transformers of various elements in the earth's

various biogeochemical cycles (Mitsch & Gosselink, 2000; Greb & DiMichele, 2006). By so doing they manage greenhouse gases, especially by acting as significant carbon sinks and thus buffering climate change impacts. Considering these immense climatic regulatory functions of wetland, it needs to be conserved. It needs to be emphasized that conservation is not against development. It only supports lifestyles that mother earth can support. Conservation is about managing the biosphere not only for the benefit of people living today but for future generations. Thus, it is advisable to integrate conservation with development efforts.

Osun State is one of the states with growing urban centres in the country. It has been observed recently that increased trend of urbanization in Nigeria's urban centres including those in Osun State has induced urban land speculators to sand-fill wetlands for the purpose of land reclamation and thus disturbing ecosystemic balance. This constitutes antagonistic postures to achieving conservation of natural resources (Akinola & Funsho, 2012). There is no doubt about the need for sand-filling some wetlands and swampy areas but it has to be planned and controlled. Indiscriminate sand-filling of wetlands is a notorious practice in Osun, which constitutes a serious threat to wetland potentials and ecosystemic balance. Encroachment of development into spiritual consecrated areas of Igbo Ifa in the Okebaale area of Osogbo, expansion into the peri-urban areas utilised for agricultural purposes have further threatened the wetlands. In Osogbo Metropolis, especially in Oke –Baale axis, most wetlands have been converted to solid land through sand-filling. Invariably, this has accentuated disastrous flooding in area.

This paper therefore, against this background, not only argues for the enhancement of the socio-economic benefits and conservation of wetland in the state but also evaluates wetland utilization in the three major urban areas of the state – Osogbo, Ilesa and Ife. Using polycentric environmental planning, the paper particularly investigates how local people in the selected cities are demonstrating their entrepreneurship in utilizing wetlands for socio-economic livelihoods. This is done with a view to advancing conservation techniques using polycentric approach.

2. Literature Review

Wetlands represent environmental resources that need to be utilized and conserved. Carter (1981) defined wetlands as land transitional between terrestrial and aquatic systems where the water level is usually at or near the surface or the land is covered by shallow water. Terer, *et. al*., (2004) observed that in the world over, rivers, lakes, seas, oceans and the plants and animals associated with them are important to every culture on earth and form an explicit or implicit part of the religious and cultural heritage of almost all human cultures. Also, their rich physical and biological resources are exploited

for food, water, medicinal plants, fuel wood, materials for building and handcrafts. Wetlands cover at least 6% of the Earth. They contribute to the livelihoods of millions of people in Africa and Asia and are increasingly being used for agriculture as populations rise and upland areas become degraded.

Wetlands fall within the first component of three exogenous variables or context (biophysical/material conditions). A precise definition of what constitute wetlands is hard to come by but The Convention on Wetlands, a UNESCO-based intergovernmental treaty on wetlands adopted in Ramsar, Iran in 1971 provides a broad categorization. The RAMSAR Convention, as it is referred to, defines wetlands broadly as "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters (Davis, 1994). It went further to say that wetlands may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within the wetlands.

Worldwide, wetlands have been estimated to cover about 6% of the earth's land surface and are unevenly distributed across the globe and are found across every climatic region except the Antarctica (Millennium Ecosystem Assessment MA, 2007).They constitute between 1% and 16% of the African continent (Koohafkan, 1998) an area between 220,000 km^2to1,250,000 km^2 (Bullock *et al*, 1998). There are at least 131 million hectares of wetlands in Africa, and 286 million hectares in Asia (International Water Management Institute, IWMI, 2010). In Nigeria they cover over 24,009 km^2 (Kio and Ola-Adams, 1990) and have been estimated to about 2587.93 hectares in Ede region, Osun State of Nigeria (Gasu, 2011).

Although, only a small portion of these wetlands are suitable for agriculture, the goods and services they produce and the livelihoods they support are significant. Nigeria is richly endowed with abundant wetlands ecosystem, the majority of which are found in the Niger, Benue and Chad basins; fourteen (14) major wetland belts have been identified in the country. These includes: Sokoto-Rima, Komadugu Yobe, Lake Chad, Upper Niger and Kainji Lake, Middle Niger – Lokoja - Jebba – Lower Kaduna, Lower Benue – Makurdi, Cross River, Lower Niger, Niger Delta, Benin – Owena and Okomu, Lagos Lagoon and Lekki Peninsula, Lower Ogun River, Ologe Lagoon, Badagry and Yewa Creeks and the trans-boundary wetlands of the Upper Benue (Oyebande, *et al.*, 2003;Asibor, 2009).They support a wide range of economic activities that sustain significant proportion of communities around them (NEST, 1991). Wetlands are highly productive and valuable ecosystems possessing a high range of biodiversity. Corresponding to its diversity, it provides a wide range of goods and services

which makes its preservation a necessity (Brander,*et al.,* 2006).

Wetlands are very unique ecological and amongst the most productive ecosystems in the world, comparable to only rainforests and coral reefs (Gasu, 2011). They are important storehouses for numerous plants genetic material, including rice—the staple food plant on which more than half of the World's population depend (Ramza, 1971; Thompson, 1973; Chapman, 1977; Gopal *et al,* 1982; Edwards, 1990; Microsoft Encarta, 2006).Wetlands have equally been known to provide for the livelihoods of millions of people, food security and many goods and services; such as agriculture, flood regulation, retention and regulation of pollutants, water quality maintenance, breeding grounds for numerous genetic species, erosion control, animal husbandry, commerce, fish farming, tourism, mining, ecological principles that ensure a greater quality of life (Bush, 2000; Acreman & Hollis, 1996;Gasu, 2011). Costanza *et al.*, (1998) estimated the total global value of these goods and services provided by coastal areas and inland wetlands ecosystems to be US$15.5 trillion or 46% of the estimated total value of foods and services provided by all ecosystem worldwide.

The range of services rendered by wetlands is broad and strategic to the preservation of the natural ecosystem and human environment. For instance, wetlands aid in water filtration by removing excess nutrients, slowing the water allowing particulates to settle out of the water which can then be absorbed into plant roots. Wetlands also let pollutants settle and stick to soil particles, up to 70% of sediments in runoff. Some wetland plants have even been found with accumulations of heavy metals more than 100,000 times that of the surrounding waters' concentration. Odine, *et al.,* (2011) revealed that wetlands in Nigeria serve as a source of income for people that have livelihood activities such as farmers, fishers, resource collectors and those rendering services around it and if put to use properly, wetlands will help to an extent to solve the problem of food insecurity and poverty as it serves as a source of food and income. In addition to these, wetlands have recreational, historical, scientific, and cultural values.

Wetlands have archaeological, historical, cultural and scientific values. More importantly, they have recreational value contributing immensely to the tourism industry (Malan, 2010). It has been noted that painters and writers have used wetlands as their subject matter. Such artists are often joined by others with cameras and camcorders. The monetary value derived from the observation and photography of wetland-dependent birds is substantial. Coastal wetlands of Lagos state and the Niger Delta area attract a lot of people annually for recreational purpose.The hydrological functions of the wetlands have to

do with water runoff, water flows, around water recharge and discharge and flow systems, residence period of the water and turn over times which are closely associated with the control of water quality, nutrient cycling and the distribution and survival of certain plant and animal's species (Hollis, 1998; Mitsch,*et al*., 1994). Biogeochemical functions of wetlands include the transformation and cycling of elements, the retention and removal of dissolved substances from surface waters and accumulation of peats and inorganic sediments. These functions retain nutrients and other elements, improve water quality and affect aquatic and atmospheric chemistry (Sahagian&Melack, 1998).

Despite the ecologically and evolutionarily fascinating potentials of wetlands, they have been the least appreciated of all habitat types (Bush, 2000) and have therefore been under serious pressure of destruction from human activities especially human developmental quest for housing, unsustainable agricultural practices and construction (Gasu, 2011). Wetlands were estimated to cover about 2587.93 hectares in 1986 in Ede region but were reduced to 889.66 hectares in 2002 and have been estimated to reduce to 461.67 hectares in 2018 all attributed to human developmental activities (Gasu, 2011). According to the Ramsar Database, since 1900 about 50% of wetlands worldwide have been estimated to have disappeared. The situation has worsened since then with estimates showing that by 1999, 84% of Ramsar listed wetlands had been affected by ecological change, though in the first instance it was the temperate zone that was seriously affected. Since the 1950s, tropical and sub-tropical wetlands are the latest victims. It has equally been observed that despite their importance economically, aesthetically, ecologically and otherwise (Gasu, 2011) their presence connotes different things to different people for instance swamps conjure images of mosquitoes, leeches, smelly water and areas for dumping rubbish (Bush, 2000).

Odine, *et al.*, (2011) lamented that majority of the people whose livelihoods resonate around wetlands have little or no formal education and they lack the ability to learn new methods that will enable them optimize the use of the wetlands and maximize profit. This implies that their interaction with the ecosystem harms rather than enhance its ability to prosper. However, due to the higher sensitivity of the ecosystem to climate change and limited capacity for adaptation, coastal land and wetlands have been identified as among the ecosystems most vulnerable to climate change worldwide (Bates, *et al.*, 2008). Furthermore, climate change is only one way in which the environment and human activities are affecting wetlands. In addition, as observed by Schindler (2001) and Wrona, *et al.*, (2006), Victorian wetlands in Australia is already at risk of loss and degradation due to pressures arising from natural processes and human activities such as

drought, drainage, altered water regime and salinization. Climate change is therefore superimposed on to these non-climate pressures on wetlands.

Wetlands depend on, are shaped by and affect climate. Climate and wetlands are interconnected in complex ways and any change in either can induce a change in the other. Climate has an overall role in controlling physical, chemical and biological processes and species composition in ecosystems affecting their ecological structure, function and biodiversity. Significant and persistent changes in both the mean and the variability of climate variables determine the impacts of climate change on wetlands. They range from the direct effects of the changes in climatic variables (e.g. temperature, precipitation, and drought) to indirect effects through interactions with non-climatic drivers (e.g. land and water use, species interactions and disturbances such as bushfire, salinization and acidification). Rapid environmental changes typically affect the natural balance of species in the natural ecosystem. Wetland is one of the natural ecosystems that suffers from man's interference and degradable activities. The International Panel on Climate Change (IPCC) in 1996 declared that wetlands constitute some of the most important and threatened ecosystems in the world.

In the light of the rising global concerns on climate change, the encroachment on wetlands needs public intervention for proper regulation of its usage. That is why this study is designed to analyse the ways and manners wetlands in the study areas are utilized.

3. Study area and Research Methodology

The study utilised both primary and secondary data**.** The primary data which made use of standardised structured questionnaire were administered on key participants of wetland users in the three towns of Osogbo, Ilesa and Ile-Ife as shown in Table 1. The survey employed the snowball sampling method where a total of two hundred (200) questionnaires were administered and 150 returned for analysis showing a response rate of 75%. In the snowball method, the first wetland user was randomly selected while this led to the next user and he/she led us to the next user and systematically in that order the next led to the next until all the required wetland users were identified and interviewed. The secondary data was obtained from internet sources, journals, textbooks, theses and newspaper articles. Statistical analysis made use of descriptive and inferential statistics.

Table 1: Distribution of Questionnaires

Selected Cities	Frequency	Percent
Ilesa	46	30.7
Osogbo	70	46.7
Ife	34	22.7
Total	**150**	**100.0**

Sources: Authors' Field Work, 2023.

Of the one hundred and fifty questionnaires, 46.7% were administered at Osogbo, 30.7% at Ilesha while, the remaining 22.7% were distributed at Ile-Ife (Table 1).

4. Discussion of Findings

A. Socio-demographic Characteristics of Wetland Users in Osun State

As evidenced in Table 2, 60.3% of the respondents were male while 39.7% were female thus indicating that male respondents were more involved in the utilization of wetlands in the major towns in Osun State. Further findings show that 70.3% of the respondents were married; 24.3% single; 4.1% divorced and 1.4% were either widows or widowers. About 90% of the respondents have secondary education, while about 38% have post-secondary education. From this, one can deduce that the respondents are enlightened to have at least a faint idea of their environment.

The respondents are predominately farmers engaged in different varieties of agricultural practices (Table 3).Not less than 44% of them were involved in fish farming, about 41.3% are involved in vegetable cultivation, while the remaining 14.7% utilises wetland for both fishing and poultry. With experiences ranging from one to above 5 years in the business of wetland utilisation, about 68% of the respondents have additional sources of income aside their wetland related business. Of interesting, however, is that most (47.2%) of the wetland users have relied on this business for more than 5 years while only a few (about 20%) has joined in the last 2 years. While interviewed, reason for such is the decline in wetland resources due to continuous utilisation without replacement and urbanisation that has led to change in use of land. The inability of wetlands to financially compete with other land uses have led to their displacement. Also, the declining knowledge of the financial benefit of wetland resources have also led to a reduction in participants.

The study reveals that 30.7% respondents earned ₦26,000 - ₦35,000 per month on the wetlands such as fishing and vegetable cultivation. 20% earned₦26,000 - ₦30,000, 29.3% realized less than ₦18,000 per month (Table 5 & Figure 2). The study however shows that most of the respondents realized more than the Nigerian minimum wage of ₦18,000 per month, hence the need to encourage the use of wetlands for economic purposes. However, most of the respondents (68%) have additional source of livelihood, while others (32%) depend solely on the business for their livelihood. Though, the Nigerian government had increased the minimum wage to ₦30,000, most states have not implemented it and they have

significant proportion of the labour force. Hence, ₦18,000 still remain the unofficial minimum wage.

Table 2: Marital Status of the Respondents

Particulars of Respondents	Variables	Frequency	Percent
Gender	Male	*90*	60
	Female	60	40
	Total	150	100
Marital Status	Married	104	69.3
	Single	36	24.0
	Divorced	6	4
	Widow/Widower	2	1.3
	No Response	2	1.3
	Total	150	100.0
Level of Education	Primary	14	9.3
	Secondary	72	48.0
	Tertiary	58	38.7
	Others	4	2.7
	No Response	2	1.3
	Total	**150**	**100.0**
Monthly Income	Less than ₦18,000	28	18.7
	₦18,000 - ₦25,000	44	29.3
	₦26,000 - ₦30,000	30	20.0
	₦31,000 - ₦35,000	46	30.7
	Total	148	98.7

Sources: Authors' Field Work, 2023.

Table 3: Occupational Type and Location

Location	**Types of Occupation**			**Total**
	Fish Farming	**Vegetable Cultivation**	**Others**	
Ilesa	34	8	4	46
Osogbo	18	38	14	70
Ile- Ife	14	16	4	34
Total	**66 (44.0%)**	**62 (41.3%)**	**22 (14.7%)**	**150 (100.0%)**

Sources: Authors' Field Work, 2023

B. Climate Change Knowledge of Wetland Users

About 84% of wetland users were aware of climate change (Table 4). An investigation into a possible relationship between level of education and level of awareness of climate change reveals a relationship. This is as about 50% of those with primary education do not have knowledge of climate change while only about 8% of those with tertiary education do not have. This indicates a likelihood of a relationship between level of education and awareness of climate change. However, most of the respondents (62.9%) got the information on

climate change from the news media, 16.1% got the information from government agencies such as Agricultural Development Programmes, 3.2% got the information from seminars and workshops, 8.1% from community campaigns and 9.7% got the information on climate change from other sources such as friends and colleagues.

Aside the knowledge through information, wetland users have also been experiencing the impact of climate change. For instance, about 82% of the wetland users maintained that climate change affects their production negatively while, others were positively affected. Most of the respondents indicate that expanding the frontiers of their production has been hindered by lack of capital (53.7%) and seasonal variation in weather (29.9%). From the foregoing, there is still a need for government and other stakeholders to intensify efforts through seminars and workshops on the issue of climate change for people to be well informed of its implication on their immediate environment.

As evidenced in Table 5, most of the respondents (54.7%) were not operating maximally while only 40.0% operate at maximum capacity; others (5.3%) were indifferent. Most of the farmers who were under productive gave the following reasons: lack of capital, insufficient farm implements, insufficient land, climate condition and lack of wetlands. However, 65.3% of the respondents produced throughout the year, while others (34.7%) produced seasonally. Most of the respondents who were unable to produce throughout the year attributed this to climate change such as insufficient water or drying up of the wetland (*Akuro*) during the dry season. Furthermore, 73.2% of the respondents also agreed that seasonal variation affects their production, while 26.8% maintained that they were not affected by the seasonal variation, these were the vegetable farmers who had enough water and use local irrigation system during the dry season. The study also revealed that 62.7% of those that were affected by seasonal variation complained of inadequate rainfall, 21.6% complained of flooding which washed away their fish ponds and vegetable farms, 11.8% complained of pest invasion, while 3.9% complained of wild animals' invasions due to their inability to fence or protect their farms.

Table 4: Educational Status and Level of Awareness of Climate Change

Particulars	**Awareness of Climate Change**		
Educational level	**Yes**	**No**	**Total**
Primary	10	4	14
Secondary	60	12	72
Tertiary	50	4	54
Others	08	2	10
Total	**128 (84.7%)**	**22 (15.3%)**	**150 (100.0%)**

Sources: Authors' Field Work, 2013.

Table 5: Operational Capacity of the Respondents

Particulars	**Frequency**	**Percent**
Maximum Capacity	60	40.0
Not at Maximum Capacity	82	54.7
No Response	8	5.3
Total	**150**	**100.0**

Sources: Authors' Field Work, 2013.

C. Planning Implications of the Findings

Owing to the importance of wetlands, it is imperative that it should be conserved and preserved in order to maintain its ecological balance and ensure the livelihoods of urban poor/people dependent on it for their livelihoods. In order to continue providing the goods and services stated above, wetlands must be interacted with in such a way to preserve its biodiversity and sustainability. To achieve this, the polycentric planning approach is proposed.

Polycentric planning has its roots in the Institutional Analysis and Development (IAD) framework. It in relation to environmentalism regards the people (participants) within an organization/community (action arena) as intelligent beings who should respond to their exogenous variables or context (biophysical/material conditions, cultural and other attributes of a community, and rules-in-use) in order to survive and develop. Biophysical/material conditions in cities in this regard could be described as wetlands that have great economic and environmental potentials.

Their activities and operations, no doubt, are contributing to environmentalism which is imperative for enhancing urban greenery and mitigating flooding in cities. Polycentric environmental planning is a deliberate act of setting up multi-layered and multicentred institutional mechanism that regards self-governing capabilities of local communities as foundation for reconstituting order from the bottom up on environmental matters. It can also be described as the process of ordering the use of environmental, human and institutional resources as well as engaging the citizens in contractual relations with the public authority on urban greenery (Akinola, *et al.*, 2013).

Achieving this requires appropriate planning framework that will put in place:

(1) More scientific and social knowledge of wetland functions, the way wetlands are used by local communities, and the positive and negative impacts of wetland agriculture.

(2) Rules that forbid sand filling and conversion of wetlands into concrete surfaces.

(3) In-depth study that will establish the links between wetlands and human livelihoods and communication of the results of such study to the grassroots.

(4) Enlightenment of the people on value of wetlands to entire society, especially in the areas of environmentalism, agriculture and food security and climate change mitigation. (5) National policies, which support wetland conservation and promote appropriate legislation.

5.0 Conclusion

This paper concludes that local people in the selected cities demonstrate their entrepreneurial capability in utilising wetlands for urban agriculture and thereby achieving socio-economic livelihoods. Since urban agriculture represents urban greenery, the cultivation of vegetables is playing significant role in carbon sequestration as they act as significant carbon sinks and thus buffering climate change impacts. Unlike land speculators that convert wetlands to concrete surfaces for rent-seeking, the activities of urban poor in utilizing wetlands for urban agriculture, no doubt, are contributing to environmentalism which is imperative for enhancing urban greenery and mitigating flooding in cities.

The fact that the majority of the respondents have been financing their children education through wetlands activities, while few others have built houses confirms that wetland is contributing significantly to socio-economic development, reduction in unemployment challenges and poverty in the selected cities. The paper posits that the socio-economic benefits and immense climatic regulatory functions of wetlands need responsive policy towards conservation. It needs to be emphasized that conservation is not anti-development; it only supports lifestyles that the mother earth can support not only for the benefit of the present generation but also for future generation. Therefore, policies and programmes that can integrate conservation with development are highly imperative. Consequently, the paper draws some planning implications that can assist policy and decision makers towards new urban governmentality that can balance wetlands utilization with increased demand for urban space on the one hand and socio-economic needs of the urban poor with urban greenery on the other hand in Osun State and in Nigeria.

This paper argues that the people that are placed in a particular environment by providence should be the beneficiaries of the natural resources in that environment. As a result, citizens in urban

areas should developed their entrepreneurial capability in the utilization of wetlands within their domain.

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