International Journal of Ecology and Environmental Sciences
www.ecologyjournal.in
Online ISSN: 2664-7133; Print ISSN: 2664-7125
Received: 05-02-2019; Accepted: 08-03-2019; Published: 15-03-2019
Volume 1; Issue 2; 2019; Page No. 01-05

Indigenous approaches of vegetation conservation in Pella district of Hong local government area, Adamawa state, Nigeria

EN Gandapa
Department of Geography, Nigerian Defence Academy, Kaduna, Kaduna, Kaduna State, Nigeria

Abstract
The prolonged and over harvesting of rural resources by increasing population has led to reduction in woody plants distribution, species diversity, and increasing scarcity of vegetal products. It is observed that rural populace embark on vegetation conservation due to reduction in fuelwood, native fruits and vegetables, and to improve woodland distribution. The study assessed the self-help procedures adopted by individual and community to improve vegetation cover. Data on practices adopted by individual and community on vegetation conservation were generated from the respondents and field observations. The scope covers Pella District of Hong Local Government Area of Adamawa State, Nigeria. The focus is to highlight the adopted practices by individual and community to manage vegetation cover in 2018. The increase in population leads to decrease in land per capita to 13.51m^2 at the detriment of vegetation covers and reduction in vegetal resources. The result reveal that the community controlled bush burning, adopted sustainable arable farming methods, protection of reserves, and planting of tree species. The result recommends intensive adoption of mixed cropping and agro-vegetation to revert the lost vegetation cover.

Keywords: rural resources, tragedy of the commons woodlands, community approach, sustainability

Introduction

Environment is very important for human survival by providing water, land, air, vegetation, minerals and animals; and encourages commerce and sites for recreation (Environmental Encyclopedia, 2019) [5]. From the point of possibilism in view, man in his struggle against nature to live on the Earth's surface clear vegetation to grow exotic crops, establish settlements, construct road networks, and harvest vegetal products like fuelwood, timber and round poles (Ayichew, 2014) [2]. Unwise human activities such as uncontrolled bush burning, large scale massive vegetation removal for arable farming have reduced vegetal resources and services that people depend on (Nep, 2013; Sahoo and Davidar, 2013) [21, 28]. The importance of vegetation such as provision of fuelwood, shelter materials; native herbs, fruits and vegetables have reduced due to vegetation depletion (Jamala, Boni, Abraham and Teru, 2012) [11].

Many African landuse systems are among the major causes accelerating vegetation degradation (Neba, 2009) [19]. This is because the uncontrolled changes from vegetation cover to agricultural land and built-up areas manifested by increase in population affects vegetation cover harmfully (Pantami, Voncir, Babaji and Mustapha, 2010) [22]. According to European Environmental Agency (2012) [7], the potential effects of increased and diverse exploitation of resources like soil fertility and vegetation by man have degraded woody plants distribution and species diversity.

The harmful effects of massive vegetation removal are so much that all over the world people and authorities have realized the need for woody plants conservation (Chand, 2017) [3]. In line with these, Chand (2017) [3]; Kadu (2017) [13]; Minnesota Conservation Funding Guide (2017) [15]; Prasad (2012) [26] stated that rehabilitation of endangered species, promulgation of environmental laws, establishment of vegetation reserves and establishment of landuse planning act have been adopted as methods of vegetation conservation. In India, local approaches are adapted to complement the government policy to conserve vegetation cover especially woodlands that are important to local populace from which basic resources for livelihood are harvested (Pandey, 2003; Siangulube, 2007) [23, 30]. Among African communities, there were traditional controls under the direction of the elders that regulated individuals on the use of plants (Monica, Mark, Kiprop and Paul, 2016) [16].

The results of studies on the importance of vegetation (Jamala *et al*., 2012) [11]; causes of vegetation degradation (Nep, 2013) [21]; problems of vegetation removal (European Environmental Agency, 2012) [7]; and methods of vegetation conservation (Chand, 2017; Kadu, 2017) [3, 13] are important. However, these studies were not on methods of vegetation conservation in Pella District of Hong Local Government Area, Adamawa State, Nigeria. In Pella District, it is observed that there is more distribution of exotic tree species like *Eucalyptus camaldulensis*, *Psidium guayava*, *Mangifera indica* and *Citrus reticulate* especially within and around more populated settlements such as Pella, Uding and Zhedinyi. More importantly, the accessibility of fuelwood, native fruits and vegetables has decreased.

In view of the above perspectives the research is embarked upon to identity the methods adopted by individual and community to conserve woodlands in Pella District. The objectives include: to identify the types of vegetal materials harvested by the populace; to find out methods of vegetation conservation; and to find out the reasons that led to adaption of vegetation conservation. The study is significant by adopting interview schedules and field study that generated data on uses of vegetation and community

base methods of vegetation conservation. It is expected that such data would be useful to environmental policy makers in designing appropriate policy to sustain the vegetation cover of Pella District, Hong Local Government Area of Adamawa State, and elsewhere.

The scope is restricted to Pella District. The concern is to highlight the methods adopted by individual and community to conserve woodland covers in 2018. This is because the individual approach is more reliable and beneficial to the populace than governmental approach. Vegetation conservation within this study are practices used by the individual or community to regenerate and protect of both native and exotic tree species through adoption of low-cost, useful trees, and based on cultural beliefs and values**.**

Geographical Background of the Study Area

Pella District is one of the major political divisions of Hong Local Government Area of Adamawa State, Nigeria. It is approximately located between latitude $09^0$59'N to $10^0$01'N and between longitude $12^0$45'E to$13^0$00'E. It was created in 1992 and has an approximate landmass of about 450km^2. The rainy season usually starts in the month of May and end in October with highest rainfall amount in August and September while dry season is from November to April of the following year. The mean annual rainfall ranges from 700 to 1000mm. The mean daily temperature is between 36^0 to 41^0C of the dry season to about 20^0 to 25^0C during the wet season (Online Nigeria, 2017) [22]. The hottest months are March and April while the coldest is November to January due to the influence of harmattan haze.

The soils are derived from the weathered basement complex and old sedimentary rocks (Gandapa, 2014) [9]. The soils are well drained because of the hilly landscape in most areas that reduce water infiltration. Fluvial soils occur on the floodplains of rivers Fa'a, Ngilang, Mba'oa and Bubulum that are associated with crowded woody plant cover, but have been affected destructively by arable farming. The relief and landforms are generally hilly with highlands ranging from about 426 to 1158m above mean sea level (Garkida, Nigeria, Sheet 155) [10].

The vegetation falls within the Sudan zone (Smith, 2019; Adoti, 2018). The woody plants height ranges from less than 1m to about 15m. The distributions vary from 1 to 17 stands per 100m^2, and the girth range from 0.17m to 2.10m. Grasses dominate the vegetation cover with height of less than 1 to 4m (Gandapa, 2014) [9]. The vegetation cover is affected adversely by arable farming and fuelwood harvesting. The long dry season, low rainfall amount, and high temperature encourage soil desiccation that causes wilting, withering, and drying up of plants especially seedlings. Various woody plant species have adapted specific features to withstand the semi-arid Sudan environment (Makinwa, 2018) [14]. For example, *Vetellaria paradoxa* 'fumoah' have developed thick bark to protect the internal tissues from loss of water during the dry season; *Anogeissus leiocarpus* 'tava' shed leaves and remain dormant to minimize loss of water through transpiration; and *Adansonia digitata* 'guw' have broad trunk formed by compacted fibre to store adequate water to sustain the trees during the dry season (Gandapa, 2014) [9].

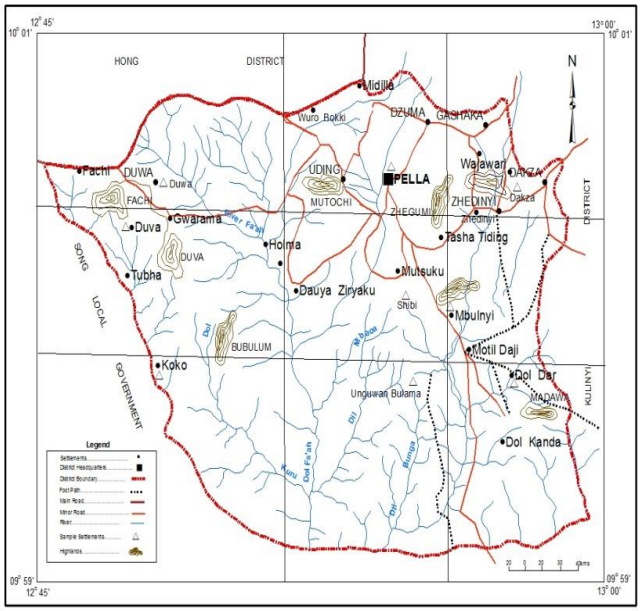
Vegetation products harvested include fuelwood, fruits and vegetables. Other uses include erosion control, wind breaker, and provide shade especially within houses. These products and services have been reduced due to massive removal for arable farming especially around populated settlements like Pella, Uding and Zhedinyi. Exotic species such as *Azadirachta indica*, *Eucalyptus camaldulensis*, *Psidium guayava*, *Mangifera indica* and *Phoenix sylvestric* 'kuchaa' are managed especially around settlements to serve as wind break; provide edible fruits, income accruing, shade, and for land grabbing.

The population increased from 17162 in 1991 to 31,067 in 2018 (National Population Commission, 2010). Thus, land per capita decreased from 26.32 to 14.49m^2. The predominant occupation of the populace is arable farming on crops like *Arachis hypogaea* 'oada masar', *Sorghum vulgare* 'uhi', *Zea mays* 'hibuku' and *Phaseolus coccineus* 'tsur' while most households depend on fuelwood to generate domestic energy (Gandapa, 2014) [9]. Economic activity that significantly affects vegetation covers adversely is arable farming especially rotational bush fallow. Small scale woodlots and shelterbelts on exotic tree species like *Mangifera indica*, *Citrus reticulata* and *Psidium guayava* are established by individuals.

Materials and Methods

Types of data required include population of Pella District and landmass, vegetal products harvested, traditional methods adopted for vegetation conservation, and the reasons that led to adoption of vegetation conservation. Data on human population was generated from National Population Commission that was used to estimate the population trends. Variety of vegetal products harvested, reasons for adoption of vegetation cover conservation, and methods of vegetation conservation were generated from the respondents and field observations.

For easier and faster coverage, Pella District was divided in nine sections. From each sub section one sample settlement was purposively selected to administer the interview schedule. The sample settlements include Duwa, Pella, Dakza, Duva, Shibi, Mbulnyi, Koko, Unguwan Bulama and Dol Dar as shown on Figure 1.



***Source*:** Garkida, Nigeria, Sheet 155

Fig 1: Pella District

To estimate the population of Pella District, arithmetic method was used than geometric to reduce over estimation (Zohry, 2012). Growth rate of 3.0% (Worldometers, 2019) was used to estimate the population from 17,162 in 1991 to 31,067 in 2018. Likewise, to estimate the sample size, 3.0% of 17,162 (population of 1991) was used in accordance with the rate of population increase (National Population Commission, 2010). Thus, 515 sample size was generated. The 515 assumed environmental resources exploiters which consist of both male and female were selected from the nine sample settlements using availability sampling technique while simple descriptive technique was used to analyze the data.

Results and Discussions

Vegetal products harvested include fuelwood, poles, native fruits and vegetables that are decreasing in accessibility; and vegetation reserves have been dereserved and converted into farmlands. The major causes of vegetation removal are arable farming, fuelwood harvesting, and construction of road networks and shelter. The population increased from 17162 in 1991 to 31,067 in 2018, density increased from 38 to 74 persons per km^2 while per capita decreased from 26.32 to 13.51m^2.

Respondents' Views on Adopted Methods of Vegetation Conservation

The table presents results of the respondents' views on the adopted methods of vegetation conservation in Pella District.

Respondents Views on Adopted Methods of Vegetation Conservation

Table 1

S. No.	Adopted Methods	Respondents	Percentage
1.	Control of bush burning	190	36.89
2	Associate vegetation cover with traditional belief	118	22.91
3.	Adoption of environmentally friendly arable farming	82	15.92
4.	Adoption of tree planting	64	12.43
5.	Adoption of conservative use of vegetal products	38	7.38
6.	Adoption of wise vegetal products harvesting	23	4.47
	Total	515	100.00

***Source*:** Field Study, 2018

Control of bush burning

From the table, 36.89% of the respondents are of the view that control of bush burning is the most important adopted approach to conserve vegetation cover. From the respondents, indiscriminate bush burning to hunt wildlife have been controlled by strict nominating. This is achieved by the penalty imposed by traditional institution (district, village and ward heads, and youth leaders) on defaulters. Such penalty includes provision of food materials like guinea corn to the family of those standing crops are affected by the fire, and enforced planting of five stands of *Vitellaria paradoxa* or *Parkia biglobosa* on community reserve land.

From the respondents, the aim of controlling indiscriminate bush burning is to protect the community vegetation reserves from reduction in crowdedness and species diversity especially in areas associated with traditional activities. Species such as *Cordia abasynica* 'mimerawa' and *Bombox ceiba* 'tumoa' that are susceptible to bush fires, and are useful as components of traditional herbs are conserved. Moreover, the prohibition of bush burning especially on Motuchi and Zhegumi hills have encouraged the sustenance of crowded woody plants that provide conducive habitat to wildlife especially those considered as clones, reduce siltation of the pools, protect roofing materials like thatch, and pulp 'yemi' of tree species like *Acacia senegalensis* 'shiwa' and *Acacia albida* 'kaya' that are cattle feed during the dry season.

Associate vegetation cover with traditional belief

From 22.91% of the respondents, linkage of vegetation cover to traditional belief is the major approach adopted to conserve vegetation. Certain areas with crowded vegetation cover such as Dol Siri (lat. 10^0.07'N, long. 12^0.54'E); Nya Miwa (lat. 10^0.08'N, long. 12^0.55'E); and Nduvam (lat. 10^0.09'N, long. 12^0.52'E) were isolated and associated with traditional activity like site for cleansing mental illness. The elders normally protect such areas by attaching spiritual values, prohibiting harvesting of plant materials, arable farming, Bush burning, and killing of wildlife within the environment. Occasionally, the elders perform certain traditional activities in the isolated places to frighten people. From the respondents, any violator was believed to be cursed by the evil spirit that lives in the place.

As a result of association of certain vegetal cover with traditional activities the communities have preserved crowdedness, species diversity and aesthetic beauty of vegetation cover on the local environment. This has broader advantages on protection of birds nesting place.

Adoption of environmentally friendly arable farming

The table shows that 15.92% of the respondents stated that adoption of culturally accepted arable farming practices such as mixed cropping as an alternative to rotational bush fallow conserve vegetation cover. According to the respondents, they have significantly adopted mixed cropping to ensure against crop failure, to have variety of crop yields, to maximize use of the available land, and to improve soil fertility. Mixed cropping have reduced shift to reserve land in search of fertile soil with positive advantage on vegetation conservation at Mbalagi. Likewise, arable farmers' preserve woodland seedlings of edible tree species like *Parkia biglobosa* and *Vetellaria paradoxa* during annual farmland clearing and clean weeding. Such species form the predominant woodlands around settlements.

Adoption of tree planting

From the table, 12.43% of the respondents opined that adoption of tree planting is an important action taken to conserve woodlands. The populace adopted tree planting to replace essential woodland species that are threatened to extinction especially around settlements. Individuals plant woody plant species that are useful and better adapted to the environment, as sources of food materials like *Mangifera indica*, better source of fuelwood like *Eucalyptus camaldulensis*, fast growing and relatively easy to propagate like *Azadirachta indica*. Such species are planted on bare lands exhausted of soil fertility especially around populated settlements like Pella, Uding and Zhedinyi. From the respondents', species of plants like *Vetellaria paradoxa* is propagated by seed, *Khaya senegalinsis* by seedlings and

Bombox ceiba by stem. Furthermore, individuals' occasionally plant trees for land grabbing.

Farmlands on floodplains of river Ngilang and Gurkuku that were on rice and sugar cane cultivation have been converted into orchard gardens on tree species like *Psidium guayava and Mangifera indica* as source of food and income accruing. Moreover, individual plant species like *Phoenix sylvestris* on gulley prone areas to protect dissection of farmlands and road incision.

Adoption of conservative use of vegetal products

From the table, 7.38% of the respondent stated that adoption of conservative use of vegetal products is a factor for vegetation conservation. Households have significantly adopted conservative use of fuelwood, poles, thatch, native vegetables, charcoal and herbs due to increasing inaccessibility. The households conserve fuelwood by using about six twigs of wood per tripod to generate energy during cooking. Simultaneously, after cooking the remaining twigs and the charcoal are put out of fire and preserved for future use.

From the respondents, fresh roofing poles harvested from *Khaya grandfoliale* 'hechi', *Azadirachta indica*, *Anogeissus leiocarpus* 'tava' and *Bambusa tulda* 'guda' the bark is significantly burned to make the poles durable and as protection device against gnawing by weevil and ant. In the same way, harvested herbs and native vegetables like *Bombox costatum* 'bang' and relic like *Tamarindus indica* 'mbula' are thoroughly dried up, kept in a dry place against spoilage, and are used wisely. Such practices prolong period of harvesting thereby conserve the species. Likewise, the households use crop residues such as corn-stock 'chiva uhi' and maize cob 'dzangar hebuku' to generate domestic energy. The use of supplementary biofuel has reduced over dependence on woodlands. This has advantage on conservation of woody plant species and distribution.

Adoption of Wise Vegetal Products Harvesting

From 4.47% of the respondents, adoption of wise vegetal products harvesting is a major management strategy to conserve vegetation. Thus, households have adopted harvesting fuelwood and timber strictly for domestic uses. To control this, indigenous hunters are assigned to monitor against commercial fuelwood and timber harvesters. Any suspected person is reported to district or ward head. Likewise, fuelwood and timber are strictly harvested from the full-grown species against the younger varieties. Also where available, they harvest the dry trees and stumps for fuelwood. This practice has advantage on protecting live woody plant stands.

More importantly, they prohibit pruning of woody plants like *Parkia biglobosa* 'nuna' and *Vetellaria paradoxa* 'fumoah' during flowering and fruiting periods. The reason is to protect the flowers and immature fruits containing seeds which are essential organ for regeneration in plants. Likewise, near settlements the indigenes disallow the pastoralists (Fulani and Mbororo) from lopping branches of tree species like *Khaya grandfoliale* 'hechi' and *Acacia albida* 'kaya' to feed the herd on palatable foliage. This is because continuous and prolonged lopping could endanger the species in the local environment.

From the respondents, they prune branches of species like *Vetellaria paradoxa*, *Anogeissus leiocarpus* and *Khaya senegalinsis* 'siri' that are infected by plant parasite 'kuradum' and disease. Trimming of branches for varied reasons has advantages on woody plant conservation because it renews canopy cover of the full-grown tree stand, and eliminate parasite from community of plants.

Conclusion

The population increased from 17,162 in 1991 to 31,067 in 2018 which leads to increase in farmlands, settlement sites and demand for more vegetal products. The predominant problem that necessitates the people to embark on vegetation management is the increasing decrease in fuelwood, and increase in wind velocity that destroy houses. Around more populated settlements indigenous species like *Parkia biglobosa* and *Vetellaria paradoxa* are ceding to exotics like *Mangifera indica* and *Azadirachta indica*. Individuals plant *Mangifera indica* around settlements for edible fruits, source of income accruing. The communities prohibit bush burning, adopt tree planting, and associate valuable spots with traditional belief as vegetation management strategy.

Recommendation

The populace should intensify tree planting of both exotic and native woody plants species on distressed lands. More importantly, arable farmers should intensify preservation of seedlings of woody plants on farmlands during annual clearing and clean weeding. Population control should be introduced in the area to reduce the level of arable farming and vegetal products harvesting. More importantly, this research calls for investigation on other profitable and non-farming economic activities that could be undertaken to reduce the over dependence on soil fertility which has adverse effects on woody plants.

References

1. Adoti O. Three major types of vegetation in Nigeria. Available, 2018, https://www.legit.ng/ 1128065-three-major-types-vegetation-nigeria.html Accessed 9 September 2019
2. Ayichew F. The paradox in environmental determinism and possibilism: A literature, 2014; 7:7. Journal of Geography and Regional Planning. DOI 10.5897/JGRP2013.0406 Available:https://www.researchgate.net/publication/274696926_The_paradox_in_environmental_determinism_and_possibilism_A_literature_review Accessed: 21 September, 2019
3. Chand S. Forest Conservation: Useful Methods for Forest Conservation. Available, 2017, http://www. yourarticlelibrary.com/environment/forest/forest-conservation-useful-
4. methods-for-forest- conservation/25277 Accessed: 6 July, 2019
5. Environmental Encyclopedia, 2019, Environmental Resources. Available: https://www.
6. encyclopedia.com/environment/encyclopedias-almanacs-transcripts-and-maps/environmental-resources Accessed, 2019.
7. European Environmental Agency 2012. Environmental Quality. Available: https://en.
8. wikipedia.org/wiki/Environmental_quality Accessed 6 July, 2018

9. Gandapa EN. Analysis of Effects of Human Activities on Vegetation of Hong Local Government Area, Adamawa State, Nigeria. Geography Department, Unpublished Ph. D. Thesis. Nigerian Defence Academy, Kaduna, Nigeria. 2014; 69-70.
10. Garkida, Nigeria, Sheet 155
11. Jamala GY, Boni PG, Abraham P, Teru CP. Evaluation of Environmental Impact of Bush Burning in Southern Guinea Savanna of Adamawa State, Nigeria. American Journal of Experimental Agriculture. 2012; 2(3):359-369 Available: https://us.search.
12. yahoo.com/yhs/search?hspart=ima&hsimp=yhs-002&p=Jamala,%20G.Y.,%20Boni, 002&p=Jamala,%20G.Y.,%20Boni,%20P.G.,%20Abraham,%20P.%20and%20Teru,%20C.P.%20(2012).%20Evaluation%20of%20Environmental%20%20%20%20%20%20%20%2_Accessed 22 September, 2019
13. Kadu D. Important Methods for Conservation of Wildlife in India. Available, 2017, http://www.shareyouressays.com/knowledge/6-important-methods-for-conservation- of-wildlife-in-india/111531 Accessed 8 July, 2019.
14. Makinwa E. Vegetation Zones in Nigeria and their Features. Available: https://www. legit.ng/1096264-vegetation-zones-nigeria-features.html_Accessed 9 November, 2018
15. Minnesota Conservation Funding Guide (2017). Conservation Practices. Available: file:///C:/Users/user/Desktop/Controlled%20Burning.htm Accessed 6 July, 2018
16. Monica KC, Mark K, Kiprop CJ, Paul O. Traditional Controls of Harvesting and Conserving Medicinal Plants in Keiyo South Sub-County, Kenya. International Journal of Humanities and Social Science. 2016; 6(11):54-63 Available:
17. https://search.yahoo.com/yhs/search;_ylt=AwrC3PHpjYddEB4A2hsPxQt.;_ylc=X1MDnNlcnZhdGlvbgR0X3N0bXADMTU2OTE2NjAxNg?p=traditional+methods+of+vegetation+conservation&fr2=sbtop&hspart=ima&hsimp=yhs002&type=ff_q3485_4038730968q Accessed 22 September, 2019
18. National Population Commission. 2006 Population and Housing Census. Priority Table. 2010; iv:13, 14
19. Neba NE. Cropping Systems and Post-Cultivation Vegetation Succession: Agro, 2009.
20. Ecosystem in Ndop, Cameroun. In: Journal of Human Ecology. 27(1):27-33 Available: https://www.researchgate.net/publication/237289336_Cropping_Systems_and_Post Cultivation_Vegetation_Successions_Agro-Ecosystems_in_Ndop_Cameroon DOI: 10.1080/09709274.2009.11906188 Accessed 21 September, 2019
21. Nep S. Environmental Quality: LA 2050. Available: http://www.la2050.org Accessed 6, 2013, July, 2018
22. Online Nigeria. Climate of Nigeria, 2017 Available: http://www.onlinenigeria.com/links/adv. asp?blurb=70 Accessed 26 January, 2017
23. Pandey DN. Traditional Knowledge Systems for Biodiversity Conservation, 2003, Available:
24. https://www.infinityfoundation.com/mandala/t_es/t_es_pande_conserve.htm Accessed, 2019.
25. Pantami SA, Voncir N, Babaji GA, Mustapha S. Effects of Burning on Soil ChemicalProperties in the Dry Sub-Humid Savanna Zone of Nigeria, 2010, Available: https://search.yahoo.com/yhs/search;_ylt=AwrEeSU8j4ZdgyEANRUPxQt.;_ylc=X1MDMjExNDcwMDU1OQRfcgMyBGZyA3locy1pbWEtMDAyBGdwcmlkAy5aTVJuUGNx?p=Pantami%2C+S.A.%2C+Voncir%2C+N.%2C+Babaji%2C+G.+A.+and+Mustapha%2C+S.+%282010%29&fr2=sb-top&hspart=ima&hsimp=yhs-002&type=ff_q3485_4038730968q Accessed 22 September, 2019
26. Prasad A. Methods for the Conservation of Natural Resources, 2012, Available: http://www.preservearticles.com/2012030625183/11-methods-for-the- conservation-of-
27. natural-resources.html Accessed 3 July, 2018
28. Sahoo S, Davidar P. Effects of Harvesting Pressure on Plant Diversity and Vegetation Structure of Sal Forests of Similipal Tiger Reserve, Odisha, Eastern India. Tropical Ecology. 2013; 54(1):97-107. Available: https://www.cabdirect.org/cabdirect/
29. abstract/20133125789 Accessed 21 September, 2019
30. Siangulube FS. Local Vegetation Use and Traditional Conservation Practices in the Zambian Rural Community: Implications on Forest Stability. Available, 2007, https://search.yahoo.com/yhs/search;_ylt=AwrC3PHpjYddEB4A2hsPxQt.;_ylc=X1MDMjExNDcwMDU1OQRfcgMyBGZyA3locy1pbWEtMDAyBGdwcmlkA25qN0VxTW85=traditional+methods+of+vegetation+conservation&fr2=sbtop&hspart=ima&hsimp=yhs-002&type=ff_q3485_4038730968q Accessed 22 September, 2019
31. Smith JMB. Savanna Ecological Region, 2019, Available: https://www.britannica.com/science/savanna_Accessed 12 2019.
32. Worldometers. World Population Prospects: The Revision: Nigeria Population, 2019, Available:https://www.worldometers.info/world-population/nigeria-population/ Accessed 22 September, 2019
33. Zohry A. Methods of Measuring Population Change. Available, 2012, http://r.search.yahoo. Com/_ylt=A0LEVjwT3a9ZxpUAgs0PxQt.;_ylu=X3oDMTBysWNmY2MwBGNvbG8DYmYxBHBvcwM0BHZ0aWQDBHNlYwNzcg Accessed 8 July, 2018.