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EFFECT OF HEAT TREATMENT ON THE DURABILITY OF LAMINATED BAMBOO AGAINST BROWN ROT FUNGUS (*SCLEROTIUM ROLFSII* SACC) ATTACK

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Abstract

Bamboo is a fast-growing woody grass with increasing importance for the sustainable production of materials with many applications. However, due to its susceptibility to fungal and insect attacks, there is need to consider treatment options to enhance its durability in service. One of these is heat. This study therefore investigates the effects of lamination and thermal (heat) treatment on the durability of laminated bamboo against brown-rot fungus attack. Twenty Bamboo culms of 4yrs old were harvested from the plantation in Gbedun, Akanran, Ona-Ara Local Government Area of Oyo State, Nigeria. The production of laminated bamboo board was carried out in the Wood Workshop of the Department of Forest Resources Management, University of Ibadan, Nigeria. Laminate thickness of 4, 6, 8 and 10mm were used to produce boards and were also thermal treated by steaming in an autoclave at 140°C for 4, 6 and 8 hours with un-treated boards serving as control. Durability test was carried out on the laminated samples and data were analysed using descriptive statistics and ANOVA at $P < 0.05$. From the results, the weight loss of the laminated boards ranged from 8.11 to 29.24% with increase in laminate thickness and thermal treatment duration resulting in decrease in weight loss of the boards produced. Laminated boards thermal treated for 8hrs were moderately resistant (class III) while, the untreated samples and those treated for 4 to 6hrs belong to susceptible class (class IV). Laminate thickness of 4, 6, 8 and 10mm belongs to class IV decay resistance class with the implication that they are non-resistant to fungus decay.

Keywords: Bamboo, laminate thickness, thermal treatment, durability test, weight loss

1. Introduction

The world is currently facing rapid decrease in forest resources and serious degradation of the environment. The tropical forest is decreasing at an alarming rate today and the demand for wood has continued to increase in proportion to human population. It is expected that there would be increase in the demand for wood due to its versatility and affordability over and above other construction materials. The high demand for wood would result in over-exploitation of both the natural and plantation forest with its attendant environmental consequences (Geomatic, 1998; Youngquist and Hamilton, 1999; Fuwape, 2001; Falemara *et al.*, 2012). The over exploitation of existing forest resources and the disappearance of economic hard wood species are of great concern to wood scientist, technologist and users as well. The



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supply of quality timber from the natural forest to wood-based industries is no more available in the quantities that can sustain the usual large diameter class logs required by these industries. Therefore, the development and exploitation of bamboo is of considerable importance.

Bamboo is an important forest resource that grows abundantly in many tropical and sub-tropical regions of the world, especially in Asia (FAO, 2007). As a fast-growing material, bamboo has been widely used as a traditional material for making basic tools and furniture as well as a building material, due to its strength, surface hardness and easy machinability.

Despite the many excellent properties of bamboo, the major drawback of this material is its durability against the deteriorating agents due to the high level of starch content and other lignocellulosic material that attracts bio-deteriorating agents to it (Roziela Hanim *et al.*, 2012). Bamboo is susceptible to attack by insects (like powder-post beetles and termites) and decay fungi such as sap-staining fungi and fungi causing brown rot, white rot and soft rot (Liese 1980, Li 2004, Krisdianto 2008). Bamboos, like other lignocellulose materials, are subject to biodegradation by fungi under certain condition which may affect their quality (Hamid *et al.* 2003). Bamboo is attacked by brown rot, white rot and soft rot fungi, above its fibre saturation point (Liese, 1985). Like the decay resistance in wood, the natural durability of bamboo is related to its endurance to attack by destructive organisms like termites, powder-post beetles, marine borers and decay fungi.

The carbohydrate content of bamboo plays an important role in its durability and service life. Durability of bamboo against mold, fungal and borers attack is strongly associated with the chemical composition (Abd.Latif *et al.*, 1991). Bamboo resistance indicates the durability of a bamboo species against destroying organisms. The resistance of bamboo against decay fungi serves as an important parameter in bamboo establishment.

Recently, attempt has been made to subject bamboo to heat treatment (Leithoff and Peek, 2001) to enhance its durability. Heat treatment has been used for various wood products to improve their dimensional stability and durability against biodeterioration (Kamdem *et al.*, 2002; Militz, 2002). Heat treatment is environmentally friendly and does not involve toxic chemical.

This paper therefore investigates the effect of thermal treatment on the durability of glue-laminated bamboo against *Sclerotium rolfsii* with a view to maximizing the utilization potential of bamboo as a substitute to other wood species.

2. Materials and Method

2.1.Raw-material source

Twenty bamboo culms of 4yrs old were harvested from the plantation in Gbedun, Akanran, Ona-Ara Local Government Area of Oyo State, Nigeria located on latitude 7^o13'60"N and longitude 4^o1'60"E. The harvested bamboo culms were taken to the Department of Forest Resources Management Wood Workshop, University of Ibadan, Ibadan, Nigeria for processing and conversion to laminated bamboo board.

2.2.Laminated bamboo board formation

The harvested bamboo culms were cross-cut from the base into 3m long billet using a circular saw. The billets obtained were again cut into three sections of 1m long each to obtain straight pieces and then split in the radial direction using a circular saw. The inner and outer surfaces of the strips obtained were



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later planed into laminate thickness of 4, 6, 8 and 10mm. The strips were thereafter edged on one end and cut on the other un-edged end to 25mm. The 25mm wide strips obtained were further cut into smaller length of 500mm long, thermal treated at different period intervals of 4hrs, 6hrs, 8hrs and un-treated, dried followed by application of adhesive bond (top bond) on the split faces of the strips. The strips were cold-pressed with a clamp for proper penetration of adhesive at the bond lines to form strong boards.

Thereafter, the boards formed were cured at room temperature for 14 days (2weeks) for proper bonding of the adhesive with the bamboo strips to enhance good machining.

2.3. Thermal treatment of bamboo strips

The 4, 6, 8 and 10mm thick of 500mm long and 25mm wide strips produced were dried at room temperature until moisture content value ranged between 75 to 80% after which they were thermal treated. Thermal (heat) treatment was conducted at Bio-Science Centre of International Institute of Tropical Agriculture (IITA), Ibadan, Oyo State, Nigeria in a Tomy SX-700 Autoclave. Strips were subjected to temperature of 140°C (Constant) at different period intervals; 4hrs, 6hrs, 8hrs and un-treated.

2.4. Laminated bamboo board testing

At the end of the curing process, the bamboo boards produced were planed, edged and cut to 19mm x 19mm x 19mm for Weight loss determination in accordance with IS. 4873 (IS, 2008). Each treatment combination of thermal treatment and laminate thickness were replicated five times and 80 samples were obtained for the weight loss test. Analysis of variance in 4 x 4 factorial experiments in a completely randomized design (CRD) was carried out to determine if thermal treatment and laminate thickness had significant effects on the durability of the laminated bamboo boards produced.

2.5. Culture medium

The inoculum of *Sclerotium rolfsii* (brown rot fungus) was obtained from the Pathology Section of Forestry Research Institute of Nigeria, Ibadan, Nigeria and the culturing of the inoculum was carried out following the standard IS. 4873 (IS, 2008).

2.6. Infection of test blocks

The bottles containing the test blocks of 19 x 19 x 19mm were incubated at 27±2°C for 24 weeks. At the end of the incubation period, the blocks were removed from the culture bottles, cleaned of the adhering mycelia, taking care not to remove the splinters of wood and weighed immediately to determine moisture absorbed. The weighed samples were oven-dried at 103°C to constant dry weight (IS, 2008).

2.7. Determination of durability after incubation

At the end of the incubation period, the wet weights of the test blocks were calculated after which they were oven-dried for 18hours at 103°C. The test blocks were then allowed to cool and weighed. The durability level of the laminated bamboo samples was determined based on the percentage of weight loss of the laminated bamboo after exposure to brown rot fungus attacks. The Percentage weight loss was determined as shown in equation 1 and used for the analysis of the effect of the fungi on the laminated bamboo samples. The resistance of the bamboo thermal treated samples were determined by categorizing it based on the average weight loss of laminated bamboo samples (Suprapti, 2010) (Table 1).



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$$W = \frac{W_1 - W_2}{W_1} \times 100 \dots \dots \dots (1)$$

Where: W= Weight loss

W₁=Initial weight before fungi attack

W₂=Final weight after fungi attack (after oven dried)

Table 1: Classification of laminated bamboo resistance based on the weight loss by fungi

Average Weight Loss (%)	Decay Resistance	Resistance Class	The Expectancy of Service Life (years)
None or negligible	Very resistant	I	≥8
Less than 5	Resistant	II	6-7
5 to 10	Moderately resistant	III	4-5
10 to 30	Non-resistant	IV	2-3
More than 30	Perishable	V	<2

Source: Suprapti, (2010).

3. Results and Discussion

Table 2: The Mean Weight Loss of Laminated Bamboo Board samples and its Resistance Class

Durability Test	Thermal Treatment	Laminate Thickness				Mean
		4mm	6mm	8mm	10mm	
WL (%)	Untreated	29.24(IV)	22.07(IV)	21.88(IV)	20.34(IV)	23.38±5.03(IV)
	4hrs	18.80(IV)	18.24(IV)	17.77(IV)	16.64(IV)	^a
	6hrs	16.19(IV)	15.71(IV)	14.88(IV)	14.84(IV)	17.86±2.98(IV)
	8hrs	12.35(IV)	9.49(III)	8.50(III)	8.11(III)	^b
Mean		19.15±7.20(IV) ^a	16.38±5.54(IV) ^b	15.76±5.41(IV) ^b	14.98±5.35(IV) ^b	15.41±3.16(IV) ^c 9.62±1.94(III) ^d
		16.57±6.02				

Means ± Standard Deviation and Resistance class of five replicate samples

The mean value for Weight Loss (WL) was 16.57% ranging from 8.11% to 29.24% (Table 2). It was observed that WL decreased with increase in laminate thickness of the bamboo boards. The lowest WL values were obtained at the laminate thickness of 10mm from each of the 4, 6 and 8hrs thermal treated and untreated boards. The relatively high resistance of 10mm laminate board to brown-rot fungus is an indication that it could be more durable than other laminate thickness.

Meanwhile, weight loss decreased with increase in thermal treatment duration. The untreated LBBs had the highest WL averaged, 23.38% while the least, 9.62% was obtained in 8hrs thermal treated LBBs. The implication of this is that, high temperature is effective in improving the durability of wood. High temperature treatment contributed to durability of material. According to Zaidon and Nazri (2000), the reduction in fungus deterioration is as a result of the reduction of starch content in the bamboo.



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The result of analysis of variance for WL presented in Table 3 shows that the differences in thermal treatment and laminate thickness had significant effect on WL while their levels of interaction had no significant effect ($P < 0.05$). The follow up test (Table 2) revealed that 10mm laminated boards treated for 8 hours were more durable than 8mm, 6mm and 4mm boards thermal treated for 6hrs, 4hrs and those untreated.

Based on resistance or durability rating against fungi (Table 2), boards treated at 140°C for 8hrs were considered moderately resistant (class III). However, those treated at 140°C for 4 and 6hrs and, untreated samples belonged to susceptible class (class IV). According to Seng (1990), wood in class III is expected to have a service life of three years, while that of class IV is very short. In this study, resistance of laminated bamboo to destroying fungi varied depending on thermal treatment and laminate thickness. According to Liese (1980), bamboo resistance or its service life is usually shorter than that of wood, from one to three years. Table 2 further showed that fungus decay of laminate thickness of 4, 6, 8 and 10mm belongs to class IV and therefore, expected to have short service life. According to Kumar *et al.* (1994), they stated that under durability classification, bamboo belong to non-durable category with little variation between different species.

Table 3: Result of the Analysis of Variance for Weight Loss of Laminated Bamboo Board Samples

Source of variation	Df	WL Sig.	WL
Thermal Treatment	3	0.000	69.873*
Laminate Thickness	3	0.000	7.039*
Thermal Treatment * Laminate thickness	9	0.221	1.369 ^{ns}
Error	64		
Total	79		

* Significant at $P = 0.05$, ns not significant at $P = 0.05$

4. Conclusion

The study showed that durability was influenced by laminate thickness and thermal treatment. The study revealed that as laminate thickness increased with thermal treatment, weight loss decreased.

The study showed that thermal treatment of laminated bamboo boards will enhanced bamboo board durability against fungi. Also, using higher laminate thickness in producing boards will make the boards more durable.

The study further showed that the durability test of the laminated bamboo samples thermal treated at 140°C (constant) for 8hrs were moderately resistant (class III) while those treated for 4hrs, 6hrs and untreated fell into the susceptible class (class IV). The laminate thickness of 4mm, 6mm, 8mm and 10mm belongs to class IV decay resistance class.

References

- Abd. Latif, M., Khoo, K.C. and Nor Azah, M.A. (1991): Carbohydrates in some natural stand bamboos. *Journal Tropical Forest Science* 4(4): 310-316.



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- FAO, (2007): World Bamboo Resources. A thematic study prepared in the framework of the Global Forest Resources Assessment 2005. Rome, Italy. Available at: <http://www.fao.org/3/a-a1243e.pdf>. Accessed on 13th January, 2016.
- Falemara, B.C., Ampitan, T.A., Ukanyirioha, C. J. and Udenkwere, M. (2012): Consciousness and the challenges of sustainable forest management. Reorganizing Nigeria Forestry in the Rapidly Changing Climatic Conditions: Challenges and Solutions. Proceeding of the 2nd annual conference of the Association of women in Forestry and Environment (AWIFE) held at Forestry Research Inst. Of Nigeria, Ibadan, 6th Nov. pg 119-125.
- Fuwape, J.A. (2001): The Impacts of Forest Industries and Wood Utilization on the Environment. Forestry Workshop. 6-7 December, 2001.
- Geomatics, (1998): A report of forest resources study in Nigeria. Submitted to Forest Management and Co-ordinating Unit. Geomatics Nigeria limited Akure. 60pp.
- Hamid, N.H, Abd. Latif, M. and Sulaiman, O. (2003): Decay Resistance of Bamboo (*Gigantochloa scortechinii*) Compared to 24 Malaysian Hardwood. <http://www.fao.org/docrep/article/wfc/xii/0039-b4.htm> on the 25th January, 2016.
- IS, (2008): *IS 4873. Methods of Laboratory Testing of Wood Preservatives Against Fungi— Part 1*. Bureau of Indian Standards, New Delhi.
- Kamdem, D.P., Pizzi, A. and Jermnnaud, A. (2002): Durability of heat-treated wood. Holz als Roh- und WerkstoV 60 (1), 1–6.
- Krisdianto, K. (2008): The Effect of Microwave Heating on Permeability of Bamboo. *Journal of Tropical Wood Science and Technology* 6(2): 37–42.
- Kumar, S., Shuka, K.S., Dev, I. and Dobriyal, P.B. (1994): Bamboo Preservation Techniques: A Review. International Development Research Centre of Canada and Indian Council of Forestry Research and Education, Dehra Dun.
- Leithoff, H. and Peek, R.D., (2001): Heat treatment of bamboo. The International Research Group on Wood Preservation. IRG Doc. No.: IRG/WP 01-40216, Nara, Japan, p. 11.
- Li, X.B. (2004): Physical, Chemical, and Mechanical Properties of Bamboo and its Utilization Potential for Fiberboard Manufacturing. M.Sc Thesis, Louisiana State University, Baton Rouge.
- Liese, W. (1980): Preservation of bamboos. Pp. 165–172 in Lessard G & Chouinard A (Eds.) *Bamboo Research in Asia*. Proceedings of a workshop held in Singapore. 28–30 May 1980.
- Liese, W. (1985). Bamboos – Biology, Silvics, Properties, Utilization. Schriftenreihe der GTZ, No. 180.
- Militz, H., (2002): Thermal treatment of wood: European processes and their background. International Research Group on Wood Preservation. IRG Doc. No.: IRG/WP 02-40241, Cardiff, Wales, p. 15.
- Roziela Hanim, A., Olga, Y., Rafidah, M.S. and Anwar, U.M.K. (2012): The Durability Properties of Boil-Treated Bamboo (*Gigantochloa levis*) Against White Rot Fungus (*Pycnoporus sanguineus*) Attack. Conference: The 10th Annual Seminar on Science and Technology (S&T) 2012, at Kota Kinabalu Sabah. Available at: <http://www.researchgate.net/publication/274641145>. Accessed on 13th January, 2016.



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- Seng, O.D. (1990): Specific Gravity of Indonesian Woods and its Significance for Practical Use. Communication No. 13. Forest Products Research and Development Centre, Bogor.
- Suprpti, S. (2010): Decay Resistance of 84 Indonesian Wood Species against Fungi. *Journal of Tropical Forest Science* 22 (1), pp. 81-87.
- Youngquist, J.A. and Hamilton, T.E. (1999): Wood Products – A call for Reflection and Innovation. *Forest Products Journal* 49 (11/12): 18-27.
- Zaidon, A. and Nazri, M. (2000): Traditional Treatment of Malaysian Bamboos: Resistance towards White Rot Fungus and Durability in Service. *Pakistan Journal of Biological Sciences* 3 (9), pp. 1453-1458.



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ANALYSIS OF DEFORESTATION AND MALARIA PREVALENCE IN THE FEDERAL CAPITAL TERRITORY, NIGERIA

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Abstract

Analysis of deforestation and malaria prevalence in the Federal Capital Territory was carried out with the aim of establishing whether or not a relationship exists between deforestation and malaria prevalence using satellite imageries and data from the National Malaria Elimination Programme for 1987, 1990, 1999, 2002, 2005, 2008, 2011 and 2014. The imageries were subjected to Normalised Difference Vegetation Index (NDVI) to calculate dense vegetation sizes for the years under study. Pearson's Product Moment Correlation was used to establish whether or not there exists a relationship between deforestation and malaria prevalence using the NDVI data and malaria prevalence rates as correlates. Results show that the reported cases of malaria rose from 160 in 1987 to 1,920 in 2014, while the prevalence rose from 3.5% to 4.1% for same years, thus a 30.58% decrease in dense vegetation coincided with a 17.14% increase in malaria prevalence. The correlation analysis showed that there is no significant relationship between deforestation and malaria prevalence. This may be due to some environmental and physical factors like the soil type and terrain. The study concluded therefore that the insignificant relationship between the two is as a result of population increase.

Keywords: Deforestation, malaria, NDVI, population.

1. Introduction

Nigeria is well endowed with forest resources accounting for about 2.5% of the GDP. These resources provide employment and help maintain the health status of the populace. A major challenge therefore being faced by the country now is that of deforestation (Olufemi and Ameh, 1999).

Deforestation is one of the most potent factors at work in emerging and re-emerging communicable diseases (Singer and De Castro, 2001). Wilson (1995) clarifies our understanding that the control of diseases would be inadequate without the ecological perspective on the life cycles of parasitic microorganisms and the associated infectious diseases. One of these diseases with new causes of infection is malaria and its presence may be as a result of attack by invasion on the host vectors natural habitat.

Environmental change is expected to affect profoundly the transmission of the parasites that cause malaria (Keiser et al, 2005). Keiser continued to claim that several environmental factors are known to affect the transmission of the parasites that cause malaria. One of such is deforestation, and is of particular concern because of its scale and ubiquity in tropical areas especially Nigeria. Amongst the



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anthropogenic drivers of environmental change is deforestation and it is possibly the most noticeable and most fingered cause of increase in malaria (Hay et al, 2004). Deforestation destroys natural boundaries that protect humans against exposure to certain diseases and it can also create new ecological niches favouring the multiplying of vectors (MacCormack, 1994). Vectors here refer to organisms that carry disease-causing micro-organisms from one host to the other.

This means therefore that deforestation possibly increases the survival rate of anopheles species that carry plasmodium—the causative organism for malaria—by exposing them to warmer temperatures that speed up larval metamorphosis. Some of the health issues influenced by the presence of forests include dietary health and nutrition security, infectious disease security, medical science and medicinal resources, social and psychological health (Keesing, 1997). This means therefore that the absence of forests can reduce health, nutrition and infectious disease security.

Around the world, vector populations in terrestrial system are on the decline as a result of significant human activities on forests leading to habitat destruction and relocation, over-utilization and pollution. This decrease in vector population is profoundly significant and represents a major public health threat to humans as they interact with their environment. This is because most of these vectors under threat try to adjust by migrating to a more favourable environment, and usually, closer to humans.

2. Review of Literature

The population growth in sub-Saharan Africa is unprecedentedly on the increase. This has led to an uncontrolled and unsustainable exploitation of natural resources, especially forest resources (Uneke, 2008). Uneke claimed that deforestation is a process that cannot be readily controlled for a variety of political and economic reasons, and that future consequences as a result of this process may be crucial with respect to malaria epidemics. He argued in this study that malaria started infecting humans in Africa when there became a shift from hunter-gatherers to farmers causing a dramatic change in environmental and behavioural practices. This is supported by Yasuoka and Levins, (2007), when they opined that deforestation and land transformation influence the malaria vector – anopheles, especially larval survivorship, adult survivorship, reproduction and vectorial capacity. This they claim is possible through changing environmental and microclimatic conditions such as sunlight, temperature, humidity, water condition, soil condition and vegetation.

Uneke (2008), showcased six points, basically:

1. Deforestation changes the ecology of disease vector and its options for hosts.
2. Deforestation can change local climate and thereby affect the spread of disease by reducing moisture and raising ground temperatures.
3. Deforestation is often the beginning of a variety of land use changes.
4. Deforestation is accompanied by migration that may enhance the spread of malaria.
5. Deforestation has so many putative climate impacts via the role of trees in the carbon cycle and regional weather patterns.
6. Ecosystem change such as deforestation can play a role in antimalaria resistance that has become a major concern for several plasmodium species.

Uneke therefore concluded that deforestation is an integral part of life of forest communities in rural sub-Saharan African countries and that malaria has a strong correlation with forest management.



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Brant *et al.*, (2012), also believe that land use changes modify temperature and relative humidity which in turn affect the survival density and distribution of mosquitoes. In this crucial study, Brant *et al.*, in the hinterlands of Sabah, Malaysia, looked at the effects of land use practices on mosquito abundance, composition and biting times. Three sites were chosen for the study: old growth forest, logged forest and oil palm plantation. They employed human landing catches from 5pm to 11pm. Ninety-two collections were made in the three sites using red torch lights to seek out mosquitoes. The result showed that the biting time per night of logged forest doubled that of the old growth forest and oil palm plantation put together.

Disease emergence and persistence are inherently geographic phenomena (Melinda *et al.*, 2010). Melinda *et al.* used the principles of Disease Ecology and the Health Belief Model to examine perceptions of mosquito-borne disease and preventive action in the study area. The study identified that the emergence of vector-borne diseases represents a complex interplay among pathogens, hosts, and their environments. This they said is an inherently geographic concern. They used the Disease Ecology Framework because of its appropriateness for the study of disease emergence and persistence. This framework addresses the ways in which human populations, physical and built environments, and human behaviour interact either to prevent or produce disease (Hay, 2000). Manga *et al.*, (1995), agree that this framework illustrates the potential for geography to unite the physical and social worlds. This study however focused particularly on the population characteristics and human behaviour of disease ecology, and dwelt very little on the role of deforestation.

One of the very first conclusive studies carried out shows the association between human biting and the degree of deforestation, by Vittor *et al.*, (2006), claimed that the recent comeback of malaria in the Peruvian Amazon was caused by deforestation. This study showed that the risk of being bitten by the primary malaria-carrying mosquito is nearly 300 times higher in cleared areas than undisturbed areas. The study further revealed that clearing forests for cropland has created more breeding sites for Anopheles species which prefer to lay eggs in waters surrounded by short vegetation. This study became conclusive when it found that increase in human population has no effect on Anopheles biting rates. This is because as human population is increasing, so also is the vector population, thus giving rise to a stable prevalence.

Also in the same line of study before the study by Vittor, *et al.*, Pichainarong and Chaveepojnkamjorn, (2004), had established a strong correlation between forest destruction and the incidence of the mosquito Anopheles *darlingi* in the Amazon. They chose the Amazon because of the rapid increase in malaria incidence there in the early 1990s. In their very own words, “we saw a major upsurge in the incidence of the disease that coincided with an extensive push in human settlement. It was critical to ask why”.

Their study identified 56 sites along a recently constructed road in Peru. Lines were then established and nets used to sample for mosquito larvae in streams and ponds along each line. The fieldwork took about 12 months during which 5,524 water samples from 1,224 streams and ponds were taken and 24,000 mosquitoes identified. Of those that carry malaria, a greater number were found in more heavily deforested landscapes. They also found out that in 17% of ponds and streams where deforestation was heavy, malaria vector was found, in 10% of water bodies where deforestation was light and in 2% water surrounded by intact forest. They therefore concluded that the unintended



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consequence of deforestation in the Amazon, unfortunately, is the increase in abundance of the main malaria-carrying mosquito in the region.

Scientific literature makes it abundantly clear that the association of deforestation and malaria disease is not mere coincidence. In line with this, Pattanayak *et al*, (2006), described the malaria burden including its etiologic roots and social toll. It considered activities especially that of forest degradation by the local people who are poor to be responsible for the increasing malaria incidence. According to Wilson *et al* (1994), an ecological perspective on the life cycles of parasitic micro-organisms and their associated infectious disease is critical to understanding and controlling the disease. Wilson, (2001), pointed out that infectious diseases are part of a larger human ecology in which human social systems, economic activities, interactions with the environment, and lifestyles represent some of the key domains of interaction that affect infection and disease risk. Pattanayak *et al* concluded therefore that malaria and deforestation are central elements to the poverty cycle in the rural areas of many developing countries. Simply put, malaria causes deforestation. This is because malaria makes people poorer and poverty leads to deforestation under some conditions.

Sawyer, (1993), argued that high rate of malaria which leads to poverty, encourages men to work as day labourers (in logging and ranching), rather than establish family farms. This study made use of the “Decision-Analyses Framework” as the key framework. This framework identifies outcome of interest which includes health indicators, wealth and environmental quality. The variables used include: extent of forest cover and forest conditions.

Continued development in developing countries in the form of agriculture, road construction, logging amongst others, have resulted in an increasing level of deforestation (Gainey, 2014). Gainey continued that if a positive correlation between deforestation and malaria transmission is confirmed, then the negative implications for residents of deforested areas could be significant. Gainey claimed he started monitoring deforestation in the Amazon since 1988, and that it has been progressing at a steady rate, now accounting for almost 24% of the overall global greenhouse gas emissions and other health issues. To support this, Olsen *et al*, (2010) in their study concluded that a 4.3% increase in the percentage of deforestation from august 1997 – august 2000 was associated with a 48% increase in malaria incidence with the population steady within the area they studied.

Gainey showed that there are three main consequences of deforestation that help increase the chances of malaria transmission;

- A. removal of competition,
- B. removal of dead end host and,
- C. creation of new suitable habitats.

Disturbing the forests compromises the ability of non-vector species to thrive. Therefore, removing a main competitor of anopheles *darlingi* from the ecosystem allows for their population to cover more grounds (Yasuoka *et al*, 2006b). Forests serve as habitat to many warm-blooded hosts of malaria; disturbing the forests therefore can result in the migration of such species away from human interference, thus removing a source of prey for mosquitoes, leaving them with no alternative than human beings in the neighbourhood. Removing the forests’ canopy increases the sun quantity on water bodies available for the habitation by the vector carrying mosquitoes (Hahu *et al*, 2014).

Gainer concluded that malaria transmission is a widespread problem in the Amazon and Tropics in general and it is a public health issue that requires attention. He continued to say that the



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transformations of ecosystems in the interim between high-impact selective logging and ecosystem recovery may replicate the ecological transitions that support mosquito breeding that are generally associated with malaria.

Guerra *et al*, in (2006) carried out a study in South-East Asia. In doing this, they first defined forest according to Anon, (2001b), as land with a tree canopy cover of more than 10%, and an area of more than 0.5ha, including natural forests and forest populations, but excluding trees specifically established for agricultural purposes. Anon further subdivided natural forests into closed (>40% canopy cover) and open (>10 – 40% canopy cover).

Guerra *et al* used geographic Information System (GIS) and maps of forest cover to determine the areas of forest cover within the spatial limits of malaria transmission. As a result, they then derived the estimate “Population at Risk of Malaria” (PARM) in these areas. These methods gave credit to the research. These GIS platforms allowed for the study and quantification of spatial associations between forest cover and malaria patterns within human settlements. The maps used in the study were generated using existing information retrieved from health guidelines. However, the study excluded highlands altitudinal limits of malaria and areas with human population densities of less than one person/km². This is because the human vector contact in such areas would be so low to interrupt transmission.

The study identified areas of closed forest that are prone to malaria infection by overlaying the malaria distribution map on the Food and Agriculture Organisation (FAO) delimitations of closed forests. An equal area projection and GIS software (Arcview 3.2; ESRI, Redlands, CA), were used to evaluate the areas in km² and the number of individuals living in such forests.

The result from this research showed that in South-East Asia and western pacific, high population densities in or near areas of malaria closed forests (these are closed forests within areas of malaria risk) expose large numbers of people to malaria parasites transmitted by highly efficient forest vectors. It is noteworthy that some vectors carry more plasmodium and also transmit same faster. It is known that the prevalence of such vectors has historically represented an issue for the control of malaria and challenged environmental management approaches, such as deforestation. (Mouchet and Brengues, 1990; Arbani, 1993).

They concluded that the relationship between forests and malaria transmission is important, and a deep understanding of it will guide strategies designed to reduce the burden of malaria in endemic forested areas.

3. Methodology

This study utilized data obtained from different establishments using such tools as questionnaire, Focus Group Discussion (FGD), Key Informant Interview (KII), satellite images and observation from the field. Some of these establishments include Health Centres, Department of Forestry of the Federal Capital Development Authority (FCDA), Abuja Geographic Information System (AGIS), National Malaria Elimination Programme (NMEP), United States Geological Survey (USGS, GLOVIS Viewer) and Google Earth. Primary sources include the gatekeepers and women in the selected communities.

The questionnaire helped obtain information on the socio-demographic characterization of respondents, health seeking behaviours and the malaria prevalence/incidence rates. The structured questionnaire was administered to Health Facilities. The Key Informant Interview (KII) was



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administered to 21 key players in each of the study communities chosen and this method helped get latent information from these players. Focus Group Discussions (FGD) were administered to women of childbearing age. This group was chosen because women in Nigeria are at the center of malaria issues. They take care of themselves, the children and the men when infected. FGDs were administered under encouraging atmosphere in all the areas selected and comprised of between five to ten women per group.

The National Population Commission (NPC) provided the population figures of Federal Capital Territory (FCT) and all the Area Councils that were selected for the study. As usual, a formula was given to be able to calculate future population figures and even previous ones since the population growth of the FCT is fixed at 9% per annum. The supplied data on population of Area Councils where the study took place helped with the calculation of malaria prevalence rates especially for the years before 2001 where the NMEP does not have adequate data.

All the maps that have to do with vegetation, the Normalised Difference Vegetation Index (NDVI) at a low resolution and the Google Earth Maps at a high resolution were sourced from the Abuja Geographic Information System (AGIS), the Forestry Department of the Federal Capital Development Authority (FCDA), United States Geological Survey (USGS, GLOVIS Viewer) and Google Earth.

3.1. Sampling

This research covered the FCT, but 6 settlements (Kuje, Kukwaba, Galadimawa, Idu, Karmo and Buga) were selected to gather qualitative information.

Attention was also given to primary forests. As a result the satellite imageries provided information on the sizes of both primary forests and forest reserves. People that participated both in the KII and FGD were selected through a systematic exercise where the names of people from the 6 communities were listed alphabetically and names against even numbers were selected for the FGD. The three people that were interviewed through the KII for each community were chosen through a purposive sampling.

3.2. Methods of data analyses

In analysing the data, two relevant methods were employed: statistical and content analysis. Statistical analysis was employed to analyse the degree of relationship between deforestation and malaria prevalence using the Pearson correlation while content analysis was used to analyse all the qualitative data generated from the Key Informant Interview, the Focus Group Discussions and questionnaire.

The malaria prevalence level was correlated against the calculated periodic forest sizes respectively for the years under study. The help of softwares like Statistical Package for Social Sciences (SPSS), and Microsoft Excel were employed for plotting of graph and some other cartographic analyses. The imageries showing vegetation cover was taken after every three-year-interval; a gap however was noticed from 1991 to 1998 as a result of no data from the United States Geological Survey (USGS).

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The Pearson Product Moment Correlation was used to analyse the strength or degree of relationship between deforestation and malaria prevalence. The result here answered to the number 4 objective. The Pearson Correlation was calculated using the following formula:

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}}$$

Where r is Pearson Correlation, x = forest cover data, y = malaria prevalence data and y = the number of outcomes.

4. Results and Presentations

Community livelihood activities in the FCT

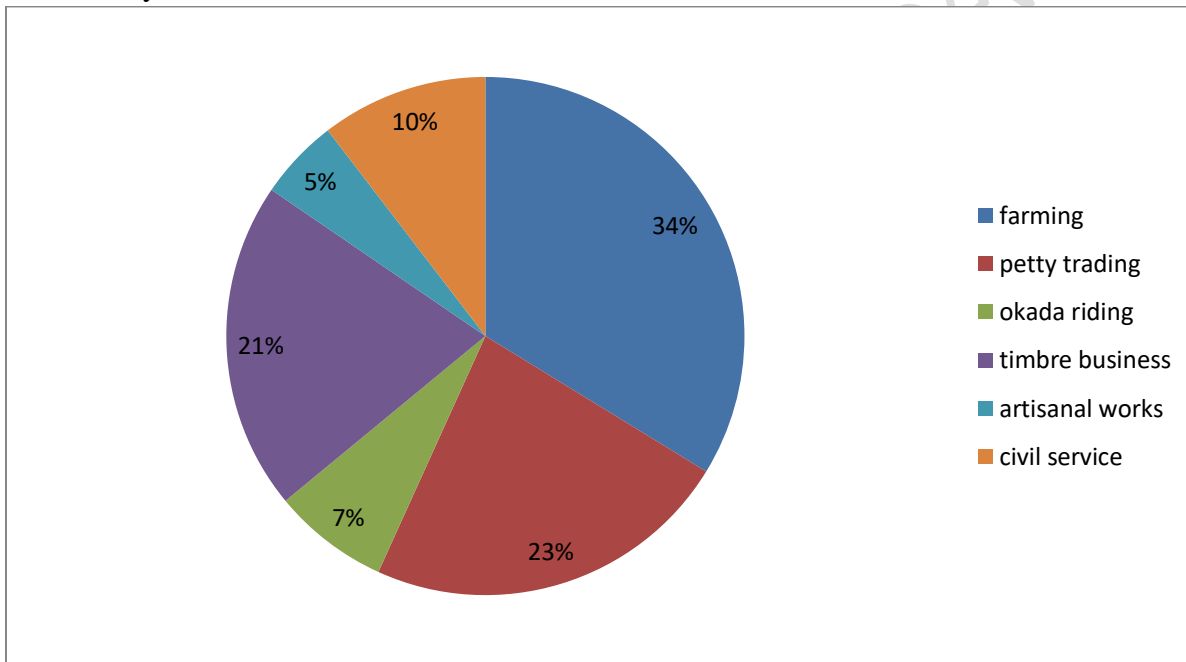


Figure 1: Livelihood activities.

Source: Fieldwork, 2015.

Two activities from Fig. 1 common to all the communities are farming and petty trading. Farming and timbre business are two activities that contribute to deforestation according to literature and these are what 55% of the residents engage in almost on a daily basis. Only the residents of Galadimawa are known not to engage in timbre and logging business since they believe forests house the community deities and help to regulate the temperature. The other communities that engage in the business of logging claim strongly they do so without the fear of regulatory authorities since they also partake in sharing the profit. This has given the loggers room to continue with the business of deforestation.



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4.1. Agents of deforestation in the FCT

Agents of deforestation are those bodies or defined groups that engage in deforestation at a significant rate. Six major agents were identified to be operating within the FCT. These are the government, furniture makers, farmers, loggers, cattle rearers and the market association as in the case of Kuje. The worrisome thing here is that majority of the farmers do not just cut trees but set the desired area on fire thus burning the trees therein to their roots and totally destroying them. As a result, agents like furniture makers and loggers try to reach the trees first before the farmers and this creates an unhealthy competition. Yengoh (2008) supports this by saying that deforestation by agents is caused by competition amongst them (*“if I do not cut these trees first for my benefit, another person will for his and so I must cut as many as I can before it is completely cut by others”*).

4.2. Health, spiritual, psychological and physical implication of deforestation on residents of the FCT

The health, spiritual, psychological and physical implication of deforestation on the residents cannot be overemphasized. The residents believe that there are implications, some without clear reasons, and some with. Some of the implications mentioned include increase in temperature. The residents of Galadimawa, Kukwaba, Kuje and Buga agree that the forests were regulating temperature by providing shades and serving as wind breaks, however since the forests have been tampered with, noticeable temperature increase has been noticed. Others believe that proliferation of ailments is on the increase based on the fact that the local herbs that were readily accessible from the forests are no more, thus making treatment more difficult and subjecting them to orthodox treatment which is costly.

The women of Idu, Buga and Galadimawa lamentably agree that deforestation sent some wild spirits that were trapped within the forests on rampage. These spirits therefore unleashed a lot of sicknesses on them which includes epilepsy, diarrhea and malaria fever. The Idu women said that reciting the Koran or offering sacrifices to the spirits gives temporal relief.

In Kuje, the women affirmed that a significant increase in the breeding rate of mosquitoes has been noticed since the market union invaded the forest to set up the daily market because of the degree of canopy that provides shade. This invasion created room for forest fragmentation causing enough sunlight to get to the ground. The market presence also generates refuse which accommodates and promotes mosquito egg production at the slightest concentration of moisture.

4.3. Relationship between deforestation and malaria infection in the FCT

Many of the residents of FCT do not really know if there exists any relationship between deforestation and malaria. Some of the respondents believe against known literature that deforestation reduces the rate of malaria infection as it brings about a total destruction of their natural habitat. Ironically, the women of Idu strongly believe that deforestation increases malaria infection. Their opinion was that the number of reported cases by people from neighbouring communities who live in deforested environments are more than theirs.

4.4. Reasons for increase in malaria infection in the FCT



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Several reasons can be attributed to malaria infection increase according to scholarly studies. Some of the reasons identified in the FCT include clogged drains, increase in population, inconsistent rainfall (heavy and consistent rainfall flushes or even totally destroys the breeding chain of anopheles mosquitoes by flushing the eggs and larva), improper garbage disposal and generally unhygienic surroundings. Some of these reasons in addition to deforestation create enabling environments for anopheles breeding. A respondent attributed this increase to incomplete treatment or, in other words, drug abuse. Abusing malaria drugs causes the causative organism to be resistance to drugs thus prolonging the stay of plasmodium in the human system.

4.5. Methods of prevention against malaria in the FCT

The National Malaria Elimination Programme was established to stamp out malaria or reduce the infection to the barest minimum. Consequently, a lot of work on prevention in collaboration with some other agencies and organisations has been carried out. To this end, insecticide treated mosquito nets were distributed freely to all antenatal women and households. For so many that do not like using the nets, they shift their option to insecticide spray or mosquito coil.

The respondents from the six study sites agreed on different prevention methods, and common amongst all the methods is clean environment. They believe that keeping the environment clean and maintaining proper personal hygiene are prime and, by so doing, there won't be any comfortable breeding space for the mosquitoes and thus no need for any other preventive method. On ground however, they use nets but claim they do so only on cold nights because the nets generate heat except when there is power to make use of the fans. The Dakachi of Galadimawa (the Village Head) further asserted that people who are well off use insecticide spray and or repellents. However from field observation, window nets were seen on some windows. Most of them torn without any hope of changing or mending them soon. The danger of having a torn net is that it allows and traps mosquitoes inside the houses.

Winckler (2013) came out with best practices that will help prevent malaria infection. These include staying in well screened areas at night, use of insecticide treated mosquito nets, use of repellents, putting on of long sleeve shirts and long pants. Others are the use of antimalaria drugs and putting on air conditioners at night as mosquitoes dread very cool environments.

4.6. Reasons for deforesting and forest produce use in the FCT

Several reasons were given for cutting down the trees by the residents of the FCT. The women of Galadimawa and Idu communities claim they cut down trees to pave way for farming as to encourage enough sunlight and aeration for maximum crop yield. The Idu Gatekeepers went ahead to share that they deforest to make available wood fuel and poles for rural electrification. In Kuje however, the women said they cut down trees to increase visibility thus curtailing armed robbery and rape incidences within and around the forest area and also to scare wild animals away into the primary forests surrounding them.

The produce from the forest is used for furniture making, electric poles, and herbs for treating ailments traditionally, timber for construction, carving of mortar and pestle, and for the construction of temporary houses. The bottom line in all of these is to generate income. Yengoh (2008) attributed deforestation to income sensitive causes. Consequently it is believed that whatever drives poverty also



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drives deforestation. This line of thought strongly holds that poor people depend on and use more environmental resources than the rich.

4.7. Methods of deforestation in the FCT

The gatekeepers of Galadimawa and Kukwaba said that the level deforestation that took place within their villages was done by the government using bulldozers and other heavy machines. To this effect therefore large expanse of vegetation was removed within a short period. Kuje residents said they use electric-driven sawing machine to save time. Idu and Karmo residents prefer burning the plants to their roots claiming it is most effective and cheap. Bush burning is really one method that cannot be controlled and destroys trees and plantations in large numbers. When trees are burnt to their roots, it does not offer them the opportunity to bud and probably regrow. Other methods used by locals who cut one tree at a time for personal use include the use of machetes, axe and other cutting implements. Of all these methods, the use of machines often encourage deforesting beyond the expected limit or boundary.

Malaria prevalence rates in the FCT

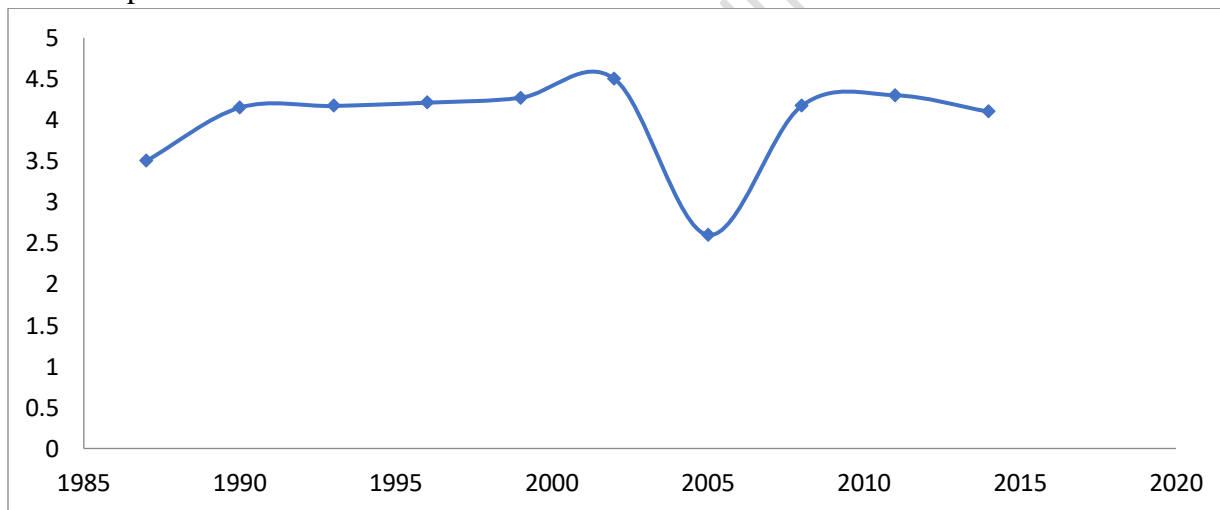


Fig 2: Malaria prevalence rates.

X axis = year and Y axis = rate.

Source: Fieldwork, 2015.

The malaria prevalence rates of the FCT follow an oscillatory pattern. From 1987, an increase in prevalence is observed making its peak in 2002 with 4.5% prevalence, NMCP (2014). Thereafter a decline was initiated till 2005 and the pattern continues. This however is not true with the number of reported cases of malaria. The number of reported cases kept on increasing except in 2005 where there was a slight decrease. This increase is chiefly attributable to population increase of both man and



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anopheles mosquitoes. For the reported cases to be on the increase while the prevalence fluctuates means that the reported cases per 1000 persons across the years is also fluctuating. This therefore means that the increase in the reported cases does not mean necessarily an increase in prevalence.

Diagnosis of malaria in the FCT

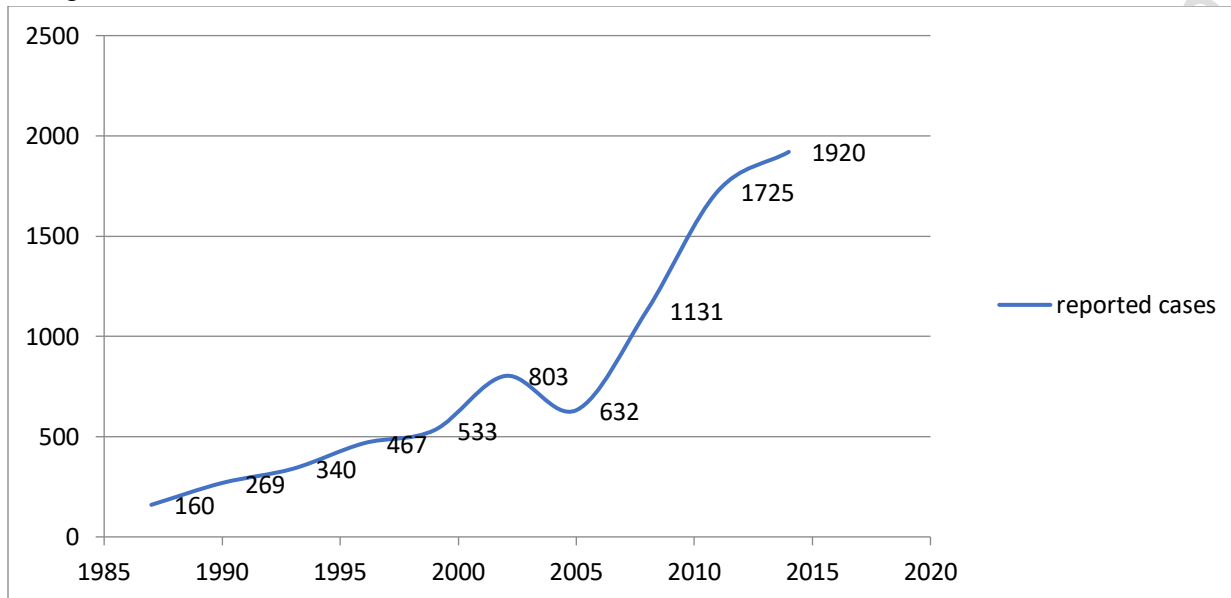


Fig 3: Weekly diagnosis of malaria infection.

Y axis = number of cases and X axis = years

Source: Medical Centres in the FCT, 2015.

The graph in the figure above is quite different from that in Fig 2. This further buttresses the fact that reported cases have no direct relationship with prevalence because of population increase. Four of the 6 communities (Idu, Karmo, Kuje, and Buga) have average diagnosed cases of 11 – 20/week. It has to be noted that these are the cases that were reported to the Health Facilities. As has been observed, some other schools of thought engage in drug abuse through self-medication by going to pharmacy shops and herbalists for treatment even without a routine test to ascertain the true sickness. Communities that have forests diagnose less malaria cases than deforested ones except for Buga probably because the natural vegetation which was deforested has been allowed to re-grow. Kukwaba and Galadimawa have the highest diagnosis of more than 30/ week. This is attributed to the total deforestation that occurred over time there, population increase and dirty environmental habits.

The sharp increase in reported cases from 632 in 2005 to 1920 in 2014 could be attributed to the population increase and secondly the total deforestation that occurred in major communities to pave way for housing estates intended to take care of the increasing population.



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4.8. Correlation of deforestation and malaria prevalence in the FCT

Table 1: Malaria prevalence and dense vegetation size.

Forest size %	18.28	18.79	20.75	13.77	13.10	13.06	12.70	12.69
Malaria prevalence	3.5	4.15	4.27	4.5	2.6	4.17	4.3	4.1

Source: Fieldwork, 2015.

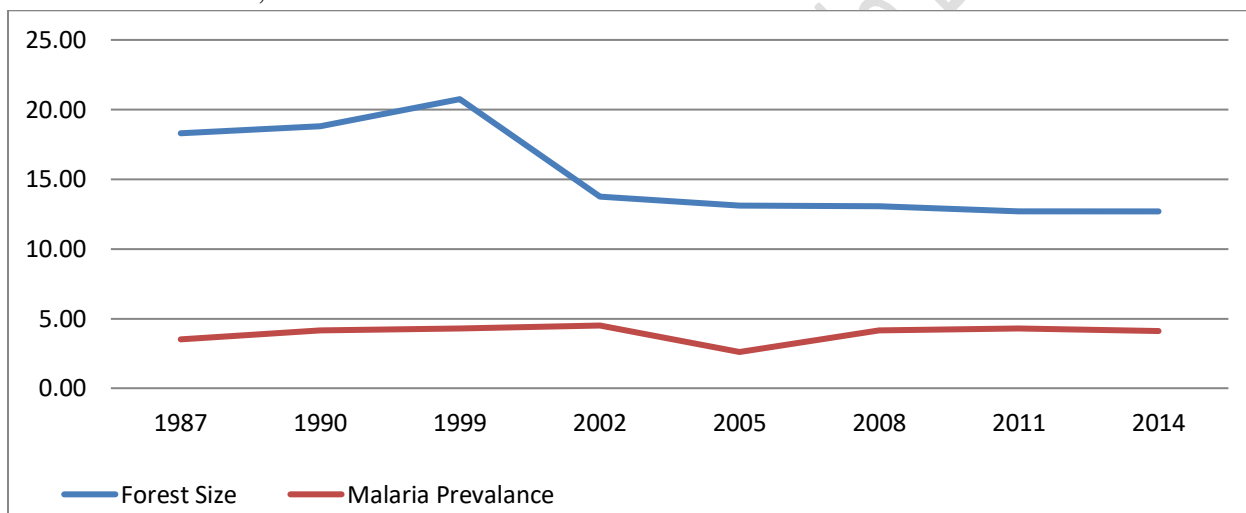


Fig 4: Malaria prevalence and area covered by dense vegetation.

Y axis = rate, X axis = years.

Source: Fieldwork, 2015.

From Fig 4, it is seemingly clear that there may not be a clear relationship between malaria prevalence and forest size in the FCT within the study period. This however will be put to statistical test using the Pearson Product Moment Correlation to x-ray the degree of relationship.

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}}$$

Where n = number of outcomes, x = area covered by forest, y = malaria prevalence.



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Table 2: Correlation table.

Forest size (x)	Malaria prevalence (y)	X ²	Y ²	xy
18.28	3.5	334.16	12.25	63.98
18.79	4.15	353.06	17.22	77.98
20.75	4.27	430.56	18.23	88.6
13.77	4.5	189.61	20.25	61.97
13.1	2.6	171.61	6.76	34.06
13.06	4.17	170.56	17.39	54.46
12.7	4.3	161.29	18.49	54.61
12.69	4.1	161.04	16.81	487.69
123.14	31.59	1971.89	127.4	487.69

Source: NMCP, 2014 and USGS, 2015.

$\sum x = 123.14$, $\sum y = 31.59$, $\sum x^2 = 1971.89$, $\sum y^2 = 127.4$, $\sum xy = 487.69$, $n = 8$.

$$r = \frac{((8)(487.69)) - (123.14)(31.59)}{\sqrt{((8)(1971.89) - (123.14)^2)((8)(127.4) - (31.59)^2)}}$$

$$= \frac{11.53}{\sqrt{13,010}}$$

$$= 0.10105$$

Applying t – test

$$t = r \sqrt{\frac{n-2}{1-r^2}}$$

$$= .01015 \times 2.4621$$

$$= 0.2488$$

Degree of freedom = $N-2 = 6$

6 @ 5% = 0.707 Thus a null result is accepted.

Deforestation in the FCT therefore has no significant relationship with malaria prevalence. This is against what we know from the literature, especially those focusing on the Amazons. This means



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probably that there are other factors that trigger this high prevalence thus creating a gap for future studies. Beyond the identified factors leading to malaria increase in the study area like clogged drains, population increase, inconsistent rainfall, poor waste management and dirty surroundings, a major reason could again be the nature of soil and the topography of the study area. Most of the soils found within the study area have capillary qualities and are able to absorb as much moisture as possible. The topography again is highly undulating and encourages runoffs as soon as the rains stop. This therefore does not encourage formation of puddles for *Anopheles* egg production. It is also possible that thickness of the vegetation in the FCT characterised by canopy covers may not be as thick as those found in the Amazon which probably led to the non-significant relationship.

According to Dejenie, Yohannes and Assmelash (2011), small water bodies such as ponds, hoof prints of cattle and irrigation channels host most of the mosquito larvae especially water with sandy bottom. The larvae occur in a wide range of habitats but most species prefer clean, unpolluted water. Larvae of *Anopheles* mosquitoes have been found in grassy ditches, the edges of streams and rivers, and small, temporary rain pools. Many species prefer habitats with vegetation. Others prefer habitats that have none. Some breed in open, sun-lit pools while others are found only in shaded breeding sites in forests. A few species breed in tree holes or the leaf axils of some plants.

5. Conclusion

Findings from this study show that occupations of residents in the study area like farming, logging and trading pose the greatest threat to devegetation. Of the six agents of devegetation identified, these occupations fit into the three slots of furniture making, farming and illegal logging. Illegal logging is the most direct danger to the FCT's remaining Forest Reserves. There is clear indication that illegal and corrupt forestry activities have a series of negative and habitually interlinked, environmental, economic and social impacts (Callister, 1999). Such activities almost certainly weaken attempts to sustainably manage forests, even though the current government lacks the sincerity and ability to secure FCT's remaining Forest Reserves. All these put together have contributed to the significant rate of deforestation within the Study Area.

Serious cultural undertones are also responsible for devegetation in the FCT. The residents agree that the two most important reasons of forests are to provide firewood and timber. This is further given a boost since the government cannot provide sufficient alternatives for firewood like kerosene and cooking gas. It was noted through observation that majority of the residents agree that charcoal is both available and affordable unlike kerosene that is available but not affordable, likewise cooking gas. Another that is both available and affordable is saw-dust from mills. Of the three that are available and affordable, charcoal and saw dust are pointers to the fact that serious devegetation takes place in the Study Area.

Owing to migration and general increase in population, the malaria prevalence has remained relatively stable. Malaria which tops the list of prevalent diseases in the study area is on the increase chiefly because of dirty environment and drug abuse (NMCP, 2014). Malaria whose prevalence remained at 4.1% amounting to 1920 reported cases in 2014 puts serious burden on the residents. Use of Insecticide Treated Nets, insecticide spray and consistent sanitation are some of the suggested ways to curb the infection.



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Pearson Product Moment Correlation was used to analyse the significance in relationship between deforestation and malaria prevalence using the percentage sizes of both the dense forest and sparse vegetation for the selected eight years and the malaria prevalence for same years as correlates. The result clearly shows that there is no significant relationship between the two. This means that even though deforestation has a positive relationship with malaria increase, same is not true for its prevalence, because as the infection rate is increasing so also is the population. Therefore some other environmental and socio-cultural conditions must be fingered as being responsible for the trend in malaria prevalence in the Study Area.

References

- Anon, (2001b). Global Forest Resources Assessment 2000 – Main Report. Food and Agriculture Organisation of the United Nations; Rome.
- Arbani, P.R., (1993). Malaria control programme in Indonesia. *Southeast Asian Journal of Tropical Medicine and Public Health*. 23:29-38, (PubMed).
- Bradford, A., (2015). Deforestation: Facts, Causes and Effects. *Livescience*.
- Brant, H., Ewers, R., Vythilingam, I., Drakeley, C., Benedick, S., Mumford, J., (2012). *Impacts of Tropical Deforestation and Fragmentation on Mosquito Community Dynamics*. Imperial College Publishers.
- Callister, D.J. (1999). Corrupt and Illegal Activities in the Forestry Sector: Current Understandings and Implications for World Bank Forest Policy, Background Paper for the 2002 Forest Strategy
- Dejenie, T., Yahannes, M. and Assmelash, T. (2011). Characterisation of Mosquito Breeding Sites in and in the Vicinity of Tigray Microdams, *Ethiopian Journal of Health Sciences*, 21(1): 57 – 66
- Elliot, C., (2010). Human Health Linked Directly to Forest Health. *World Wide Fund for Nature*.
- Gainey, L., (2014). Study on the Impacts of Deforestation on Malaria Transmission. Retrieved from www.nhm.ac.uk
- Guerra, C.A., Snow, R.W., Hay, S.I. (2006). A global assessment of closed forest, deforestation and malaria risk. *Ann Trop Med Parasitol*; 100(3): 189-204.
- Hahu, M.B., Gangnon, R.E., Barcellos, C., Asner, G. and Patz, J., (2014). Influence of deforestation; logging and fire on malaria in the Brazillian Amazon. *PLoS One*, 9(1)
- Hay, S.I. (2000). An overview of remote sensing and geodesy for epidemiology and public health application. *Advances in Parasitology*. PubMed.
- Hay, S.I, Guerra, C.A, Tatem, A, Noor, A.M, and Snow, R.W., (2004). The global distribution and population at risk of malaria: past, present and future. *Lancet Infectious Diseases*. 4:327-336, (PubMed).
- Keesing, F. (1997). *Ecological Interactions Between Small Mammals, Large Mammals and Vegetation in a Tropical Savanna of Central Kenya*. Berkeley Publishers.
- Keiser, J., Singer, B.H., Utzinger, J. (2005). Reducing the burden of malaria in different epidemiological settings with environmental management: a systematic review. *Lancet Infectious Diseases*. B5:695-708, (PubMed).
- MacCormack, C.P. (1994). *Ethnography of Fertility and Birth*. Waveland Press.



2017 VOLUME 3 (ONLINE VERSION)

- Manga, L., Toto, J.C., Carnevale, P., (1995). Malaria vector transmission in an area deforested for a new airport in southern Cameroon. *Journal of Tropical Medicine*; 75: 43-49.
- Melinda, B., Kolivras, K., Grossman, L., Redican, K., (2010). Knowledge, Perceptions, and Practices: Mosquito-borne Disease Transmission in southwest Virginia, USA. *Southeastern Geographer*; 50(3): 366-385.
- Mouchet, J. and Brengues, J. (1990). The interface between agriculture and the epidemiology of malaria vectors. *Society of Exotic Pathology Bulletin*. 92:309-312. (PubMed).
- National Malaria Control Programme (NMCP), (2014) Federal Ministry of Health. Annual Report. Abuja. Nigeria.
- Olsen, S., Gangnon, R., Silverira, G., and Patz, J., (2010). Deforestation and Malaria in the Mancio Lima County,, Brazil. *Emerging Infectious Diseases*, 16(7), 1108 – 15.
- Olufemi, A.O., and Ameh, C.E., (1999). Forest Resources Situation Assessment of Nigeria. EC FAO PARTNERSHIP PROGRAMME: tropical forestry budget line. B7 – 6201/97-15/VIII/FOR, Abuja, Nigeria.
- Pattanayak, S.K., Dickinson, K., Corey, C., Sills, E.O., Murray, B.C., Kramer, R., (2006). Deforestation, Malaria, and Poverty: A call for Transdisciplinary Research to Design Cross-Sectoral Policies. *Sustainable: Sci Pract Pol*. 2(2): 1-12.
- Pichainarong, N. and Chaveepojnkamjorn, W. (2004). Malaria infection and life-style factors among hill-tribes along the Thai-Myanmar border area, northern Thailand. *Southeast Asian Journal of Tropical Medicine and Public Health*. 35: 834-839.
- Sawyer, D. (1993). Economic and Social Consequences of Malaria in New Colonization Projects in Brazil. *Social Science Med*. 37(9): 1131-6.
- Singer, B.H. and De Castro, M.C., (2001). Agricultural Colonization and Malaria on the Amazon Frontier. *Annals of the NY Academic of Science*. 954: 184 – 222.
- Uneke, C., (2008). Deforestation and Malaria in sub-Saharan Africa: an overview. *The internet Journal of Tropical Medicine*. Volume 6, #1.
- United States Geological Survey (2015). GLOVIS Viewer.
- Vittor, A.Y., Gilman, R.H., Tielsch, J., Glass, G., Shields, T., Lozano, W.S., Pinedo-Cancino, V., Patz, J.A. (2006). The effect of deforestation on the human biting rate of *Anopheles darlingi*, the primary vector of falciparum malaria in the Peruvian Amazon. *American Journal of Tropical Medicine and Hygiene*. 74:3-11, (PubMed).
- Wilson, M.E., (1995). “Infectious Diseases: an ecological perspective.” *British Medical Journal*, 311(7021): 1681 – 1684.
- Wilson, M.L., (2001). *Ecology and Infectious Disease*. Baltimore, MD. The John Hopkins University Press; 285-291.
- Wilson, M., Levins, R., Spielman, A., (1994). *Disease in Evolution: Global Changes and the Emergence of Infectious Disease*. New York Academy of Sciences.
- Winckler, S., (2013). Malaria Prevention: 10 useful tips. *DreDs.com*.
- Yasuoka, J., Mangione, T., Spielman, A and Levins, R., (2006b). community-based rice ecosystem management for suppressing vector anophelines in Sri Lanka. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 100: 995 – 1006.



2017 VOLUME 3 (ONLINE VERSION)

- Yasuoka, J. and Levins, R., (2007). Impacts of deforestation and agricultural development on Anopheline ecology and malaria epidemiology. *American Journal of Tropical Medicine and Hygiene*. 76: 450 – 460.
- Yengoh, G.T., (2008). Explaining the Causes of Deforestation with the Hyde Model. *International Institute for Applied System Analysis*. IR – 08 – 039.

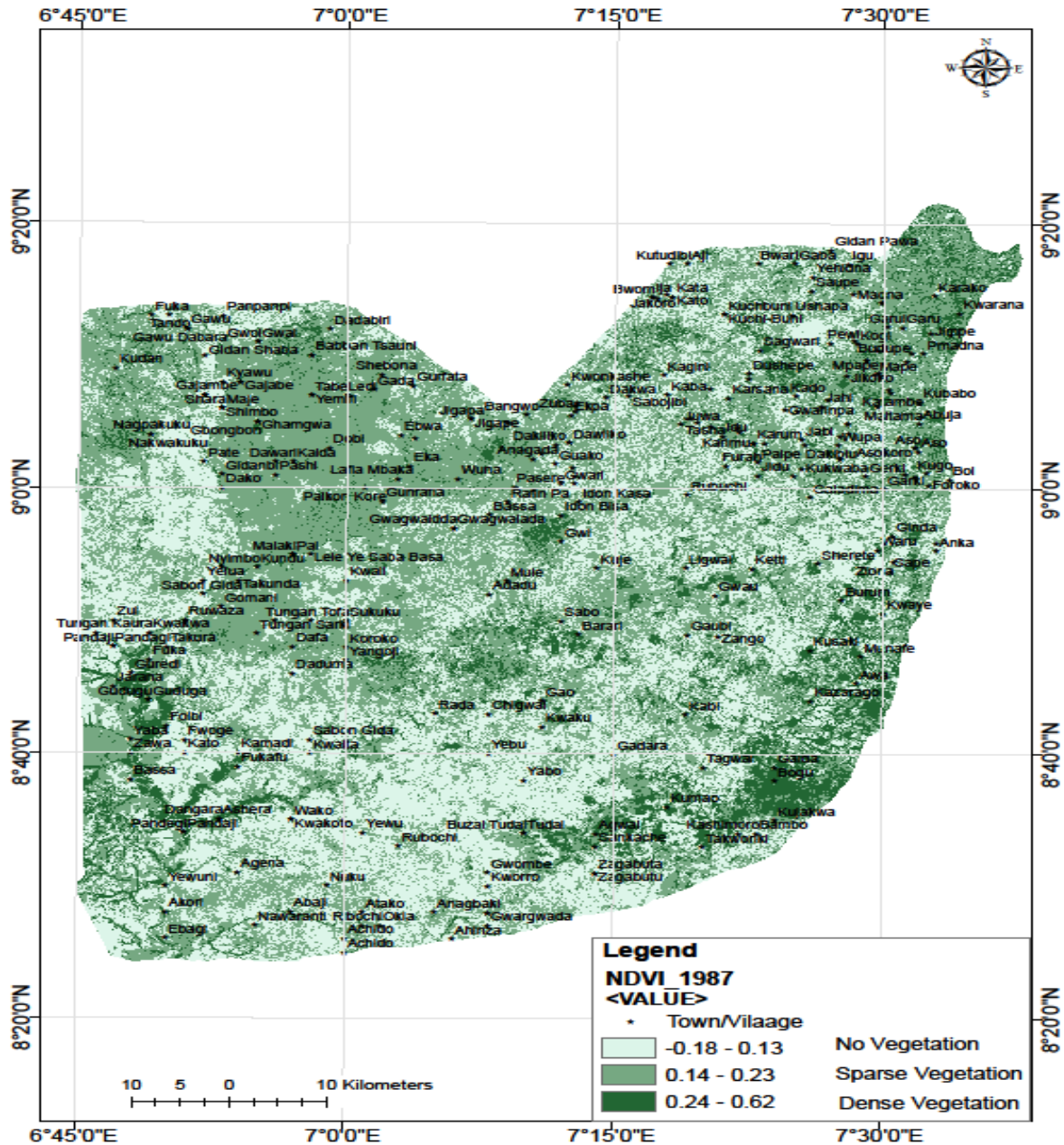
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Appendix: NDVI maps for FCT.

APPENDIX 1

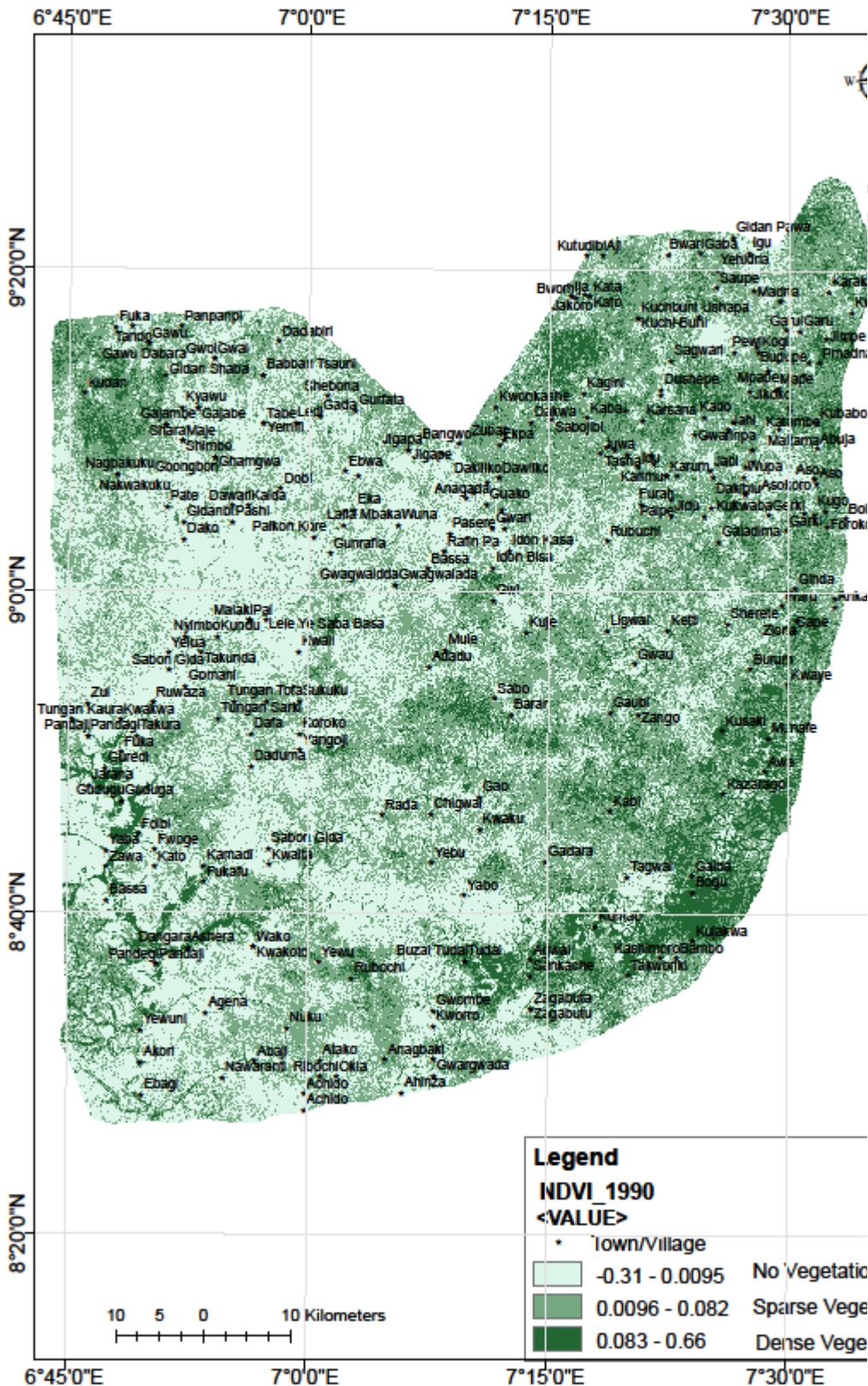


Source: United States Geological Survey, 2015



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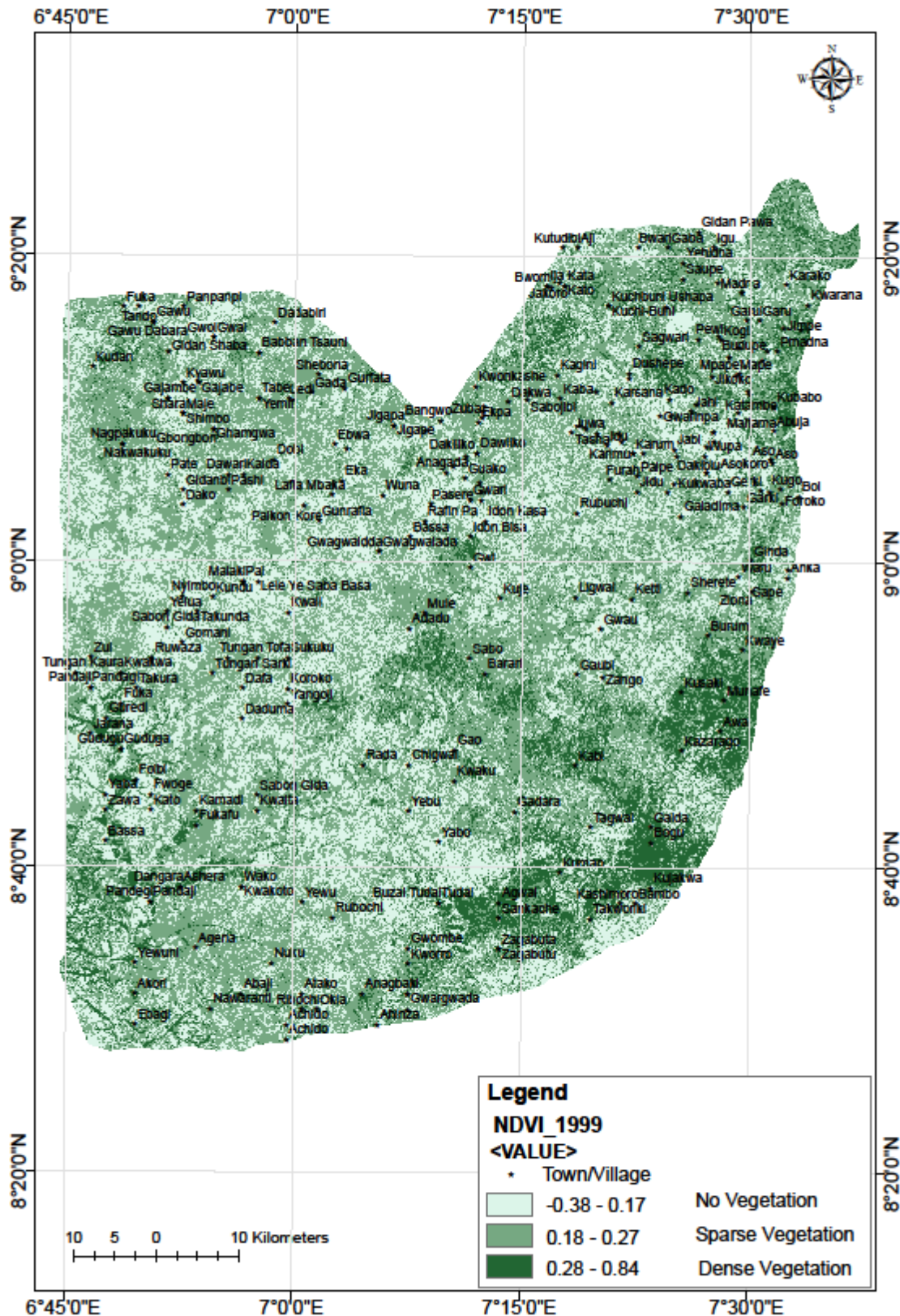
APPENDIX 2





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APPENDIX 3





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APPENDIX 4

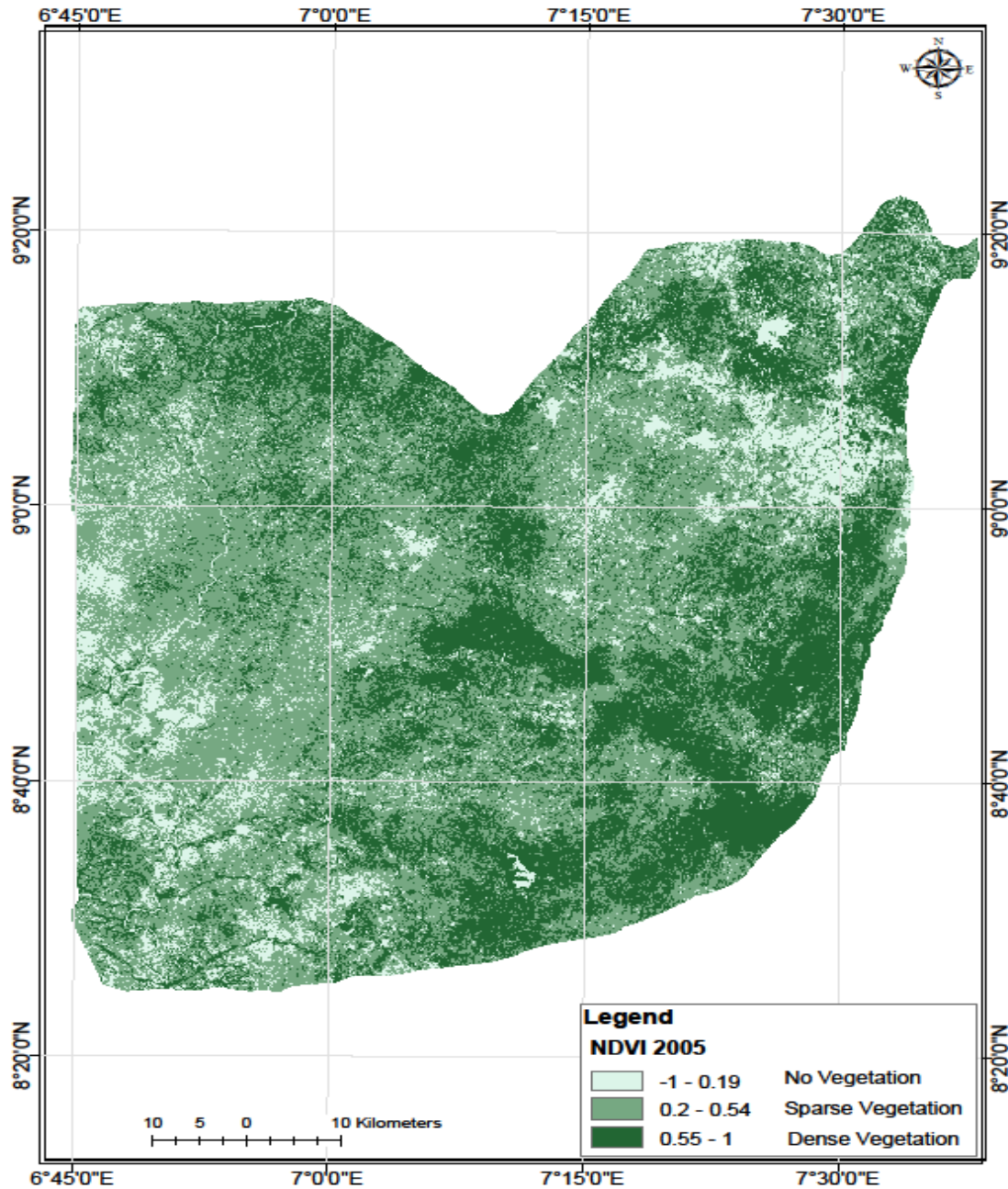


Source: United States Geological Survey, 2015



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APPENDIX 5

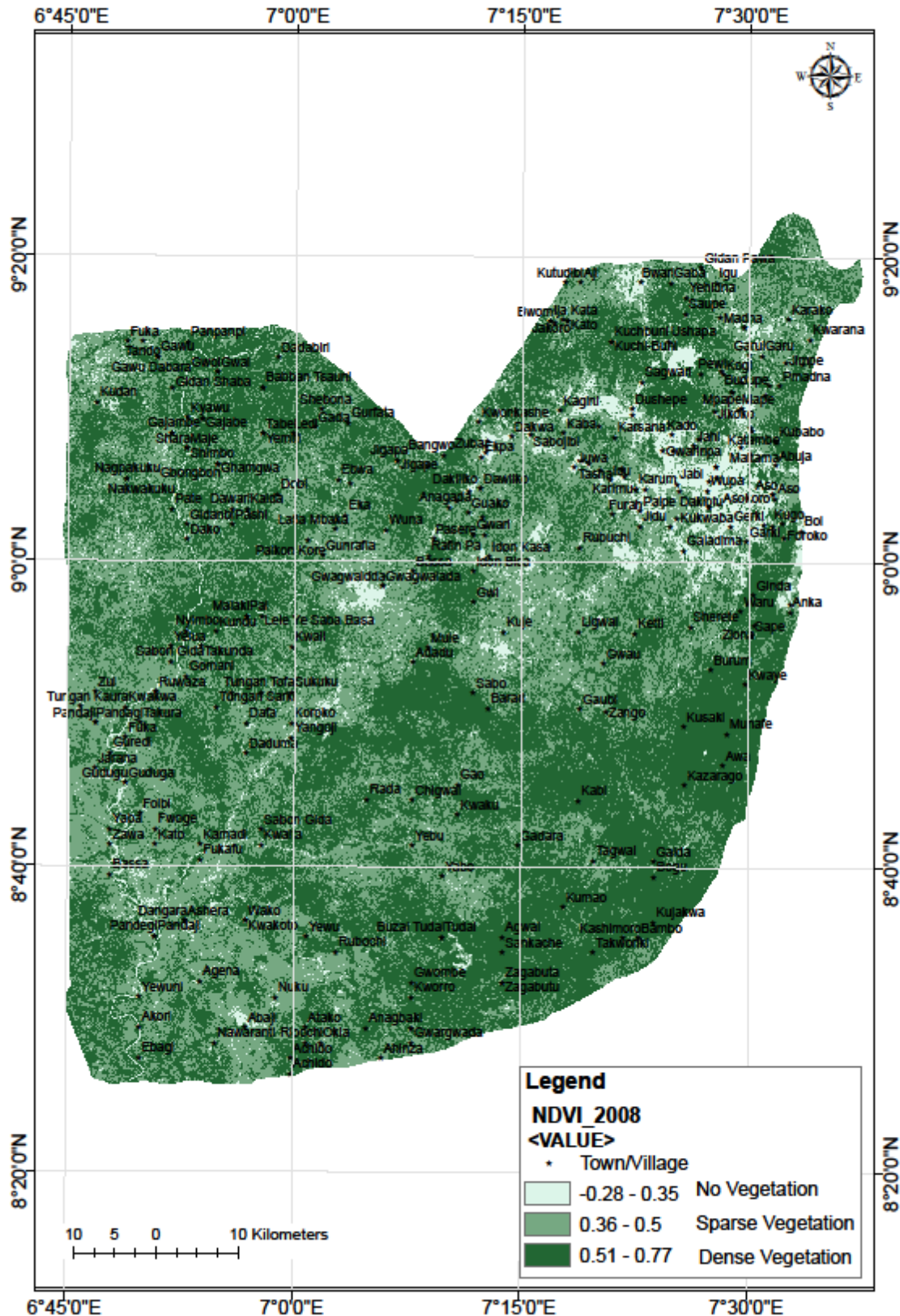


Source: United States Geological Survey, 2015



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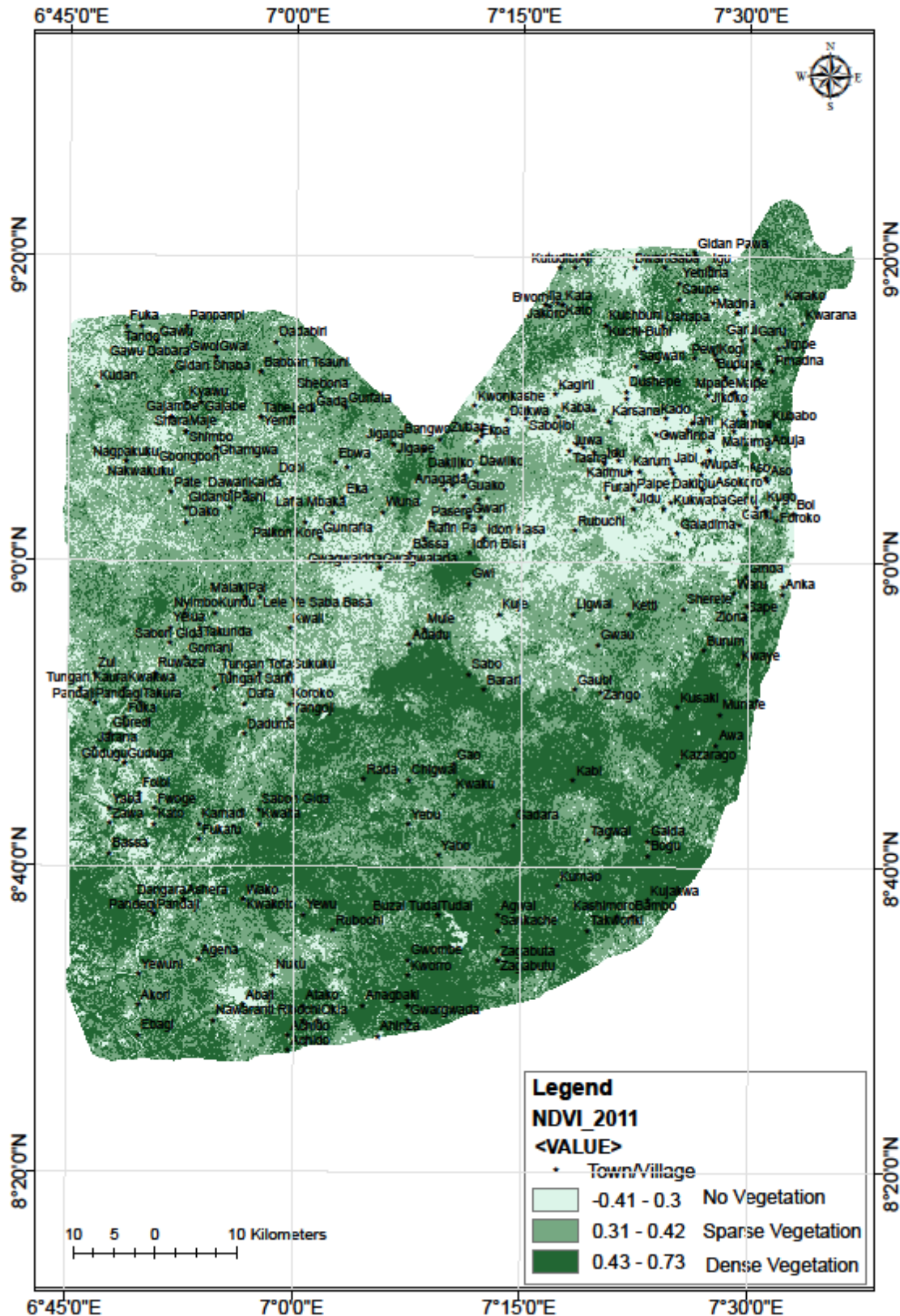
APPENDIX 6





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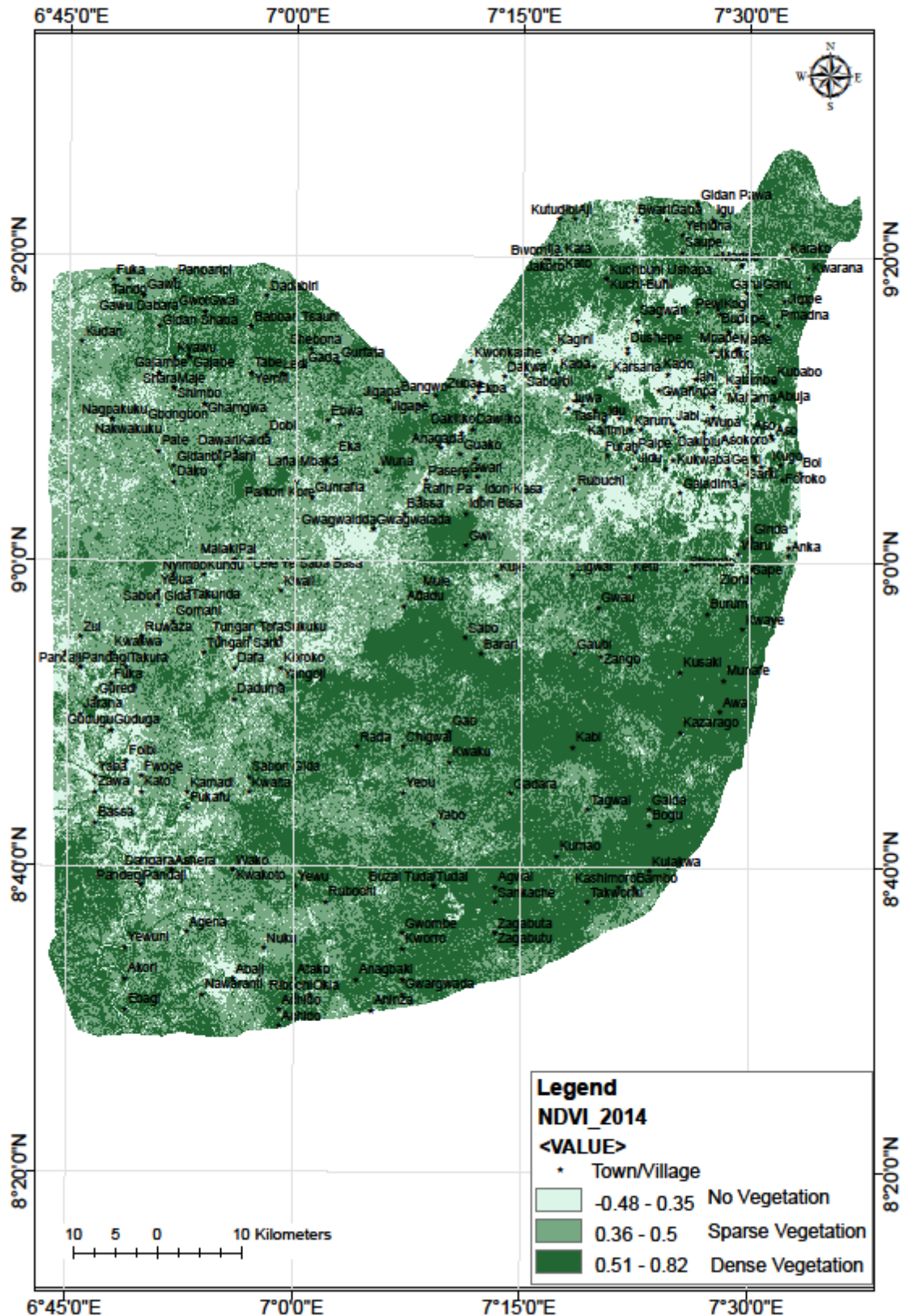
APPENDIX 7





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APPENDIX 8





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EVALUATION OF NATURAL DURABILITY OF THE WOOD OF *BORASSUS AETHIOPUM*. MART. AT DIFFERENT ECOLOGICAL ZONES AGAINST SUBTERRANEAN TERMITE (*MACROTERMES BELLICOSUS*. SMEATHMAN) IN NIGERIA

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Abstract

Natural durability of the wood of *Borassus aethiopum* was evaluated to assess its utilization potentials. Samples for the study were collected from natural forest locations in three ecological zones in Nigeria, namely: Derived savannah, Sudan savannah and Guinea savannah. Five trees were sampled at base (10%), middle (50%) and top (90%) of the merchantable height and from bark to bark radially from each of the ecological zones. A split plot statistical method was used to test the significance of the variability in the percentage weight loss at 5% probability level. The percentage weight loss was $15.32 \pm 0.05\%$ with mean value $10.37 \pm 0.02\%$ at the base, $12.21 \pm 0.21\%$ at the middle and $23.40 \pm 0.11\%$ at the top. Across the bole, it ranges from 0% to $31.18 \pm 0.21\%$ at the base, 0% to $34.57 \pm 1.31\%$ at the middle and 0% to $61.16 \pm 0.78\%$ at the top. However, among the ecological zones, highest weight loss was observed in Derived savannah followed by Guinea savannah and Sudan savannah with $15.98 \pm 0.01\%$, $15.26 \pm 0.35\%$ and $14.75 \pm 0.11\%$ respectively.

According to the rating, the outer wood, middle wood and inner wood are rated. We observed trace of termite attack: moderate termite attack and heavy termite attack respectively in accordance with ASTM D1758-74. We conclude that the outer wood of *B. aethiopum* can be used without preservation because termite was unable to destroy it but every other part (centre and inner wood) must be preserved to increase the service year.

Keywords: *B. aethiopum*, *M. bellicosus*, durability, termite, and eco-zones

1. Introduction

The importance of wood in the world economy cannot be over emphasized. Its excellent potential as a structural material can be jeopardized by the attack of bio-deteriorating agents such as fungi and insects. Ogunsanwo *et al.* (2002) noted that large quantities of timbers are destroyed annually by these agents. Wood is a biological material that can be viewed as a renewable source of energy which will continue to exist as long as the sun shines, and, when used properly, will not decay. But if exposed to favourable condition for bio-deteriorating agents when in use, lumber and other wood products succumb to the same biological processes that decompose dead trees in the forest. In the forest, decomposition of



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wood is nature's way of recycling, but to the homeowner or farmer, decayed wood products mean added repair or replacement costs (Reeb, 1997; Croan, 1997; Clausen, 2010). Wood is also liable to attack by agents of degradation especially in packaging, storage and service leading to deterioration. Wood destruction occurs when the cellulose cell walls are broken, and this result in loss of weights (80% of its dry weight) and value (Badejo, *et al.*, 2001). Wood structures are affected by fungi, insects and other micro-organisms which cause rot and decay, (Ogunsanwo *et al.*, 2002 and Akinyemi *et al.*, 2004) especially under a suitable humid climate or wherever wood comes in contact with ground or water (Ogunsanwo, *et al.*, 2002).

Termites cause the most serious damage of all wood-feeding insects especially in Nigeria. (Ojo, 2016). In addition to timber and wood products, they attack growing trees, leather, rubber, and wool as well as agricultural crops (Malaka, 1983). Significant damage is caused by termites to man-made fabrics, polythene, plastics, metal foils, books, furniture, wooden telephone poles, wooden railway sweepers, and insulators of electric cables (Malaka, 1996).

Therefore, if wood is to be effectively and maximally utilized for construction and engineering purposes, practices that will minimize the hazard of biodeterioration must be considered, and these include evaluation of its natural durability to establish if there will be need for preservation against termite.

Macrotermes bellicosus is an aggressive termite prevalent in tropical Africa causing high percentage of damage by termite in Nigeria. (Ojo, 2016), and *Borassus aethiopum* is a multipurpose palm, providing multifunctional uses in the areas of shelter, food supply, improvement of the economic status (income and employment) of the rural people and the protection of the environment from degradation and biodiversity depletion (Tee, *et al.*, 2006). Every part of the tree can serve any of the socio-cultural, economic and environmental needs of humanity. The wood has been excellently used in building construction and it is generally believed to be naturally durable (Ajaiyeoba and Nwaruh, 1983). The English names are Ron Palm (Phillipe, 1999), Giant Africa Palmyra Palm, African fan palm (FAO, 2006) or Elephant palm (Sanon and Sacande, 2007),

Apart from strength properties, resistance to decay and other wood deteriorating attacks is fundamental to wood utilization potentials. With the conditions in the tropics being extremely conducive for wood destroying agents, natural durability of wood and allied products is one of the most important factors affecting the use of timber. It is necessary therefore to investigate the natural durability of the species to bring out its full potentials for effective utilisation.

2. Materials and method

2.1. The study Area

The study area consists of three ecological zones in Nigeria, namely: a derived savannah from south west, Guinea savannah and Sudan savannah. The locations of collection were: Sudan savannah-Kano (Kano state), Guinea savannah-Okenne (Kogi state) and derived savannah-Ife-Odan (Osun state). Nigeria is located in the tropical zone (between latitude 10° 00'N and longitude 8° 00') with a vast area having savannah vegetation (Salako, 2003). This is a region that is itself diverse, necessitating a classification into derived savannah, southern Guinea savannah and northern Guinea savannah and Sudan savannah.



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The states in the Sudan savannah ecological zone of Nigeria includes Sokoto, Bauchi, Kano, Kastina, Yobe, Zamfara, Jigawa, Kebbi, Taraba, Gombe, Borno and Adamawa state. The zone is characterized by tall grasses and Acacia trees with an annual rainfall of less than 1000mm and as low as 500mm in the upper region. The rainy season could be as short as 3 months, while the relative humidity is generally low (Adejumo and Raji, 2007).

Guinea savannah lies approximately between longitudes 3° and 14°E and latitudes 7° and 10°N. The climate of the area is characterized with relatively high temperatures throughout the year. The average annual maximum varies from 35°C and 31°C throughout the year while the average annual minimum is between 23°C and 20°C. The Guinea savannah area includes part of Adamawa and Taraba, Benue, Abuja, Kwara, Kogi and Niger, Enugu (Ayanlade and Odekunle, 2009).

While the derived savannah for this study is Iwo, in Osun sate, Osun state lies between latitudes 7° 37'E and longitudes 4° 10'N. It is located in the South Western part of Nigeria, bounded by Oyo in the West, Kwara in the North, Ekiti in the East and Ondo in the South. It has a total land area of 9,396km². It has the characteristic of West Africa Monsoonal climate with a markedly bimodal distribution of rain. The rainfall pattern ranges from 1,475mm per annum in the southern part to 1,125mm in the northern area. The maximum temperature is at 32.5°C and relative humidity 79.90% (Nyenka, 2000).

2.2.Sample selection and Data collection

Five (5) trees were felled at each of the sites (Derived savannah, Guinea savannah and Sudan savannah) especially during the boom. To ensure minimal influence of age, lack of management and other variables, trees initiating swollen top with uniformly close diameter were chosen.

Bolts of 500mm long were cut from each sample tree at the base, middle and top of the merchantable height, resulting in fifteen (15) bolts in each of the ecological zone. The bolts were then taken to the Wood Workshop of Forest Products Development and Utilization Department, Forestry Research Institute of Nigeria, Ibadan for further conversion to test samples.

Selection of representative samples for test was carried out from the central planks obtained from all the bolts to give 45 planks from where test samples for all the experiment were obtained: 15 for each of the ecological zone. The radial position was divided into 6 compartment from bark to bark.

To evaluate durability of a timber, long term outdoor and ground contact testing, more commonly known as 'grave-yard' testing, has been adopted by many researchers, including Ling, *et al.*, (2003)

Test specimen of 19x19x457mm in accordance with ASTM D 1758-74 was adopted as the testing protocol. The test samples were buried in a graveyard with evidence of infestation by termite, with spacing not less than 300mm between specimens and not less than 600mm between rows in accordance with ASTM D 1758-74 (Plate 1). The initial weight was first determined before taken to field. The experiment lasted for 12 months on the field (Timber graveyard) and the weight loss was determined by using the following formula in accordance with American standard for Testing Materials (ASTM D) 3345-08, 270 test samples were used for the test, 90 per each ecological zone

$$W = \frac{W_1 - W_2}{W_1} \times 100 \dots\dots\dots 1$$

Where: W= Weight loss



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W_1 =Initial weight

W_2 =Final weight after attack

Apart from the weight loss, visual rating was also conducted base on ASTM D1758-74 visual biodegradation rating of field test specimen.

2.3.Experimental Design

The experimental design adopted was a two factor split plot with the main plot arrange in a Randomized Complete Block Design with five replications of the test sample for each of the ecological zones, and Analysis of Variance (ANOVA) was conducted to estimate the relative importance of various sources of variation. The main effects considered are differences among longitudinal direction (Base, Middle, and Top) and across the bole. Follow-up test was conducted with the use of Duncan Multiple Range Test. This was done to know the differences between two means, and also to choose the best treatment combination from the factors considered.

3. Result and Discussion

From table 2, the result shows that average percentage weight loss was 15.32 ± 0.05 %, with mean value 10.37 ± 0.02 % at the base, 12.21 ± 0.21 % at the middle and 23.40 ± 0.11 % at the top. Across the bole, it ranges from 0% to 31.18 ± 0.21 % at the base, 0 % to 34.57 ± 1.31 % at the middle and 0 % to 61.16 ± 0.78 % at the top (Table 2). This is in line with Wong, *et al.*, (2005) who affirmed that, natural durability of most tropical species varies from the pith to bark (radial variation).

The mean values for derived savannah were 11.15 ± 0.71 %, 12.46 ± 3.77 % and 24.33 ± 3.77 for the base, middle and top respectively, while the values for Guinea savannah were 9.89 ± 0.36 %, 12.43 ± 1.21 % and 23.45 ± 2.38 % respectively. For the Sudan it was 10.08 ± 0.11 % at the base, 11.74 ± 0.53 % at the middle and 22.42 ± 0.11 % at the top, (Table 2). Radially, it ranged between 0 % and 31.11 ± 0.89 %, 0 % and 34.04 ± 0.57 %, 0 % and 29.09 ± 0.79 % at the base for derived, guinea and Sudan savannah, respectively. At the middle it ranged between 0% and 35.23 ± 2.11 %, 0 % and 36.37 ± 0.39 %, 0 % and 33.21 ± 0.56 % for derived, guinea and Sudan savannah respectively. At the top for derived, guinea and Sudan savannah respectively, the values ranged between 0 % and 65.37 ± 3.10 %, 0 % and 60.09 ± 2.36 %, 0 % and 58.02 ± 0.33 %.

Weight loss increases from base to the middle and further increased to the top along the axial axis while it increases from the outer (bark) to the inner part and further decreases to the bark since it was sampled from bark to bark across the bole (Figure 1). It was observed that termite visited virtually every part of the wood by creating tunnels on the test samples as shown in Plate 2, but could not devour the outer because of the hard pan layer of the species. Even in the forest, termites create tunnels on the body of the tree as observed below in plate 3. Termite could not cause any weight loss at the bark because of the hardness of the wood but caused weight loss at the inner part due to the nature of the inner part which is fluffy. This allows the termite to devour it massively. However, among the ecological zones, the highest weight loss was observed in derived savannah, followed by Guinea savannah and Sudan with 15.98 ± 0.01 %, 15.26 ± 0.35 % and 14.75 ± 0.11 % respectively (Table 2). Consequently, the value for durability test against termite for the species recorded for the outer (peripheral), central and the inner zones is a function of their hardness which apparently make the samples to be resistant or susceptible to termite attack. Though



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factors responsible for durability are numerous and diverse, some of them relating to conditions within the wood, others with circumstances attending to its use (FAO, 1986).

Statistically, result of changes in sampling heights revealed that both radial position and sampling heights are significantly different at 5% level of probability (Table 3). Effect of interaction between radial and sampling position was also significant at this level. The follow up test further revealed that sampling heights and radial positions were different from one another (Table 2).

4. Rating of the wood of *B. aethiopum*

Apart from the weight loss, visual rating was also conducted base on ASTM D 1758-74 visual biodegradation rating of field test specimens as given in table 4. The outerwood could be described as 9- Trace of termite, the centrewood as 7- Moderate termite attack and the innerwood as 4- Heavy termite attack

Durability of a wood product subjected to a decay hazard is determined by both the inherent decay resistance of the wood and the magnitude of the hazard. The risk of decay in wood products can vary widely with moisture availability, soil condition, and climate. Therefore, although the term “natural durability” is well understood, it may be applied differently for the same species in different locations. For example, a wood species that is durable in the northern United States may perform extremely poorly under tropical conditions (Scheffer and Morrell, 2005).

Density and other physical characteristics do not appreciably affect decay resistance. Superior decay resistance in many tropical hardwoods is associated with high extractive content—including decay inhibitors—rather than the density of the wood (Scheffer, 1973). A wood species might be resistant to one group of termites, but susceptible to others. Tewari, (1978) classified *Borassus flabellifer* palm to be highly perishable with the grade number 4.

5. Conclusion and Recommendation

We observed that termite will naturally visit the wood of *B. aethiopum*, but the outer part is resistant to termite while other parts (centre and inner wood) are susceptible to termite attack. This is in contradiction with the general belief that *B. aethiopum* wood is resistant to termite attack according to indigenous knowledge.

The results obtained from this study revealed that *Borassus aethiopum* has the potentials required by construction industries to substitute the primary timber species. It is recommended therefore that *B. aethiopum* Wood” from the outer zone and the “wood” from the butt before 65% of the merchantable height of the centre zone should be used without treatment (Preservation). This recommendation might provide a guideline for maximum utilization of the species and prompt research into other Tropical species believed to be naturally durable.

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References



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- Akinyemi, O., Adebayo, O.O., Alabi, O.O., Afuwape, M.A., Famuyide, O.O., Adejoba, O. R. and Ojo, M.O. (2004): Biodegradation responses of *Ceiba pentandra*, *Pterygota macrocarpa* and *Brachystegia eurycoma* wood samples treated with biopreservative and solignum. *Journal of Agricultural Technology*. Vol.12. pp.28-39.
- Adejumo, B. A. and A. O Raji. (2007): "Technical Appraisal of Grain Storage Systems in the Nigerian Sudan Savannah". *Agricultural Engineering International: the CIGR Ejournal*. Invited Overview No. 11. Vol. IX. September, 2007. Pp 12.
- Ajaiyeoba, D. B and Nwaruh, A. E. 1983: The place of the Fan Palm (*Borassus aethiopum*) in the Timber Industry: A case study of Benue State of Nigeria. Paper presented at the 19th Annual Conference of the Agricultural Society of Nigeria held in Ilorin, October 23-28, 1983. Pp 1-10.
- American Society for Testing and Materials ASTM, D 1758-74 (ASTM) (1974): Standard Methods of Evaluating Wood preservatives by field test with stake. ASTM International. Philadelphia pp 490-498.
- American Society for Testing and Materials D 3345-08 (ASTM), (2008): Standard Test Method Laboratory Evaluation of wood and other Cellulosic Materials for resistance to termites. ASTM international, West Conshohocken, Pennsylvania.
- Ayanlade, A. and Odekunle, O. T. (2009): GIS Approach in Assessing Seasonal Rainfall Variability in Guinea Savannah Part of Nigeria. *7th FIG Regional Conference Spatial Data Serving People: Land Governance and the Environment – Building the Capacity Hanoi, Vietnam, 19-22 October 2009*. pp 1-9.
- Badejo, S.O.O., Adebayo. O. and Ogbogu. G.U. (2001): Studies on chemical preservation of Nigerian plantation grown *Gmelina arborea* for use as construction timber. *Bulletin of Science Association of Nigeria*. Vol.23:145-147.
- Clausen, C. L. (2010): Biodeterioration of wood. Wood handbook—Wood as an engineering material. U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. General Technical Report FPL-GTR-190. Pp 508. (www.fpl.fs.fed.us).
- Croan, S. (1997): Environmentally benign biological wood preservatives By *Streptomyces rimosus*, sc-36. The international research group on wood preservation working group 1 biology, prepared for the 28th annual whistler, Canada 25 - 30 May 1997. Pp 17.
- Food and Agriculture Organization of the United Nations (FAO), (1986): Wood preservation manual. *FAO Forestry Paper 76; 152pp*.
- Food and Agriculture Organization of the United Nations (FAO), (2006): Corporate document repository. African and the western Indian Ocean region. Available at www.fao.org/docrep.
- Ling, W. C., Lai, J. K. and Sammy, J. (2003): Proposed revision of CCA penetration requirements for refractory timbers in Malaysian standard. Based on findings from graveyard test study conducted in Sibu, Sarawak. *Proceedings of TRRTC/STA Forest Products Seminar, 21-22 November 2003*. Kuching, Malaysia. pp149-161.
- Malaka, S. L. O. (1983): Economic importance of Termites: six case studies in Nigeria and Ghana," *Nigerian Field*, vol. 47, no. 4, pp. 222–230.
- Malaka, S. L. O. (1996): Termites in West Africa, University of Lagos Press, Lagos, Nigeria. Pp 165.



2017 VOLUME 3 (ONLINE VERSION)

- Nyenka, J. G. N. (2000): Prevalence, Utilization and Marketing of *Artocarpus altilis* (Parkinson) Fosberg in the rain forest Area of Osun State, Nigeria. Unpublished M.Sc Dissertation submitted to Department of Forest Resources Management. University of Ibadan. pp 137.
- Ogunsanwo, O.Y., Adetogun, A.C and Mendie, M.I. (2002): Compressive Strenght of plantation grown obeche (*Triplochiton scleroxylon* K, Schum) treated with chromated copper Arsenate (CCA). *Nig. Jour. For.* 33(1) 40-44.
- Ojo, A. R. (2016): Intra–Tree Variation in Physico-Mechanical Properties and Natural Durability of *Borassus aethiopum* Mart. Woods in Savanna Zones of Nigeria. A PhD Thesis submitted to the Department of Forest Resources Management. Faculty of Agric and Forestry, University of Ibadan. Pp 175.
- Phillipe, F. (1999): Ron Palm. retrieved from www.desert.com.
- Reeb, J. E. (1997): FOR-54 Wood-destroying organisms and wood preservation. Cooperative extension service, College of Agriculture, University of Kentucky retrieved from http://www.ca.uky.edu/forestryextension/Publications/FOR_FORFS/for54.pdf.
- Salako, F. K. 2003: Soil Physical Conditions in Nigerian Savannahs and Biomass Production. Lecture given at the College on Soil Physics Trieste, Department of Soil Science and Agricultural Mechanization, University of Agriculture, Abeokuta, Nigeria. 3-21 March 2003. pp 365-377.
- Sanon, M and Sacande, M. (2007): SEED LEAFLET. *Borassus aethiopum* Mart. No. 120 September 2007. Forestry and Land Scape. Millennium Seed Bank Project. retrieved from www.kew.org/msbp.
- Scheffer, T.C. (1973): Microbiological degradation and the causal organisms, in *Wood Deterioration and its Prevention by Preservative Treatments*, Volume I, D.D. Nicholas, ed. Syracuse University Press, Syracuse NY. pp. 31–106.
- Scheffer, T. C. and J. J. Morrell, (2005): Natural Durability of Wood: A Worldwide Checklist of Species. Forest Research Laboratory, Oregon State University. Research Contribution 22. pp 58.
- Smulski, S. (1996): *Wood-destroying Fungi in Residential construction*. Wood Specialists Incorporated. Shutesbury, Massachusetts.
- Tee, N. T., Popoola, L, and Ancha, P. U. (2006): Investment potentials of *Borassus aethiopum* (Mart) in Northeastern Nigeria. *Obeche Journal. The Journal of the Tree club*, Department of Forest Resources Management. Univ. of Ibadan. Vol 25 (1) Pp 12-20.
- Tewari, M.C. (1978): Data on Natural Durability of Timber Species (Installed in the Test Yard at New Forest, Dehra Dun) According to 1976 Inspection, Their Treatability and Seasoning Characteristics. IRG/WP/3127. International Research Group on Wood Preservation, Stockholm, Sweden.
- Wong, A. H. H. (2004): A Novel Malaysian biological hazard class selection guide. *Malaysian Wood Preserving Association, MWPA, Vol 4 (17) December 2004.* p p.708.
- Wong, A. H. H., Kim, Y. S, Singh, A. P and Ling, W. C. (2005): Natural Durability of Tropical Species with Emphasis on Malaysian Hardwoods – Variations and Prospects. *The International Research Group on Wood Preservation. Doc No. IRG/WP/05-10568.* Paper Prepared for the 36th Annual Meeting Bangalore, India, 24-28 April 2005.

Appendix



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Table 1: ASTM D1758-74 visual biodegradation rating of field test specimens

Visual rating	Description
10	Sound timber, no decay / termite attack
9	Trace of termite attack
7	Moderate termite attack
4	Heavy termite attack
0	Failure due to termite attack

Table 2: Mean % Weight Loss for Termite for the Ecological Zones in Nigeria

		Derived savannah	Guinea savannah	Sudan savannah	Pooled Mean
Sampling height	Radial position				
Base	1	0.00±0.00 ^a	0.00±0.00 ^a	0.00±0.00 ^a	0.00±0.00 ^a
	2	2.31±0.001 ^b	1.82±0.1 ^b	1.47±0.05 ^b	1.86±0.001 ^b
	3	30.42±2.11 ^c	34.04±0.57 ^c	29.09±0.79 ^c	31.18±0.21 ^c
	4	31.11±0.89 ^c	21.13±1.32 ^c	28.34±0.99 ^c	26.86±2.37 ^c
	5	3.05±0.10 ^b	2.37±0.12 ^b	1.55±0.02 ^b	2.32±0.11 ^b
	6	0.00±0.00 ^a	0.00±0.00 ^a	0.00±0.00 ^a	0.00±0.00 ^a
	Mean		11.15±0.71	9.89±0.36	10.08±0.11
Middle	1	0.00±0.00 ^a	0.00±0.00 ^a	0.00±0.00 ^a	0.00±0.00 ^a
	2	2.02±0.001 ^b	1.21±0.01 ^b	3.33±0.04 ^b	2.18±0.01 ^b
	3	35.23±2.11 ^c	36.37±0.39 ^c	32.11±0.9 ^c	34.57±1.31 ^c
	4	35.15±0.54 ^c	34.45±3.47 ^c	33.21±0.56 ^c	34.27±1.79 ^c
	5	2.33±0.01 ^b	2.59±0.07 ^b	1.79±0.013 ^b	2.24±0.025 ^b
	6	0.00±0.00 ^a	0.00±0.00 ^a	0.00±0.00 ^a	0.00±0.00 ^a
	Mean		12.46±3.77	12.43±1.21	11.74±0.53
Top	1	0.00±0.00 ^a	0.00±0.00 ^a	0.00±0.00 ^a	0.00±0.00 ^a
	2	10.41±2.11 ^b	12.31±0.01 ^b	9.13±0.03 ^b	10.62±0.59 ^b
	3	60.73±0.12 ^c	57.11±5.71 ^c	55.91±2.48 ^c	57.92±2.73 ^c
	4	65.37±3.10 ^c	60.09±2.36 ^c	58.02±0.33 ^c	61.16±0.78 ^c
	5	9.49±0.21 ^b	11.21±0.11 ^b	11.47±2.10 ^b	10.72±1.37 ^b
	6	0.00±0.00 ^a	0.00±0.00 ^a	0.00±0.00 ^a	0.00±0.00 ^a
	Mean		24.33±3.77	23.45±2.38	22.42±0.11
Pooled mean		15.98±0.01^a	15.26±0.35^a	14.75±0.11^a	15.32±0.05

Legend: Mean with the same alphabets in the column are not significantly different from one another for each of the Base, Middle and top at 0.05 level of probability

Mean with the same alphabet in the row are not significantly different from one another for the ecological zones at 0.05 level of probability

Table 3: Analysis of Variance for % Weight Loss for Termite



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Source of variation	df	Sum of squares	Mean of square	F-cal	P-value
Trees (Block)	14	25.19	1.79	1.62ns	0.999 ^{ns}
Sampling Height (SH)	2	3117.26	1558.63	1404.17	0.000*
Major plot Error	28	49.42	1.77		
Radial Position (RP)	5	31009.48	6201.90	5587.30	0.000*
Interaction (SH, RP)	10	3135.95	313.60	282.52	0.000*
Sub-Plot Error	210	232.28	1.11		
Total	269	37569.58			

Legend:

*= significant at $P < 0.05$

ns= not significant at $P > 0.05$

Table 4: Visual rating of the wood of *B. aethiopum* (ASTM D1758-74)

Wood of <i>B. aethiopum</i> across the bole	Description
1 (Outer)	9 Trace of termite visit (Plate. 4)
2 (centre)	7 Moderate termite attack (Plate. 5)
3 (innermost)	4 Heavy termite attack (Plate. 6)

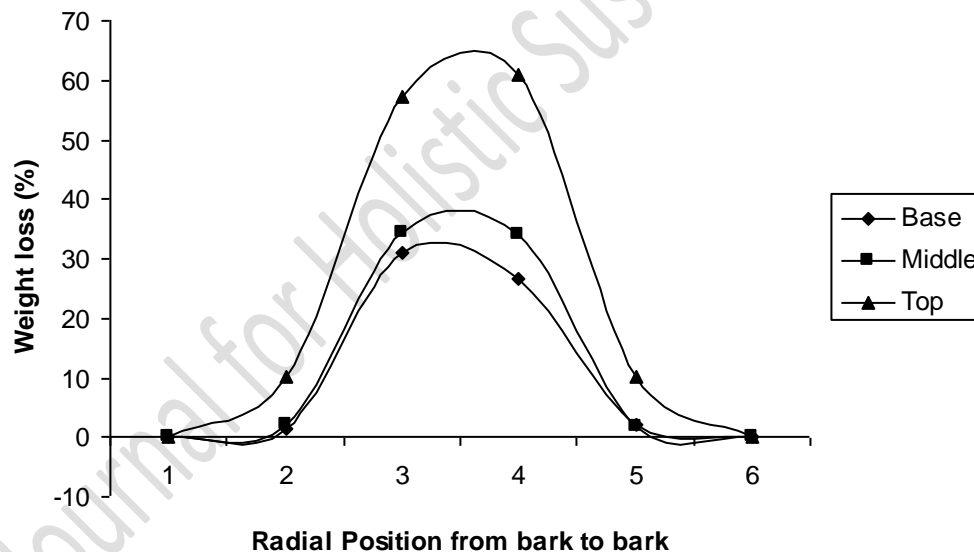


Figure 1: Showing % Weight loss for termite of the wood of *B. aethiopum* with respect to wood samples across the bole

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Plate 1: Graveyard Experiment with Evidence of Termite Infestation



Plate 2 and 3: showing termite attack on the field and in the forest creating tunnels on wood sample

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Plate 4: Sound wood of outer part of *Borassus aethiopum* with traces of termite visitation



Figure 5: Moderately attacked of *Borassus aethiopum*



Figure 6: Heavily attacked of *Borassus aethiopum*



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SEPARATING LAW AND POLITICS FOR SOCIAL SUSTAINABILITY: CHALLENGES TO INDEPENDENCE OF THE JUDICIARY IN NIGERIA

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Abstract

The paper examines the separation of law and politics as applicable to the concept of independence of the judiciary, to illustrate the dimension of social sustainability. It engages Nigeria as the political space for the discussion. The overall objective is to review the nexus between law and politics to illustrate the concept of independence of the judiciary. The finding is that there is an inexorable link between the organs of government, and between law, policy and administration: the exercise of governmental powers requires the full complement of the three arms – legislature, executive and the judiciary

1. Introduction

It is vitally important in a democracy that individual judges and the judiciary as a whole are impartial and independent of all external pressures and of each other so that those who appear before them and the wider public can have confidence that their cases will be decided fairly and in accordance with the law. When carrying out their judicial function, they must be free of any improper influence. Such influence could come from any number of sources. It could arise from improper pressure by the executive or the legislature, individual litigants and their lawyers, pressure groups, the media, self-interest or colleagues, for instance more senior judges. In the dispensation of justice between 'man and man', 'citizen and citizen' and between 'citizen and the state',ⁱ it is expedient that judges are found to be impartial and impervious to corrupting influences from both within and outside the judicial system.

According to the *Commonwealth Principles on the Accountability of and the Relationship Between the Three Branches of Government*,ⁱⁱ an independent, impartial, honest and competent judiciary is integral to upholding the rule of law, engendering public confidence and dispensing justice. The function of the judiciary is to interpret and apply national constitutions and legislation, consistent with international human rights conventions and international law, to the extent permitted by the domestic law.

However, it is quite clear that the business of government requires a careful balancing of the exercise of power and functions among the recognized arms of government – Legislature, Executive and the Judiciary. The degree of success in this enterprise may go a long way to determine the extent to which persons in a given State would enjoy freedom and liberties and be able to pursue happiness, ultimately culminating into social sustainability. When all else fails, the judiciary is both conceived and perceived as the bastion of hope and the defender of democratic virtues, which in turn may only be guaranteed in the face of an independent and unfettered judiciary.



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Using doctrinal legal analysis, our objective is to review the nexus between law and politics, to illustrate the concept of independence of the judiciary. We use Nigeria as the political space for our discussion. Overall, we contribute to the literature on how to build a socially sustainable polity.

2. Allocation of Governmental Powers under the Constitution

Consistent with the practice the world over, governmental powers are recognized in the Nigerian State as consisting of the legislative, executive and judicial exercise of powers. Under the 1999 Constitution,ⁱⁱⁱ legislative powers of the Federal Republic of Nigeria are vested in a National Assembly for the Federation, consisting of a Senate and a House of Representatives. The National Assembly is vested with power to make laws for the peace, order and good government of the Federation or any part of it, consistent with the allocation of powers under the Constitution.^{iv} In the same vein, legislative powers of a State of the Federation are vested in the House of Assembly of the State, for the purpose of making laws for the peace, order and good government of the State or any part of it, as prescribed under the Constitution.^v

The executive powers of the Federation are vested in the President and may be exercised by him either directly or through the Vice-President and Ministers of the Government of the Federation or officers in the public service of the Federation as may be prescribed by any relevant law. This arm of government is responsible for the execution and maintenance of the provisions of the Constitution and all other laws made appropriately by the National Assembly.^{vi} The Constitution makes comparable provision vesting executive powers of a State in the Governor and which may be exercised through the Deputy Governor and Commissioners of the Government of that State or officers in the public service of the State.^{vii}

The judicial powers of the Federation are vested in the courts established for the Federation, while those of the State are vested in the courts established for that State.^{viii} The courts specifically mentioned under the Constitution shall be the only superior courts of record in Nigeria and shall have all the powers of a superior court of record.^{ix} The courts are vested with all inherent powers and sanctions of a court of law over all matters, actions and proceedings between persons, or between government or authority and any persons in Nigeria.^x

Thus, the judiciary serves as a counter poise to executive malfeasance. Above every other consideration, the judiciary provides a veritable platform for the ventilation and espousal of constitutionally guaranteed rights; its orders as the authoritative arbiter of what constitutes the law under the principle of the rule of law is binding on all concerned parties.^{xi}

3. Independence of the Judiciary – What it means

The concept of independence of the judiciary means many things as well as different things to different people. It has been regarded as a concept often misunderstood and always misconceived by politicians. According to Lehohla, Chief Justice of Lesotho, it only means “absence of undue influence, interference or control with the judicial functions of the court”. It does not mean lack of accountability (unruliness) or irresponsibility; judicial independence is complemented by genuine accountability and by meaningful communication by the Judiciary and the Executive under law and under the



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Constitution".^{xii} In simple terminology, judicial independence can be defined as the ability of a judge to decide a matter free from pressures or inducements.^{xiii}

According to the *U.N. Basic Principles on the Independence of the Judiciary*,^{xiv} independence of the judiciary, among other things, implies that the judiciary shall decide matters before them impartially, on the basis of facts and in accordance with the law, without any restrictions, improper influences, inducements, pressures, threats or interferences, direct or indirect, from any quarter or for any reason. There shall not be any inappropriate or unwarranted interference with the judicial process, and the judiciary shall ensure that judicial proceedings are conducted fairly and that the rights of the parties are respected.

The basic principles formulated accompanying independence of the judiciary are:

- ✓ **Freedom of expression and association** - judges are entitled to freedom of expression, belief, association and assembly, but must always conduct themselves in such a manner as to preserve the dignity of their office and the impartiality and independence of the judiciary.
- ✓ **Qualifications, selection and training** - judicial officers shall be individuals of integrity and ability with appropriate training or qualifications in law.
- ✓ **Conditions of service and tenure** - the term of office of judges, their independence, security, adequate remuneration, conditions of service, pensions and the age of retirement shall be adequately secured by law.
- ✓ **Discipline, suspension and removal** – a charge or complaint made against a judge in his/her judicial and professional capacity shall be processed expeditiously and fairly under an appropriate procedure; and judges shall be subject to suspension or removal only for reasons of incapacity or behavior that renders them unfit to discharge their duties.^{xv}

The Bangalore Principles of Judicial Conduct^{xvi} identified the following principles:

- ✓ **Judicial independence** in both its individual and institutional aspects – a judge shall exercise the judicial function independently on the basis of the judge's assessment of the facts and in accordance with a conscientious understanding of the law, free of any extraneous influences, inducements, pressures, threats or interference, direct or indirect, from any quarter or for any reason; free from inappropriate connections with, and influence by, the executive and legislative branches of government; independent of judicial colleagues in respect of decision makings.
- ✓ **Impartiality** - applies not only to the decision itself but also to the process by which the decision is made.
- ✓ **Integrity** - essential to the proper discharge of the judicial office.
- ✓ **Propriety** - and the appearance of propriety, are essential to the performance of all the activities of a judge.
- ✓ **Equality** – ensuring equality of treatment to all before the courts.
- ✓ **Competence and diligence** - prerequisites to the due performance of judicial office.

The Commonwealth Principles on the Accountability of and The Relationship Between the Three Branches of Government^{xvii} identified the following as components of independence of the judiciary:



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- ✓ Judicial appointments should be made on the basis of clearly defined criteria and by a publicly declared process.
- ✓ Arrangements for appropriate security of tenure and protection of levels of remuneration.
- ✓ Adequate resources should be provided for the judicial system to operate effectively without any undue constraints which may hamper the independence sought;
- ✓ Interaction, if any, between the executive and the judiciary should not compromise judicial independence.
- ✓ Judges should be subject to suspension or removal only for reasons of incapacity or misbehaviour that clearly renders them unfit to discharge their duties.
- ✓ Court proceedings should, unless the law or overriding public interest otherwise dictates, be open to the public. Superior Court decisions should be published and accessible to the public and be given in a timely manner.
- ✓ An independent, effective and competent legal profession is fundamental to the upholding of the rule of law and the independence of the judiciary.

In brief, judicial independence may be described as being comprised of two components – the individual independence of judges and the institutional independence of the courts. Individual independence refers to the requirement that judges decide cases independently and impartially. Institutional independence is the independence of the judicial branch itself from the other branches of government, which enables it to carry out its role of safeguarding the judicial process and protecting the individual independence of judges. This independence not only refers to external influence but also to influence from other judges themselves.

4. Constitutional Guarantees of Independence of the Judiciary in Nigeria

It is pertinent to note that the Nigerian Constitution contains copious provisions protective of the judiciary and apparently intended to assert and facilitate its independence. We shall briefly examine these provisions.

4.1. *Appointment of Judges*

The President is empowered to appoint a person to the office of Chief Justice of Nigeria,^{xviii} Justice of the Supreme Court,^{xix} President of the Court of Appeal,^{xx} Chief Judge of the Federal High Court,^{xxi} President of the National Industrial Court,^{xxii} Chief Judge of the High Court of the Federal Capital Territory,^{xxiii} Grand Kadi of the Sharia Court of Appeal of the Federal Capital Territory^{xxiv} and President of the Customary Court of Appeal of the Federal Capital Territory^{xxv} on the recommendation of the National Judicial Council, subject to confirmation of such appointment by the Senate. He appoints a person to the office of a Justice of the Court of Appeal,^{xxvi} Judge of the Federal High Court,^{xxvii} Judge of the National Industrial Court,^{xxviii} Judge of the High Court of the Federal Capital Territory,^{xxix} Kadi of the Sharia Court of Appeal^{xxx} and Judge of the Customary Court of Appeal^{xxxi} on the recommendation of the National Judicial Council, without the requirement of approval by Senate.

In the same vein, the Governor of a State is empowered to appoint a person to the office of Chief Judge of the State,^{xxxii} Grandi Kadi of the Sharia Court of Appeal of the State,^{xxxiii} and President of a



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Customary Court of Appeal of the State^{xxxiv} on the recommendation of the National Judicial Council subject to confirmation of the appointment by the House of Assembly of the State. He appoints a person to the office of a Judge of a High Court of the State,^{xxxv} Kadi of the Sharia Court of Appeal of a State,^{xxxvi} and Judge of a Customary Court of Appeal of the State^{xxxvii} on the recommendation of the National Judicial Council, without the requirement of approval by the House of Assembly of the State.

It may be noted that any person who has held office as a judicial officer shall not on ceasing to be a judicial officer for any reason whatsoever thereafter appear or act as a legal practitioner before any court of law or tribunal in Nigeria.^{xxxviii} Apparently, this prohibition may not prevent such an ex-judicial officer from taking up freshly or returning to a previously held academic position (for example, in a tertiary institution in Nigeria) or providing consultancy services or taking a role in an alternative dispute resolution (ADR) process.

4.2. *Tenure of Judges*

The Chief Justice and other Justices appointed to the Supreme Court as well as the President and other Justices of the Court of Appeal may retire on the attainment of sixty-five years of age or otherwise must retire on attainment of seventy years of age.^{xxxix} In the case of other judicial officers,^{xl} they may retire on the attainment of sixty years of age or otherwise must retire on attainment of sixty-five of age.^{xli}

4.3. *Remuneration of Judges*

The remuneration, salaries and allowances payable to judicial officers are guaranteed^{xlii} and have been made a charge upon the Consolidated Revenue Fund of the Federation.^{xliii} Also, the remuneration and salaries payable to them and their conditions of service, other than allowances, shall not be altered to their disadvantage after their appointment.^{xliv} Furthermore, the recurrent expenditure of their judicial offices has been made a charge upon the Consolidated Revenue Fund of the Federation.^{xlv}

4.4. *Pension*

The Constitution contains provisions guaranteeing pension rights of judicial officers upon retirement from office. A judicial officer who held office for not less than fifteen years and who retired at the retirement age specified under the Constitution,^{xlvi} shall be entitled to pension for life at a rate equivalent to his last annual salary and all his allowances in addition to any other retirement benefits to which he may be entitled.^{xlvii} Where he retired at the specified age but did not hold office up to fifteen years, he shall be entitled to pension for life at the same rate as in the foregoing, but pro rata the number of years he served as a judicial officer in relation to the period of fifteen years, and all his allowances in addition to other retirement benefits to which he may be entitled under his terms and conditions of service.^{xlviii} In any other case, he shall be entitled to such pension and other retirement benefits as may be regulated by an applicable Federal or State law.^{xlix}

It may be noted that the application of the constitutional provisions on pension rights of the judicial officers is without prejudice to the provisions of any other law that provides for pensions, gratuities and other retirement benefits for persons in the public service of the Federation or a State.¹ Furthermore, the



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payment of pension to the judicial officers has not been made a charge upon the Consolidated Revenue Fund of the Federation, unlike in the case of pension to the President or Vice President of Nigeria.^{li}

4.5. *Removal of Judges from Office*

A judicial officer shall not be removed from his office or appointment before his age of retirement except in the case of Chief Justice of Nigeria, President of the Court of Appeal, Chief Judge of the Federal High Court, President of the National Industrial Court, Chief Judge of the High Court of the Federal Capital Territory, Abuja, Grand Kadi of the Sharia Court of Appeal of the Federal Capital Territory, Abuja and President, Customary Court of Appeal of the Federal Capital Territory, Abuja, by the President acting on an address supported by two-thirds majority of the Senate.^{lii}

The Chief Judge of a State, Grand Kadi of a Sharia Court of Appeal or President of a Customary Court of Appeal of a State, may be removed only by the Governor acting on an address supported by two-thirds majority of the House of Assembly of the State.^{liii} In the foregoing cases, the ground of removal may be inability of the judicial officer to discharge the functions of his office or appointment (whether arising from infirmity of mind or of body) or for misconduct or contravention of the Code of Conduct.

In the case of other judicial officers apart from those mentioned above, they may be removed by the President or, as the case may be, the Governor acting on the recommendation of the National Judicial Council that the judicial officer be so removed for any of the reasons stated above.^{liv}

4.6. *Jurisdiction of Courts and Right of Appeal*

The jurisdiction of the various courts established for the federation under the Constitution are spelt out by a combination of provisions in the Constitution and other relevant statutes. Thus, the Supreme Court shall, to the exclusion of any other court, have original jurisdiction in any dispute between the Federation and a State or between States if and in so far as that dispute involves any question (whether of law or fact) on which the existence or extent of a legal right depends. In addition, the Court shall have such original jurisdiction as may be conferred upon it by any Act of the National Assembly; but this shall not entail vesting original jurisdiction in the Court over criminal matters.^{lv}

In the same vein, the Court of Appeal shall have original jurisdiction to hear and determine any question as to whether - (a) any person has been validity elected to the office of President or Vice-President under this Constitution; or (b) the term of office of the President or Vice-President has ceased; or (c) the office of President or Vice-President has become vacant.^{lvi} Furthermore, the Court shall have appellate jurisdiction to the exclusion of any other court of law in Nigeria, to hear and determine appeals from the Federal High Court, National Industrial Court, the High Court of the Federal Capital Territory, Abuja, High Court of a State, Sharia Court of Appeal of the Federal Capital Territory, Abuja, Sharia Court of Appeal of a State, Customary Court of Appeal of a State and from decisions of a court martial or other tribunals as may be prescribed by an Act of the National Assembly.^{lvii}

It should be noted that the jurisdiction of the other courts aside from the afore-mentioned are fairly spelt out in the Constitution and other relevant laws. The line of appeal from decisions of the various courts up to the Supreme Court as apex court is well spelt out in the Constitution. The decision of the



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Supreme Court on any matter is final; there is no appeal from its decisions to any other body or person. However, this is without prejudice to the exercise of the power of prerogative of mercy by the President or Governor of a State.^{lviii}

4.7. *Enforcement of court orders, decisions, etc.*

The decisions of the Supreme Court shall be enforced in any part of the Federation by all authorities and persons, and by courts with subordinate jurisdiction to that of the Supreme Court.^{lix} The decisions of the Court of Appeal are to be enforced in any part of the Federation by all authorities and persons, and by courts with subordinate jurisdiction to that of the court of Appeal.^{lx} Also, the decisions of the Federal High Court, National Industrial Court, a State High Court and of all other courts established by this Constitution shall be enforced in any part of the Federation by all authorities and persons, and by other courts of law with subordinate jurisdiction to that of the Federal High Court, National Industrial Court, a High Court and those other courts, respectively.^{lxi}

4.8. *National Judicial Council, the Federal Judicial Service Commission^{lxii}*

The Constitution established for the Federation, among others, the National Judicial Council and the Federal Judicial Service Commission,^{lxiii} with specific composition and powers.^{lxiv} The National Judicial Council is empowered to make recommendations to the President or Governor as appropriate on judicial officers to be: appointed as heads of the various judicial offices; removed from office. It collects, controls and disburses all moneys, capital and recurrent, for the judiciary; advises the President and Governors on any matter pertaining to the judiciary as may be referred to the Council by the President or the Governors; appoints, dismisses and exercises disciplinary control over members and staff of the Council; controls and disburses all monies, capital and recurrent for the services of the Council; and deals with all other matters relating to broad issues of policy and administration.^{lxv}

The Federal Judicial Service Commission is vested with power to advise the National Judicial Council in nominating persons for appointment into various judicial offices; make recommendations to the Council on removal from office of such judicial officers; appoint, dismiss and exercise disciplinary control over the Chief Registrars and Deputy Chief Registrars of the Supreme Court, the Court of Appeal, the Federal High Court, National Industrial Court and all other members of the staff of the judicial service of the Federation not otherwise specified in the Constitution and of the Federal Judicial Service Commission.^{lxvi} Thus, from all indications, the duo of National Judicial Council and the Federal Judicial Service Commission perform very critical functions in the judicial sector, as a whole. The President is empowered to appoint the Chairman and members of the two bodies, subject to confirmation by the Senate. In making the appointment, the President is mandated by the Constitution to consult the Council of State.^{lxvii} Those so appointed enjoy specified tenure and may only be removed from office by the President acting on an address supported by two-thirds majority of the Senate praying that he be so removed for inability to discharge the functions of the office (whether arising from infirmity of mind or body or any other cause) or for misconduct.^{lxviii}

In exercising their powers to make appointments or to exercise disciplinary control over persons, the two bodies shall not be subject to the direction or control of any other authority or person.^{lix} The



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remuneration, salaries and allowances payable to the Chairmen and members of the National Judicial Council and the Federal Judicial Service Commission are guaranteed under the Constitution, are made a charge upon the Consolidated Revenue Fund of the Federation and shall not be altered to their disadvantage after their appointment.^{lxx} Corresponding provisions are made in respect of the State Judicial Service Commission.^{lxxi}

4.9. *Financial Autonomy of the Judiciary*

By virtue of section 80 of the Constitution, essentially all revenues and monies of the federation are to be paid into a Consolidated Revenue Fund of the Federation. No withdrawals can be made legitimately from this Fund except in respect of expenditure that is authorised by the Constitution to be charged directly upon the Fund, or it is authorised by the Appropriation Act duly passed by the National Assembly, pursuant to an Appropriation Bill laid before it by the President.^{lxxii}

The President is charged with the responsibility of having prepared and laid before the National Assembly an estimate of revenue and expenditure of the Federation for each fiscal year, contained in an Appropriation Bill for consideration and approval of the National Assembly.^{lxxiii} However, it appeared from a careful reading of Section 81 (2) of the Constitution that the Appropriation Bill need not contain expenditure already authorised by the Constitution to be charged directly upon the Consolidated Revenue Fund.

In other words, the remuneration, salaries and allowances payable to judicial officers,^{lxxiv} recurrent expenditure of their judicial offices,^{lxxv} remuneration, salaries and allowances payable to the Chairmen and members of the National Judicial Council and the Federal Judicial Service Commission,^{lxxvi} among others, which have been made a charge upon the Consolidated Revenue Fund of the Federation (the same applies to State Judicial Service Commission of the States) need no further appropriation by way of the Appropriation Bill. The sums payable as such only must not exceed the amount as would have been determined by the Revenue Mobilisation Allocation and Fiscal Commission,^{lxxvii} being one of the bodies established for the Federation under section 153 of the Constitution.^{lxxviii}

For good measure, section 81 (3) of the Constitution^{lxxix} directs that any amount standing to the credit of the judiciary in the Consolidated Revenue Fund of the Federation shall be paid directly to the National Judicial Council for disbursement to the heads of the courts established for the Federation and the State under section 6 of the Constitution. In the same vein, section 162 (9) of the Constitution specifies that any amount standing to the credit of the judiciary in the Federation Account shall be paid directly to the National Judicial Councils for disbursement to the heads of courts established for the Federation and the States under section 6 of the Constitution.

Consequently, the practice in Nigeria whereby the Executive takes charge of and responsibility for the financial matters of the Judiciary and the judicial officers in charge of the various courts have to go cup in hand to beg for release of funds meant for the Judiciary will appear unconstitutional. It is purely derogation from and an encroachment on the financial autonomy of the Judiciary as envisioned by the Constitution.

5. Independence of the Judiciary from External Environment



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Another component of independence of the judiciary is its freedom from unwanted, unwarranted and needless interference or encroachment from the external environment, not limited to the other arms of government. We shall now proceed to consider some of the likely external sources of interference.

5.1. *Independence from the Legislature*

In a sense, the judicial machinery is a creation of the Legislature to the extent that it (the judiciary) is a creation of law. The Constitution itself is an enactment, just as other statutes and liable to legislative amendments or repeal in accordance with stipulated procedure. Admittedly, both the Constitution and other relevant laws make wide ranging provisions for the establishment, structure, jurisdiction, etc. of courts as well as appointment, tenure, removal, etc. of judges. To this extent, there is no pure independence of the judiciary from the legislature.

However, this minimum nexus between the two organs of government have come to be accepted as a necessary component of modern systems of government. In itself, this is not worrisome nor does it portend derogation from the independence of the judiciary, as we understand it. The judges are by this not fettered in their responsibility to interpret the law, guided by hallowed rules of statutory interpretation.

It is instructive to note that Section 4 (8) of the Constitution provides that, except as otherwise provided by the Constitution, the exercise of legislative powers by the National Assembly or by a House of Assembly shall be subject to the jurisdiction of courts of law and of judicial tribunals established by law, and accordingly, the National Assembly or a House of Assembly shall not enact any law, that ousts or purports to oust the jurisdiction of a court of law or of a judicial tribunal established by law.

5.2. *Independence from the Executive*

The formulation of national policies (which could include administration of justice in the country) is the primary function of the Executive, the effect of which may be seen through laws passed by the Legislature. Under the Constitution, the President may, in his discretion, assign to the Vice-President or any Minister of the Government of the Federation responsibility for any business of the Government of the Federation, including the administration of any department of government.^{lxxx} The President shall hold regular meetings with the Vice-President and all the Ministers of the Government of the Federation for the purposes of determining the general direction of domestic and foreign policies of the Government of the Federation, among other things.^{lxxxi}

In other words, the government will have to formulate policies to give itself direction. A policy is a path of action to be pursued by a government or international organization to achieve a particular rationale, goal, or purpose. Laws are then made with a view to achieving the set goals articulated or envisioned in governmental policies.

The courts are generally loath to question matters of national policy except where it is inconsistent with the spirit of the provisions of the Constitution or principles of international law or natural justice. It is expedient of government to draw clear lines of demarcation between national/governmental policy and party policy. National/state policies should rather be founded on national instead of party interests.^{lxxxii}



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The judiciary owes a duty to the nation and the citizenry to watch that political correctness, party discipline, zeal or overbearing posture of government cum party do not surreptitiously blur the difference.

Apparently, the Executive have considerable interactions with the Judiciary, for example, through the various processes of appointment and removal of judicial officers. This can provide ample opportunity for an overbearing Executive to impair the independence of the judiciary. The view has been expressed that most politicians are neither committed to the establishment of a strong, virile and independent judiciary, nor do they believe that the judiciary should have the power to review legislative and executive decisions.

Some elected officials have a distorted view of the judiciary as an extension of the executive branch of government. This mindset encourages attempts to control and manipulate the judiciary and to turn judges into pliable instruments of state power. The pervasive influence of the executive, its powers of retaliation and ability to advance or hamper a judge's career make it difficult for judges to adjudicate disputes without fear or favor as required by their oath. Judges concerned about their careers and even their personal safety temper justice with self-preservation.^{lxxxiii} It will not be difficult to find cases illustrating the foregoing in Nigeria.

According to Hon. Justice Dahiru Musdapher, while serving as the Chief Justice of Nigeria identified some of the problems of the judiciary to include the lack of independence of the judiciary, especially at the state level, in terms of funding, political manipulation of the processes of appointment and removal of Judges by some state chief executives and their respective Houses of Assembly. According to him "while it is true that, in some cases, this is self-inflicted (because of the way some Judges portray themselves), it does not invariably follow that a distinct arm of government should, because of the actions of a few, be treated with disdain. Sadly, the judiciary in several states still goes cap in hand to the executive begging for funds."^{lxxxiv}

5.3. *Independence of the Judiciary from Lawyers and Litigants*

Increasingly, modern day realities show a growth in the corrupting influence of lawyers and litigants in the administration of justice. Indeed, the Nigerian landscape is inundated with allegations of corruption against judges in the dispensation of justice, secured by graft from litigants and their lawyers. There exists a perceptible popular distrust of the judiciary's integrity and its ability to protect civil rights and constrain the excesses of elected officials. For most Nigerians, the judicial process is nothing more than an auction in which justice goes to the highest bidder.

Convinced that judges decide cases on the basis of connections and gratification without regard to the legal merits of the case, citizens seek to influence the outcome of cases either by settling the judge, or intimidating judicial officers. Far worse, negative perceptions about the justice system encourage citizens to resort to violent, extralegal and possibly criminal practices to secure their rights. Popular distrust of the judiciary has fueled needless attacks on the integrity and the institution of the judiciary.^{lxxxv}

It is desirable that judges should be free from having their financial well-being dependent on the outcome of the cases they are deciding. Judges should be adequately remunerated, such that they need not endure economic hardship. From this threshold, it will be justified to visit delinquent and erring judges with appropriate sanctions, including removal from office in deserving cases. There is the



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assertion that there is a link between judicial remuneration and judicial independence from lawyers and litigants.^{lxxxvi} As put by Lord Bingham:

In most societies, and subject to most obvious exceptions, there is some perceived relationship between what someone earns and the status or prestige which he enjoys. Financial rewards are not, of course, everything, but nor are they nothing. Unless, therefore, the rewards of judicial office (with or without other benefits) are sufficient to attract the ablest candidate to accept appointment, albeit with some financial sacrifice, the ranks of the judiciary must be filled by the second best, those who (under our system) have failed to make it in private practice, and there would be an inevitable lowering in the standing and reputation of the judiciary, and a sea change in the relationship between advocate and judge. There would also, I suggest, be a loss of those qualities of confidence and courage on which the assertion of true independence not infrequently depends, because these qualities tend to be the product of professional success, not the hallmark of professional mediocrity.^{lxxxvii}

6. Personal Independence of the Judiciary

Of no little importance is the need for a judge to be free from the debilitating influence of self. Personal rectitude and an acceptable standard of morality will be self-preserving of the judge; hardly can anyone or anything save a person from himself. A judge must free himself from the burden of conflict between self-interest and work interest. Thus, it would be unethical of any judge to sit on a case where, known to him even if unknown to others, his impartiality is brought to question by personal interest.

Judicial independence is as much a matter of a judge's character, courage and discipline, as it is a matter of constitutional and structural safeguards. An independent and impartial judge must be courageous, daring and not timid; he must not be stampeded into giving a decision to appease anyone regardless of how high in rank or how powerful, or bow to political pressure; for example, demonstrations or press statements.^{lxxxviii}

It is imperative that the judicial system is engineered by persons of impeccable character, inviolable and incorruptible. In the words of Uwaifo JSC:

a corrupt judge is more harmful to the society than a man who runs amok with a dagger in a crowded street; while the man with the dagger can be restrained physically, a corrupt Judge deliberately destroys the foundation of society and causes incalculable distress to individuals through abusing his office, while still being referred to as honourable.^{lxxxix}

In the same vein, Oputa JSC (as he then was) opined:

No one should go to the bench to amass wealth, for money corrupts and pollutes not only the channels of justice but also the very stream itself. It is a calamity to have a corrupt



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judge. The passing away of a great advocate does not pose such public danger as the appearance of a corrupt judge on the bench, for in the latter instance, the public interest is bound to suffer and elegant justice is mocked, debased, depreciated and auctioned. When justice is bought and sold, there is no more hope for society. What our society need is an honest, trusted and trustworthy Judiciary.^{xc}

The judiciary deserves to be filled by knowledgeable and versatile judicial officers, imbued with the discipline and rigour of diligence, hard work, dedication to duty, thoroughness, perseverance and self-sacrifice for the utmost good of the nation and the people. An ignorant Judge is no better than a mass murderer, because, in his ignorance, he would have committed so much blunders that even the pains of appeal could not rectify.^{xcii}

7. Judicial Accountability

The independence of the judiciary and of individual judges needs to be tempered by the duty of accountability. Accountability has political, financial, and legal dimensions. Unpopular judicial decisions may give rise to efforts to change the law on which those decisions are based and a judge whose decisions are criticized by civil society monitors or frequently overturned on appeal may lose prestige and respect (political accountability). The judiciary's management of resources and internal administration should be subject to review and audit (financial accountability). Judges, court personnel and lawyers should be subject to disciplinary action under established rules of conduct and subject to prosecution and liable for damages under the same laws as anyone else for willful misconduct (legal accountability).^{xcii}

8. Conclusion

There is an inexorable link between the organs of government; between law, policy and administration. The exercise of governmental powers requires the full complement of the three arms – legislature, executive and the judiciary. Such a complement would ensure social sustainability by helping the state thrive.

As with many aspects of human endeavour, the challenges of independence may not be so much of deficiencies in the law or its machineries as with the operators. The human functionaries of government can truly be a reflection of the society and its values. Independence of the judiciary may not be attained outside of the personal, inner convictions of the players, entrenched in values higher and beyond the natural man. Let each judicial officer make a firm resolve that he will do justice and equity, even if the heavens will fall.

ⁱ Courts and Tribunals Judiciary, "Independence" available at <<https://www.judiciary.gov.uk/about-the-judiciary/the-judiciary-the-government-and-the-constitution/jud-acc-ind/independence/>> (accessed 4 August 2015)

ⁱⁱ As agreed by Law Ministers and endorsed by the Commonwealth Heads of Government Meeting, Abuja, Nigeria, 2003

ⁱⁱⁱ Constitution of the Federal Republic of Nigeria 1999; Cap. C23 Laws of the Federation of Nigeria 2004



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- iv Section 4 (1) – (5) 1999 Constitution as amended
- v Section 4 (6) & (7) 1999 Constitution as amended
- vi Section 5 (1) (a) & (b) 1999 Constitution as amended
- vii Section 5 (2) (a) & (b) 1999 Constitution as amended
- viii See generally, section 6 of the Constitution as amended
- ix Section 6 (3) – (5) 1999 Constitution as amended
- x Section 6 (a) & (b) 1999 Constitution as amended
- xi Arewa, J. A. “Judicial Integrity In Nigeria: Challenges And Agenda For Action” available at <<http://www.nials-nigeria.org/journals/Arewa-Judicial%20Integrity.pdf>> (accessed 4 August 2015)
- xii Lehohla, M. L. “Sustaining the Independence of the Judiciary: The Dangers of Politicizing the Judiciary”; Being Lecture delivered at South African Chief Justices’ Forum Conference in Johannesburg on 13th – 14th August, 2010, available at <http://www.venice.coe.int/SACJF/2010_08_RSA_Johannesburg/Lesotho.pdf> (accessed 4th August, 2015)
- xiii Abdullahi I. “Independence of the Judiciary In Nigeria: A Myth or Reality?” International Journal of Public Administration and Management Research (IJPAMR), Vol. 2, No 3, August, 2014, pp. 55 – 66, available at <<http://rcmss.com/2014/IJPAMR-VOI2-No3/INDEPENDENCE%20OF%20THE%20JUDICIARY%20IN%20NIGERIA%2012%20Pages.pdf>> (accessed 4 August 2015)
- xiv Adopted by the Seventh United Nations Congress on the Prevention of Crime and the Treatment of Offenders held at Milan from 26 August to 6 September 1985 and endorsed by General Assembly resolutions 40/32 of 29 November 1985 and 40/146 of 13 December 1985, available at <http://apps.americanbar.org/rol/docs/judicial_reform_un_principles_independence_judiciary_english.pdf> (accessed 4 August 2015); see also International Bar Association Human Rights Institute Report, “Beyond Polokwane: Safeguarding South Africa’s Judicial Independence”, available at <<http://www.ibanet.org/Document/Default.aspx?DocumentUid=4c7e8c0f-652d-44bd-a459-d9ac85d6872e>> (accessed 4 August 2015)
- xv U.N. Basic Principles on the Independence of the Judiciary, *supra*
- xvi The Bangalore Draft Code of Judicial Conduct 2001 adopted by the Judicial Group on Strengthening Judicial Integrity, as revised at the Round Table Meeting of Chief Justices held at the Peace Palace, The Hague, November 25-26, 2002
- xvii *Supra*
- xviii Section 231 (1) 1999 Constitution as amended
- xix Section 231 (1) 1999 Constitution as amended
- xx Section 238 (1) 1999 Constitution as amended
- xxi Section 250 (1) 1999 Constitution as amended
- xxii Section 254B (1) 1999 Constitution as amended (see section 6, Constitution of the Federal Republic of Nigeria (Third Alteration) Act No. 3 of 2010)
- xxiii Section 256 (1) 1999 Constitution as amended
- xxiv Section 261 (1) 1999 Constitution as amended
- xxv Section 266 (1) 1999 Constitution as amended
- xxvi Section 238 (2) 1999 Constitution as amended
- xxvii Section 250 (2) 1999 Constitution as amended
- xxviii Section 254B (2) 1999 Constitution as amended (see section 6, Constitution of the Federal Republic of Nigeria (Third Alteration) Act No. 3 of 2010)
- xxix Section 256 (2) 1999 Constitution as amended
- xxx Section 261 (2) 1999 Constitution as amended
- xxxi Section 266 (2) 1999 Constitution as amended
- xxxii Section 271 (1) 1999 Constitution as amended
- xxxiii Section 276 (1) 1999 Constitution as amended
- xxxiv Section 281 (1) 1999 Constitution as amended
- xxxv Section 271 (2) 1999 Constitution as amended
- xxxvi Section 276 (2) 1999 Constitution as amended
- xxxvii Section 281 (2) 1999 Constitution as amended



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- xxxviii Section 292 (2) 1999 Constitution, as amended
- xxxix Section 291 (1) 1999 Constitution, as amended
- xl By section 318 (1) 1999 Constitution, Judicial Officers are holders of the various judicial offices in relation to courts specified under section 6 of the Constitution
- xli Section 291 (2) 1999 Constitution, as amended
- xlii Section 84 (1) 1999 Constitution, as amended
- xliii Section 84 (2) 1999 Constitution, as amended
- xliv Section 84 (3) 1999 Constitution, as amended
- xlv Section 84 (7) 1999 Constitution, as amended
- xlvi Section 291 (1) & (2) 1999 Constitution, as amended
- xlvii Section 291 (3) (a) 1999 Constitution, as amended
- xlviii Section 291 (3) (b) 1999 Constitution, as amended
- xlix Section 291 (3) (c) 1999 Constitution, as amended; for example, *Pension Reform Act, No. 4 of 2014*
- l Section 291 (4) 1999 Constitution, as amended
- li Section 84 (5) & (6) 1999 Constitution, as amended
- lii Section 292 (1) (a) (i) 1999 Constitution, as amended
- liii Section 292 (1) (a) (ii) 1999 Constitution, as amended
- liv Section 292 (1) (b) 1999 Constitution, as amended
- lv Section 232 (1) & (2) 1999 Constitution, as amended
- lvi Section 239 (1) & 1999 Constitution, as amended
- lvii Section 240, 1999 Constitution as amended
- lviii Section 235, 1999 Constitution as amended
- lix Section 287 (1) 1999 Constitution as amended
- lx Section 287 (2) 1999 Constitution as amended
- lxi Section 287 (3) 1999 Constitution as amended
- lxii A State Judicial Service Commission is established for each State under the Constitution, with guiding provisions similar to those applicable to the Federal Judicial Service Commission; see sections 197 – 202, 1999 Constitution as amended
- lxiii Section 153 (1) & (2) 1999 Constitution as amended
- lxiv Third Schedule, 1999 Constitution as amended; paras 20 – 21 & 12 – 13 thereof
- lxv Third Schedule, 1999 Constitution as amended; para. 21 thereof
- lxvi Third Schedule, 1999 Constitution as amended; para. 13 thereof
- lxvii Section 154 (1) – (3) 1999 Constitution as amended
- lxviii Section 157 (1) & (2) 1999 Constitution as amended
- lxix Section 158 (1) 1999 Constitution as amended
- lxx Section 84 (1) – (4) 1999 Constitution as amended
- lxxi Section 124 (1) – (4) 1999 Constitution as amended
- lxxii Section 80, 1999 Constitution as amended; see section 120 for application to States
- lxxiii Section 81 (1) & (2) 1999 Constitution as amended; see section 121 for application to States
- lxxiv Section 84 (2) 1999 Constitution as amended
- lxxv Section 84 (7) 1999 Constitution as amended
- lxxvi Section 84 (1) – (4) 1999 Constitution as amended
- lxxvii Section 84 (1) 1999 Constitution as amended
- lxxviii Composition and powers of the Commission are spelt out under Paragraphs 31 & 32 Part 1 of Third Schedule to the 1999 Constitution as amended
- lxxix See section 121 (3) with reference to States
- lxxx Section 148 (1) 1999 Constitution as amended
- lxxxi Section 148 (2) 1999 Constitution as amended; see section 193 for application to the States
- lxxxii Lehohla, M. L. “Sustaining the Independence of the Judiciary: The Dangers of Politicizing the Judiciary”; *supra*



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^{lxxxiii} Okechukwu Oko “Seeking Justice in Transitional Societies: An Analysis of the Problems and Failures of the Judiciary In Nigeria” *Brook. J. Int’l L.*, 2005, Vol. 31:1, pp. 9 - 82

^{lxxxiv} Hon. Justice Dahiru Musdapher, “The Nigerian Judiciary: Towards Reform Of The Bastion Of Constitutional Democracy” Fellows’ Lecture Series, Nigerian Institute of Advanced Legal Studies, 2011, available at <<http://nials-nigeria.org/pub/THE%20NIGERIAN%20JUDICIARY%20Towards%20Reform%20Of%20The%20Baston%20Of%20Constitutiona%20Democracy.pdf>> (accessed 4 August 2015)

^{lxxxv} Okechukwu Oko “Seeking Justice in Transitional Societies: An Analysis of the Problems and Failures of the Judiciary In Nigeria” *Brook. J. Int’l L.*, 2005, Vol. 31:1, pp. 9 - 82

^{lxxxvi} Thean, L. P. “Judicial Independence and Effectiveness” available at <http://www.aseanlawassociation.org/docs/w1_sing.pdf> (accessed 4 August 2015)

^{lxxxvii} Lord Bingham, “*Judicial Independence*”, Judicial Studies Board Annual Lecture given on 5 November 1996, reproduced in Tom Bingham, *The Business of Judging*, 2000, at pp. 65 – 66; but see Thean, L. P. “Judicial Independence and Effectiveness” available at <http://www.aseanlawassociation.org/docs/w1_sing.pdf> (accessed 4 August 2015)

^{lxxxviii} Lehohla, M. L. (Chief Justice of Lesotho) “Sustaining the Independence of the Judiciary: The Dangers of Politicizing the Judiciary”; *supra*

^{lxxxix} Hon. Justice S.O. Uwaifo, “The Imperative of an Untainted Judiciary”, *THISDAY Newspaper*, January 30, 2005 at p, 32; Being Valedictory speech delivered on Monday 24th January 2005, reproduced in (2005) 1 *SCNJ* at 20

^{xc} Oputa C, “Judicial Ethics, Law, Justice and the Judiciary”, *A Journal of Contemporary Legal Problems* Vol. 1 No. 8.

^{xci} Hon. Justice Dahiru Musdapher, (Former Chief Justice of Nigeria) “Law Reform In Nigeria: Challenges & Opportunities”; Being Lecture Delivered at Federal University Dutse, Jigawa State, Nigeria, on 20th May, 2014 available at <<http://fud.edu.ng/sites/default/files/media-content/LAW%20REFORM%20IN%20NIGERIA.pdf>> (accessed 4 August, 2015)

^{xcii} Office of Democracy and Governance USAID Program Brief, “Reducing Corruption in The Judiciary” available at <http://pdf.usaid.gov/pdf_docs/Pnadq106.pdf> (accessed 4 August 2015)