

# Climate Change Effects on Environmental Flora in the Nigerian Terrain: Health Implications on Mankind

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*Abstract- Environmental conditions play a key role in defining the function and distribution of flora, in combination with other factors. Changes in long term environmental conditions that can be collectively coined climate change are known to have had enormous impacts on flora diversity pattern in the past and are seen as having significant current impacts. Researchers predict that climate change will remain one of the biodiversity patterns in the future. Adopting the survey method of research, this study investigates the importance of Juglans regia (walnuts) commonly known as walnut, in the areas of food and medicine in Nigeria. Some factors that are responsible for biodiversity depletion in environmental flora forms a major focus of this work. The concept of ecosystem or biosphere as a circle of life receives highlight. This work also details the purposes, significance, educational implication as well as policy implication of the concept of biodiversity loss.*

**Keywords:** Climate change, environmental flora, biodiversity, ecosystem and Juglans regia

## I. INTRODUCTION

The earth's climate is changing and the impacts are already being felt by biodiversity and wildlife habits across the planet. Greater biodiversity makes species and systems more resilient, while loss of biodiversity weakens them, making them more vulnerable to extinction. If a large proportion of the biosphere is invested in only a small, number of species (such as humans and their associated domesticated/cultivated species), this will result in an inherently unstable system. The biodiversity, interaction, and functions within ecosystem have developed and evolved over countless years. Changes that have occurred ever so slowly over time have allowed for adaptation of species and ecosystem survival. But, catastrophic and rapid changes can have a disastrous effect on ecosystem and biodiversity of species. Among these are natural events such as floods, fire disasters, volcanic eruptions, tsunamis and hurricanes. The third Assessment Report of the IPCC and other (PTO) studies conclude that its impact is being felt most by the world's poorest people particularly those in Africa, Nigeria inclusive (IPCC, 2001). Africa's high vulnerability to the impacts of climate change is exacerbated by other factors such as wide spread poverty, recurrent drought and floods, a dependence on, natural resources and biodiversity, over dependence on rain fed agriculture, a heavy disease burden and the numerous conflicts that have engulfed the' continent.

Changes in future climate may negatively affect the overall economy of Africa, thus hampering potential for economic growth (Davidson *et al.*, 2003). Poor people, majority of who are in Nigeria, are often directly dependent on goods and services from ecosystems, either as a primary or supplementary source of food, fodder, building materials and fuel. As a result of this dependency, any impact that climate change has on natural systems threatens the livelihoods, food intake and health of poor people (Reid, 2003). Plant population sizes vary in space and time both within and amongst species (Barret and Joshua, 1991), according to Barret and Joshua, the variability in plants population is a result of complex interactions among life history features of population. In the first chapter of the book of Genesis, it is pointed out that the dry land emerged from the oceans and became populated with plants and animals, and how man ultimately appeared on the scene to use the landscape for his own purposes. As a result of mountain building erosion, sedimentation and other geomorphologic processes, the land surfaces increase in complexity. The vegetation of the earth, which depends upon 'the soil, rainfall and sunshine evolved very differently in different regions. In turn, the various species of animals, which depend upon different plants for shelters and food, accommodated themselves to this, varied vegetation pattern. The original unused land scale thus varied enormously from place to place due to either man's activities or natural catastrophe; however, the objectives of the study addresses effect of climate change on environmental flora in the Nigerian terrain implications for ecosystem and more so:

- i. To create awareness of some factors that are responsible for biodiversity depletion.
- ii. To create public awareness on the economic importance of biodiversity to the society or mankind.
- iii. To create public awareness of the effect of biodiversity loss in plant on the society and
- iv. To educate the society on the conservation of biodiversity.

Biodiversity refers to variety of different species in an ecosystem, genetic variation within a population of a species and variety of kinds of ecosystems according to Biodiversity monitoring and Assessment project, (2007). It is also the number and variety of species that exists including birds, animals, plants and insects. More than that however, it is the way these interest in an ecosystem. These interactions are the key to biodiversity. Peter (2002), puts it that it is variability among living organism all sources including land based and aquatic ecosystem and ecosystem for which they are part. Diversity is the key to ensuring the continuance of

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life on earth. It is fundamental requirement for adoption and survival and continued evaluation of species. Ecosystems (Think Quest) 2007 describes ecosystem or biotic complex as the complex of interaction phenomena among the vegetation, climate, soil and fauna. According to this Quest, the climate exercises a very strict and sometimes direct control on the development and distribution of flora, animal and soils. On the other hand, climate itself is profoundly

affected by the nature of the vegetation covers, wind speed, temperature region and atmospheric humidity. Vegetation controls the distribution of animals most rigorously; each animal must remain within the reach of the plants upon which it feeds or in the case of a carnivore, within the reach of its prey, which in turn is controlled in distribution by vegetation. This study used *Juglan regia* (walnut) as its major research (see fig. 1).



Fig. 1: Walnuts seeds and tree

## II. MATERIALS AND METHODS

Three sites were selected for this study. Enugu site lies between latitudes 6° 24'N and longitudes 7°30'. Nsukka site latitude 6° 51' 24"N and longitude 7° 23'E while Umudike site is latitude 5° 28' N and longitude 7°32'E. The Umudike site is located close to the research institute Umudike Abia. Umudike and Nsukka are the major areas in which most of the studies were carried out because the sample were in their natural habitat and have given a more representative record of the species in its natural habitat. The study was carried out during, 2008 to 2011, representing three fruiting seasons of the species (that is, 2008/2009, 2009/2010, 2010/2011). In each site, ten trees were selected' and numbered. Out of these ten, three sample trees were randomly selected and each tree was marked with a yellow paint in a ring form for easy identification in the field during subsequent visits. With the exception of the Umudike site at the, Umuahia Research Institute (URI) which was evenly spaced, the selected trees in the other sites were irregularly spaced, and approximately 50 meter apart. The inception and the duration of fruiting in *Juglans regia* were studied between 2008 and 2011 on the sample trees. Visits of thesetrees were made between October of one year and August of the following year. The commencement, peak and

termination (final) of seeding/fruiting among the sample trees in each site were also recorded. The climatic data of the study sites were obtained from the metrological stations at Enugu, Nsukka and Umudike. Seedling intensity, which refers to the quantity of seeds produced by a tree per unit time was estimated from the seeding sample trees using the following parameters according to Oni (1989).

1. Total number of branches per tree
2. Number of branches carrying seeds per tree.
3. Total number of twigs per branch
4. Number of twigs bearing seed per branch
5. Number of twigs without seed per branch

Three trees had been selected and marked using yellow paint. Each of the trees starts producing seeds in its pods. The numbers of pods per sample trees were recorded. From each of the three fruiting trees, the number of fruits was counted and recorded for each site. The fruiting efficiency was calculated for each site by expressing the mean number of fruits per tree as a percentage of the pooled mean number of the total trees studied. Data obtained for each site were pooled and fruiting trees were separated into different class internals.

**III. RESULTS AND DISCUSSION**

The inception (on set) of fruiting in *J. regia* varied from site to site. In Umudike the commencement of fruiting in June was consistent throughout the three fruiting seasons, while Nsukka it consistently commenced in July through the period of the study. At Enugu fruiting commenced in June during the first seasons of study, and in July during the last two Seasons, see table I.

**Table 1: On set of fruiting in *J. regia* at Enugu/Nsukka and Umudike during 2008 – 2011 fruiting seasons Fruiting Seasons (Year)**

| Sites   | 2008/2009 | 2009/2010 | 2010/2011 |
|---------|-----------|-----------|-----------|
| Enugu   | June      | July      | July      |
| Nsukka  | July      | July      | July      |
| Umudike | June      | June      | June      |

Source: Fieldwork, 2008 - 2011

**IV. DURATION OF FRUITING**

In all the sites fruiting lasted from 133 to 207 days. The shortest period at Enugu was 133 days during 2010/2011 while Umudike had 142 days during 2009/2010 the same period. *J.regia* fruiting for 200 days being the longest during the 2009/2010 at Umudike those was closely followed by the 2008/2009 fruiting season when the same trees fruiting for 200 days.

**Table 2: Mean Duration (in days) of Fruiting per site per Season *Juglans regia* Fruiting Seasons**

| Site    | 2008/2009 | 2009/2010 | 2010/2011 | Total | Mean  |
|---------|-----------|-----------|-----------|-------|-------|
| Nsukka  | 200       | 193       | 181       | 574   | 191.3 |
| Enugu   | 177       | 160       | 133       | 470   | 156.7 |
| Umudike | 200       | 207       | 142       | 552   | 184   |
| Total   | 577       | 560       | 456       |       |       |
| Mean    | 192.3     | 186.7     | 152.0     |       |       |

Source: Fieldwork, 2008 - 2011

The mean duration of fruiting within a particular fruiting season differs remarkably among the sites, see table 2. 2010/2011 recorded lesser fruiting days which dictates low yield as against the other past two years. The following factors could be attributed to the low product.

**Table 3: Estimated Number of Fruits per Tree of in *Juglans regia* in Three Locations in Nigeria**

| Sample trees | 2008/2009 |        |         | 2009/2010 |        |         | 2010/2011 |        |         |
|--------------|-----------|--------|---------|-----------|--------|---------|-----------|--------|---------|
|              | Enugu     | Nsukka | Umudike | Enugu     | Nsukka | Umudike | Enugu     | Nsukka | Umudike |
| Tree 1       | 400       | 484    | 440     | 480       | 520    | 640     | 360       | 440    | 560     |
| Tree 2       | 520       | 560    | 480     | 520       | 420    | 680     | 370       | 480    | 540     |
| Tree 3       | 484       | 540    | 520     | 440       | 564    | 644     | 370       | 392    | 620     |
| Mean         | 468       | 528    | 480     | 640       | 501    | 655     | 346       | 437    | 573     |

Source: Fieldwork, 2008 - 2011

**(a) BIODIVERSITY DEPLETION IN ENVIRONMENTAL FLORA**

Biodiversity loss with depletion in plant occurs when species of plants becomes extinct. This is occurring on a large scale today primarily because of the actions of humans. Most of the farming areas are used for building sites. These have been to local extinction and global extinction. Local extinction according to Daniel and Edward (1998) occurs when the species disappears from part of its range and precut elsewhere. Global extinction occurs when specie becomes extinction everywhere. The most viable example of this is the slash and burn deforestation, in which people move into a section of land and just burn all of the natural vegetation there to ashes so that they can plan a new farm area, this was extremely common in the 80s and shall occurs today's. Unfortunately, the consequences of this is that there are few nutrients in the soil, so farms built on such land will only last for two or three growing seasons before they become barren (Daniel and Edward, 1988).

**(b) IMPACTS OF CLIMATE CHANGE**

Climatic factors played a major role in the duration of the fruiting *Juglans regia*. It was discovered that the raining seasons for 2008/2009 lasted longer than necessary, before the normal. It lasted about eight months (8) for that year which was not obtainable for the other years 2010 and 2011. If climatic factors such as temperature and precipitation change in a region beyond the tolerance of a species phenotypic plasticity, then distribution changes of the species may be inevitable (Lynch and Lande, 1993). However, Petariidou *et al.* (1997), reported a fruiting duration of 105 days for similar species of *juglans*. The difference in the duration of the fruiting of *J. regia* could have been due to difference in site latitudes. Okoro (1986) reported differences in fruiting of *pinus caribbean* due to latitudinal difference in Nigeria. Duration of flowering/fruiting in Alpine plans grown in Australia was found to increase with latitudes due to site difference (Pickering, 1995), Oni (1989) observed low frequency of 3 – 12 fruiting trees in a plantation of *Terminalia invorensis* in the high forest zone of Nigeria while Carthew (1993) reported annual fluctuations in the number of plants that were fruiting in a natural population of *Banksia spinubsa*. These fluctuations could be seen in from this table below.

Midgley *et al.* (2002) studying the potential impact of climate change on plant diversity in the cape floristic region

(CFR) in South Africa have shown that 11% of the species studied are at risk of extinction, and a reduction in the

modelled range sizes of 42% of the species, with the projected climate change scenario. A study published in Nature (Thomas *et al.*, 2004) Climate change could result in the extinction of more than a million terrestrial species in the next fifty years. Rare species, fragmented ecosystems and areas already under pressure from pollution and deforestation are the most vulnerable. Fire is also a major cause of biodiversity loss in Africa especially in Nigeria. As global warming increases, these fires are likely to get more intense and extensive, and may result in significant ecosystem changes that would affect biodiversity through species loss or changes in species composition (Resalkar, 2003, Band *et al.*, 2004). Many thousands of plants are potentially affected by climate change, particularly the floristically diverse *Juglans* which occur mostly in winter rainfall regions at the southern tip of the country, and are threatened particularly by a shift in the rainfall seasonality e.g. A reduction in winter rainfall amounts or an increase in summer rainfall, which would alter the fire regime critical to the regeneration in the *Juglans*. Increase in droughts, floods and other extreme vents would add to stresses in many ecosystems.

**V. HEALTH IMPLICATION OF BIODIVERSITY LOSS OF JUGLANS REGIA (WALNUT)**

One way to identify the reasons for diversity is to look at what we derive from biological diversity and what we will lose as a result of species extinction. Peter (2002) gives some values of biodiversity as, food supplies from natural product like protein and fatty acids are obtained from (*J. regia*) and medicines. Recently, *J. regia* consumers have discovered that the use of it, stabilizes the heart (cardio protection) and helps the high blood pressure patients to control it naturally, and aids for the avoidance of occurrence of high blood pressures where it has not existed at all. *Juglans regia* has been discovered to contain antioxidants which helps to act against the effects of free radicals. Thus *J. regia* is one of the food sources in Nigeria that has a lot of health benefits, gradual extinction is causing more harm than good to the heart of mankind in the country.

**VI. CONCLUSION AND RECOMMENDATION**

The concept of biodiversity cannot be overemphasized. In this study attempt had, been made to explain biodiversity, ecosystem, causes of biodiversity depletion in plant, health implication of biodiversity loss in plant such as in medicine, market, food supply, supplying man with clothing shelter and furnishings. The effects of climate change and biodiversity depletion in flora in the society were also highlighted. Since walnut serve as income avenue for some people in the country especially people at the South-West, it is imperative that such flora be preserved. For the simple fact that human beings cannot exist in isolation, there is need for everybody to see that ecosystem is preserved. That is why the government is advocating or campaigning for the biosphere, and should therefore promulgate the following policy.

**World Campaign for the Biosphere**

The biosphere or ecosystem as has been earlier explained, is the envelop or sphere surrounding the earth in which life exists naturally. The biosphere which has its early evolution

through thousand of millions of years functioned as an integrated whole. But now its integrity is being jeopardized by relentless surges in the number and dominance of one of the million of species on earth and increasingly threatened by the dangerous capability inherent in the unique brain of the species (Margaret, 1982). To this effect, Margaret pointed out four major aims and objectives of the world campaign for biosphere which should be priority of the government of Nigeria about biodiversity depletion in plant:

- (a) To develop and foster on continuing basic education programmes and allied activities designed to mark the concept of biosphere intimately known and personally meaningful to people of all ages and culture throughout the federation.
- (b) To foster the development of scientific understanding of the design and operation of the biosphere.
- (c) To prepare for launch and guide practices actions towards safeguarding our one only biosphere.
- (d) To encourage the development of political and other institutions to reduce the physical harm which we inflict unnecessarily on ourselves and nature by falling to accommodate to the biosphere’s ways and need.

**Certification of Forest Practices**

Worldwide concern with the need for forest sustainability has led to international activities of two kinds.

- i. Attempt to impose bans on imports of wood obtained from purportedly non-sustainable, forest and
- ii. The development of international programme for certification of forest. The goal of certification is to certify to consumers that forests were in fact managed sustainable and provide certification for wood product (Margaret, 1982).

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