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Research Article

Combating Climate Change Effects with Tree Planting in the Guinea Savanna: - Rural Dwellers Awareness and Perception

Unanaonwi Okpo Esio[1], Amonum Joseph Igba[2] and Agwaza Washima[2]

[1]Department of Biological Sciences, Federal University Otuoke, Nigeria
[2]Department of Forest Production and Products, Federal University of Agriculture Makurdi, Nigeria
***Corresponding author:** okpoesio2002@yahoo.com

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ABSTRACT

Rural dwellers are known to be the most active in tree planting mostly because of its role in rural livelihood. However, most rural dwellers are not aware of the role of trees in mitigating climate change effects. This research was conducted to ascertain the level of awareness and purposes of rural people involved in tree planting in Katsina-Ala Local Government Area of Benue State. Eight (8) of the twelve Council wards of the local Government Area were randomly selected by simple random sampling technique. Fifty respondents were randomly chosen from each of the eight wards. A total of 400 respondents were interviewed through structured questionnaire that seek responses to relevant question of the research. Data were analyzed using descriptive statistics in percentages and bar –charts. Results show that 73% of the study population plant trees in their compounds, while 27% did not. Among four uses of trees investigated, majority of the respondents (40%) uses trees for timber, while 13.75% use it for environmental protection. Majority of the respondents (80%) reported high temperature as the most felt environmental hazards in the study area. Awareness campaign is recommended among rural dwellers, especially farmers.

Key words: Climate change, tree planting, awareness, rural livelihood

INTRODUCTION

Understanding the extent to which trees maintain life in our planet is crucial to our survival and should not be knowledge in the heads of the literate and city dwellers only. Without trees, human lives would not be sustainable because our lives depend on availability of air, water and food. Trees help us to get oxygen (air) and help in keeping our soil fertile for crop production, for food (Tatcher, 1997; Tamale, 1995; Noble and Randall, 1988).

Trees provide a wide range of products including timber, fruits, medicine, beverages, fodder, oils and tannin, and life supporting services such as carbon sequestration, erosion control, soil fertility, shade and beautification among others. However, our trees and forests are rapidly disappearing at an alarming rate (Unanaonwi and Amonum, 2014).

Global deforestation in the last two decades has resulted in the loss of millions of hectares of forest. Below ground populations which play vital roles in ecosystem processes rely on tree diversity above ground and continuous tree loss above ground will negatively affect the biogeochemical processes that maintain the ecosystem for continuity of life (Chapin *et al*., 2000).

Climate change caused by emission of green-house gasses into the atmosphere has today become a major environmental problem all over the world. Human activities like burning of fossils fuel and land use practices especially deforestation, carbon-dioxide emissions and other heat trapping gasses are released in large quantities into the atmosphere. Due to the built-up of these carbon compounds in the atmosphere, and with scanty tree population to reduce the effects, the wise option for the time and time to come is that of tree planting to prevent more severe environmental hazards and to maintain ecological, social and economic balance (Unanaonwi, 2015).

Trees and carbon sequestration

All the world needs presently is reduction of carbon in the atmosphere. Trees, particularly those with deep roots, contribute to the earth's climate much more than scientists thought (Anongo, 2008; Noble and Dirzo, 1996). New studies by scientists studying climate change

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assumed a simple model of plants sucking water out of the soil and spewing water vapour into the atmosphere, have recognized the importance of vegetation in removing carbon dioxide from the atmosphere and in cooling through transpiration. Trees play indispensable roles in creating and preserving a quality environment. They build and protect the soil and filter water. Through the provision of obstacles such as roots, logs and decaying litter, which act as spongy absorbents, tree drastically reduce surface run-off. This ensures a stable environment. Trees play significant role in climate stability. It releases oxygen upon which man relies on, as well as absorb much of the solar radiation and reduce the reflectivity of the earth surface (Unanaonwi and Amonum, 2015).

A study on the Amazonian forest by Biologists and Climatologists shows that deep rooted trees use water in a complex way. The tap roots transfer rain water from the surface to the reservoiurs deep underground and distribute water upwards after the rain to keep the top layer moist, thereby accentuating both carbon uptake and localized atmospheric cooling during dry periods. They estimated that this affect increases photosynthesis and the evaporation of water from plant by 40% in the dry season when photosynthesis would otherwise be limited. It has been reported (Muys et. al., 2007; Agaceta, 1990; Igboanugo in Press.) that *Jatropha curcus* for example is capable to sequester a high percentage of atmospheric carbon dioxide with specific leaf area of 393.773cm^2gm^{-1} apart from biofuel production.

Trees play an important role in climate change. The destruction and degradation of forests Contributes to the problem through the release of carbon II oxide. But the planting of new trees can help mitigate climate change by removing CO^2 from the atmosphere. Combined with the sun's energy, the captured carbon is converted into trunks, branches, roots and leaves via the process of photosynthesis. It is stored in these biomass until being returned back into the atmosphere, whether through natural processes or human interference, thus completing the carbon cycle. Tree planting and plantation forestry are well established both in the private and public sectors. FAO (2010) stated that plantation forests comprised an estimated 7% of global forest area in 2010. Most of these forests were established in areas that were previously not under forest cover, at least in recent years. Trees are also planted as part of efforts to restore natural forests as well as in agroforestry, which involves increasing tree cover on agricultural land and pastures.

Under certain conditions plantations can grow relatively fast, thus absorbing CO^2 at higher rates than natural forests. In the absence of major disturbances, newly planted or regenerating forests can continue to absorb carbon for 20–50 years or more. In comparison to preventing the loss of natural forests, however, tree planting has the potential to make only a limited contribution to reducing CO^2 levels in the atmosphere. In 2000, the IPCC (2000) reported that tree-planting could sequester around 1.1–1.6 GT of CO^2 per year. That compares to total global greenhouse gas emissions equivalent to 50 GT of CO^2 in 2004. It is certain that each living tree removes a certain amount of carbon from the atmosphere.

Tree planting and rural dwellers participation

Rural men and women in many areas have long been involved in the conservation and cultivation of trees on agricultural lands and forested areas. Until recently, there has been a tendency to discount these indigenous activities. The main focus of forestry efforts has been on management of trees for environmental protection or for industrial timber production. The shift in emphasis toward forestry in partnership with rural people is, therefore, a significant departure from earlier perceptions, policies and practices. The relationship between rural people and the trees in their environment is generally complex. Many of the approaches used have been developed over long periods of time. Often they have emerged as responses to increasing, though sometimes subtle, pressures on the local environment. Their underlying function has been to ensure that locally-valued tree species continue to be available to rural people.

The extent to which people cultivate and manage trees varies throughout the non-industrial areas of the world. It depends largely on characteristics of local ecology, patterns of agricultural land-use, cultural traditions, local demands for wood and wood products, tenure rights and economic pressures. In some societies, tree cultivation and management is a major feature of the way of life; in others, it has assumed a peripheral or even a negligible role. Depending on the intensity of the management approach, different strategies will be able to withstand more environmental stress than others. Environmental degradation and the depletion of tree cover is sometimes symptomatic of a lack of comprehensive traditional tree and environmental management systems. In many cases, it has been the result of the breakdown of traditional systems because of intense and interacting pressures.

Introduced innovations may be required where strong indigenous traditions do not exist. In heavily forested areas, and in some regions of the world where alternative resource-use strategies have been pursued, tree conservation and regeneration strategies may be largely absent. Similarly, pressures of poverty, population growth and insecure tenurial rights - among others.

Almost everywhere, a certain standing stock of different types of trees, whether deliberately cultivated or allowed to grow naturally, has been recognized as necessary by farming communities. Even in nomadic pastoralist societies, trees have traditionally played a variety of essential roles. Though pastoralists may rarely have planted trees, their traditional way of life was such that they did not usually deplete the supply in the territories over which they ranged with their flocks. Indeed, the grazing animals helped maintain the tree base by dispersing tree seeds over wide areas.

The many products and benefits which rural people derive from trees reflect detailed and sophisticated knowledge about their immediate environment. The assumption that traditional communities are unaware of the benefits provided by trees, and therefore need to be educated about the immediate consequences of the depletion of tree cover, is rarely accurate.

Local impacts such as the loss of fodder, shade, fruit, and other benefits are obvious. Although rural populations may not have a clear understanding or perception of the

long term consequences of deforestation - particularly downstream consequences - their ability to name and distinguish a large number of species and to describe their characteristics demonstrates awareness of trees and the role they play in their own lives.

In some cases, rural silvicultural systems are highly sophisticated with considerable numbers of trees planted and well-developed techniques used for managing and harvesting them. Elsewhere, managing tree resources is more passive and relies on conservation and natural regeneration. Stability of the system rests on the fact that population pressures are low and that the forest's capacity for regeneration is great enough to offset any damage done by the utilization practices of rural people.

Where traditional societies have remained stable, they have generally been able to maintain the productive role of the tree resources on which they depend. Though traditional tree management strategies might slow or even stop the processes of environmental deterioration, the primary focus has usually been on the utility value of trees for household or community use. Some practices have resulted in developing elaborate agroforestry systems, such as home gardens, which have incorporated indigenous trees into sustainable production systems. Others have been more modest in scope and effect, based on the desire to retain at least some valued trees conveniently near the household factors - have sometimes precluded the development or retention of indigenous strategies.

Presently in many part of the world, (Ruffo *et al*., 2002; Rootheart, 1999; Rudel, 1997; Simmons, 1997) tree planting is actively carried out by rural dwellers and they still remain the most active. Climate change and its effects is being felt in the most rural and interior part of the world, but apart from the local uses of trees to which they are well familiar, most rural dwellers still remain ignorant of the role of trees in mediating climate change effects. This research is aim at ascertaining the awareness and the level of participation in tree planting among rural dwellers in selected communities in the Guinea Savanna of Nigeria.

MATERIALS AND METHODS

The study was carried out in Katsina-Ala Local Government Area of Benue State, Nigeria. It lies between latitude 7^0 10^l N and longitude 9^0 17^l E. (Fig. 1). Eight out of 12 council wards of the Local Government were randomly selected using simple random sampling technique. Fifty (50) respondents were further selected randomly from each of the eight council wards, giving a total population of four hundred (400) respondents for the study. Structured questionnaire were administered to the entire respondents respectively. The questionnaire comprised of two part –A and B. Part A deals with the demographic aspect of respondents while part B comprised of seventeen items which seeks responses from the respondents such as purpose for planting trees, uses, perception/opinion about tree planting, willingness to plant more trees, knowledge of environmental hazards, source of information, and methods of maintenance, etc.

Data analysis

Data extracted from the questionnaires was analyzed using simple statistics in form of percentages and bar charts.

RESULTS

Fig. 1 shows that 73% of the study population plant trees in their compound while 27% did not. On ward council bases, Mbaji ward council recorded the highest response with 84% of the respondents admitting to have planted trees in their compounds.

The result shows that majority of the respondents (40%) use trees for timber among the four uses investigated. Only 13.75% use trees for environmental protection.

Fig.3 shows that among the environmental hazards experienced by the people in the study area, high temperature (80%) was the most reported. Flooding was reported by 20% of the respondents in the study. On ward council bases, in Oyoyo and Mbayago ward councils; 100% of the respondents reported they have been experiencing high temperature in recent time. Result shows that the study area was not affected by deforestation, wind erosion and desertification; and was not reported from any of the ward councils under this study.

People that are not aware that trees could be planted to mitigate environtal effetcs remain the highest (68%) in all the eight Ward Councils investigated. Only 32% of the sampled population were aware of tree planting as a means to reduce climate change effects. The highest number (80%) of peole not aware of this role of trees occurred in Mbatyula and Iwuanyam ward councils, bringing the number of people who are aware to 20% of the sampled population.

DISCUSSION

Increase in tree population locally or globally is a good indicator of the readiness to protect the environment and combat climate change effects. Fig.1 shows that 73% of the local population under study planted trees in their compounds while 27% did not plant trees within their compounds. However, if the aim of increasing the number of planted trees either locally or globally is not defined, it could be just an increase to serve other purposes since trees are multipurpose (Unanaonwi, 2010^a). Among rural dwellers, few trees are around the home than on distant farmlands because consideration is given to vegetable crops in the home-garden for easy access in their daily needs than to trees. If the purpose of planting is for beautification of the environment, which is rare among rural communities, then the trees will be planted around homes and compounds. If the aim is for economic uses such as food, vegetables, fruits, spices and nuts, the trees will be planted around the home. For provision of shade, trees are planted around the compound. Outside these considerations much tree stand may not be found around the home in rural settings.

However, increasing the tree population will have to go beyond urban or environmental forestry or home plantings. Tree planting should go beyond the home environment into forested areas by way of reforestation

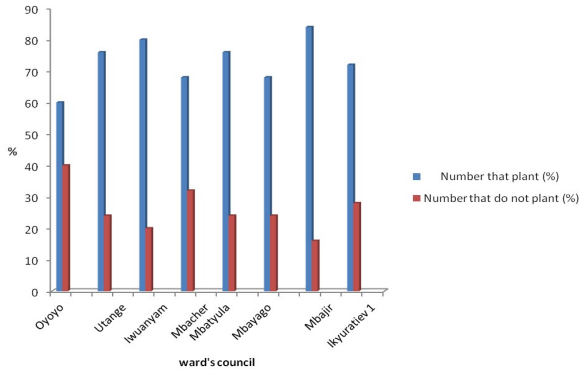

Fig. 1: Respondents who plant trees around their compound in Katsina –Ala Local Government Area.

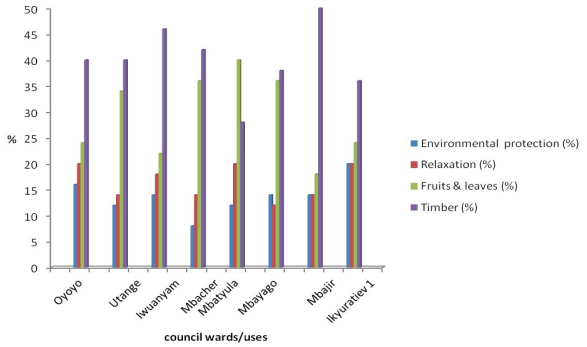

Fig. 2: Uses of trees by Respondnets in Katsina-Ala Local Government Area.

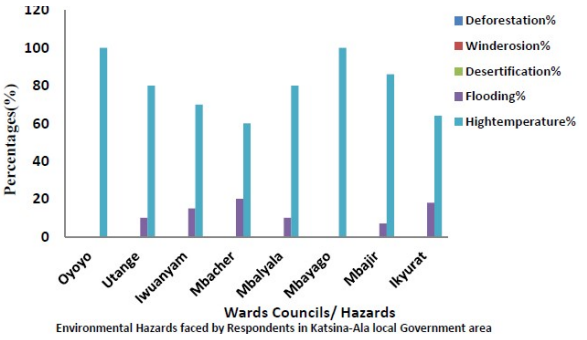

Fig. 3: Environmental Hazards Faced by respondents in Katsina-Ala Local Government.

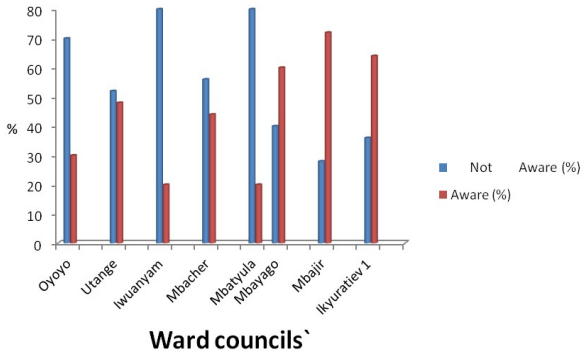

Fig. 4: Respondents level of awareness on tree planting as a means to combat environmental hazards.

and afforestation to meet the present environmental challenge. Tree planting by individuals are usually predicted on certain factors land tenure rights, species preferences, economic values e.t.c. (Unanaonwi, 2010[b]), and where these does not fit into individual's consideration, tree planting may not be embarked upon. These have over the years affected tree planting and ownership by private farmers.

As already stated, the use purpose determines whether trees should be planted especially in the midst of vast demand for available land. Fig.2 indicated that majority of the respondents (40%) use trees for timber while 29.25% use trees for fruits and leaves. Only a few persons (19%) indicated the use of trees for relaxation as shade and 13.75% use trees for environmental protection. Most communities of the third world have not yet realized the importance of trees in ameliorating the environment and because of this, deliberate action of tree planting is lacking (Unanaonwi, 2015[b];IUCN,2001. Unru, 1995).

In all eight ward councils investigated, timber use indicated the most prominent. The same finding had been recorded in Poland before the establishment of Decree 11.1, 1992, which made the forest an all-encompassing unit, not only for timber production as earlier held (Puervisl, 2000).. The use of trees as relaxation spot mostly because of its shade which directly bears on environment indicated as low as 17% of the respondents. People need to know the benefits of trees to the environment and that environmental sustainability is directly related to human development (Unanaonwi and Amonum, 2014).

There was no report of hazard caused by wind erosion and desertification in the study area .High temperature was the most reported (80%) fig.3, while 20% of the study population reported flooding as their major challenge. High temperature with scanty rainfall is an environmental factor that delays agricultural activities among rural farming people in the tropics, especially in the developing world where agricultural mechanization is not a planned practice. However, a phenomenon that brings about environmental hazards varies across geographic regions. In some regions like Australia, of most recent, is bush fires, in Asia-Pacific and sub-Sahara Africa including Nigeria, it is flooding. In the Polar Regions like Rumania it is melting ice and rise in ocean level, and wind storms in the Americas. In Oyoyo and Mbayago ward councils, all respondents indicated high temperature as the only environmental hazards faced.

Most people living in rural communities around the world are yet to understand the inextricable relationships between tree and the environment. They are not equally aware that trees are capable of protecting the environment and the associated hazards due to global warming that brings changes in climatic pattern. This awareness need to be totally embraced with the needed action to bring about reduction in the degree and severity of these hazards on the environment. In this study as much as 80% of the population reported high temperature to be the most felt environmental hazard but only 32% were aware that trees in the environment could reduce high temperature. Fig. 4 shows that majority (68%) of the respondent were not aware of this important role of the trees. If this is translated to the entire population where 68% do not know

that trees could help reduce high environmental temperature, then conscious efforts of tree planting or allowing trees to remain as a means of protection will be lost.

Conclusion

Rural awareness on the role of trees in combating the effects of climate change needs to be pursued. Majority of lands locally or globally still belongs to traditional rural people and government efforts alone in tree planting and environmental greening will not be sufficient to remedy the situation. Rural people should be educated on how hazards on the environment could be reduced and eventually checked through tree planting. It has been shown that most communities do not know of other functions of trees than for timber. This implies that if trees are allowed to stand for a time, by and by it will be cut. Climate change effects are not uniform in all localities but the same action of tree planting could be taken to combat the effects.

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