

LOW CARBON DEVELOPMENT AND POVERTY ERADICATION IN NORTH-EASTERN NIGERIA

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Abstract: Three environmental Non-Governmental Organizations (NGOs), namely, Environmental Care Foundation (ECF), Agro-Environmental Technology Initiative (AGETi), and Biofuel and Environmental Sustenance Initiative (BESI) have team up and came out with a result oriented strategy for attaining low carbon emission as well as creating wealth for the teeming unemployed youths in the North-Eastern geo-political zone of Nigeria.

Awareness campaign on activities detrimental to the environment is our main thrust, however, our specific activities include: 1. Tree Planting Campaign- seedlings of trees and other ornamental plants are raised and sold to the public. In the 2012 World Environmental Day, over 5,000 seedlings were bought from our nurseries and almost all were planted in Adamawa and Taraba States on that occasion. 2. Waste Disposal- plastic waste bins are allocated to interested households, who pay the sum of N500 (about \$3) per family per month. The waste is evacuated twice a week and at present, more than 1,500 youths are gainfully engaged into this venture. There are also beautifully designed and well-constructed public waste bins, which are strategically located along the major streets of our cities. They carry the logo and names of big companies and organizations, which in turn pay the NGO some amount of money either monthly or quarterly for the advertisement rendered. 3. Fuel briquette production- the activity is significantly combating deforestation as well as bringing income to members. Agricultural waste from weeds, maize, rice, sugarcane and other organic wastes are used in the briquette production for cooking. The use of briquette as cooking fuel is gaining more preference than firewood because of its convenience of storage and usage. 4. Cattle Biogas Production- this is the latest activity of the NGO which has just been experimented and about to go commercial. Cow dung from local cattle owners are collected and processed into useable gas for cooking and lightning purposes. A prototype landfill biogas digester where the cow dung under goes fermentation and produces gas has been constructed. The energy produced is fed to households via pipelines for domestic use. The use of this gas instead of firewood will save time and natural resources and also mitigate the emission of methane which contributes 15% of the greenhouse gases.

Keywords: biogas, briquette, employment, carbon emission, environment.

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Introduction

The North East of Nigeria is a geographical expression referring to the six states located in the north eastern part of Nigeria, being one of the six geo-political zones of the country. The states in the zone are namely, Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe.



Fig.1 Map Showing the Six States in the North-Eastern Nigeria

According to Uguru (1981) States in the north eastern Nigeria fall within four of the six major vegetational belts of the country. The southern part of Taraba State and eastern part of Adamawa State fall within the Southern Guinea grassland, which is a belt of open woodland and a transitional zone between the rain forest and the savannah. Along the water courses, dense vegetation of forest trees still predominates. Oil palm trees are scattered in patches, especially along low-lying areas with high moisture content. The trees are fairly closely spaced and beneath these trees is found a characteristic grass layer comprising mainly *Pennisetum*, *Andropogon* and *Panicum*. The annual rainfall is about 1300-1600mm.

The Northern Guinea grassland is more open woodland than the Southern Guinea grassland. Southern part of Taraba State and eastern part of Adamawa State fall within this vegetational belt. It has less tree growth and more luxuriant grass growth. The grasses found are *Andropogon*, *Panicum*, *Pennisetum*, *Paspalum*, *Hyperrhenia* and *Brachiaria*. The average annual rainfall is between 1020-1270 mm.

Further north, the Northern Guinea grassland gradually merges into the Sudan savannah. This area is much more open than the preceding belt. It is characterized by stunted trees, which are widely spaced and are interspersed by various types of low grass cover. The grasses do not grow as tall as those of the Guinea grassland. This belt covers the greater part of north eastern Nigeria, cutting across all the six states. It has an annual rainfall of 640-1020mm. The largest number of livestock in Nigeria is kept in this belt, with the Fulanis herding the greater number of the cattle.

North east of the Sudan savannah and around Lake Chad is the Sahel savannah. This is an arid region with fewer, more resistant woody plants and poorer grasses. The rainfall is scanty (500 mm) and falls within about four months. Beyond this zone the belt tends towards scrubland and desert with short grasses and thorny bush. Only parts of Borno and Yobe States fall within this zone.

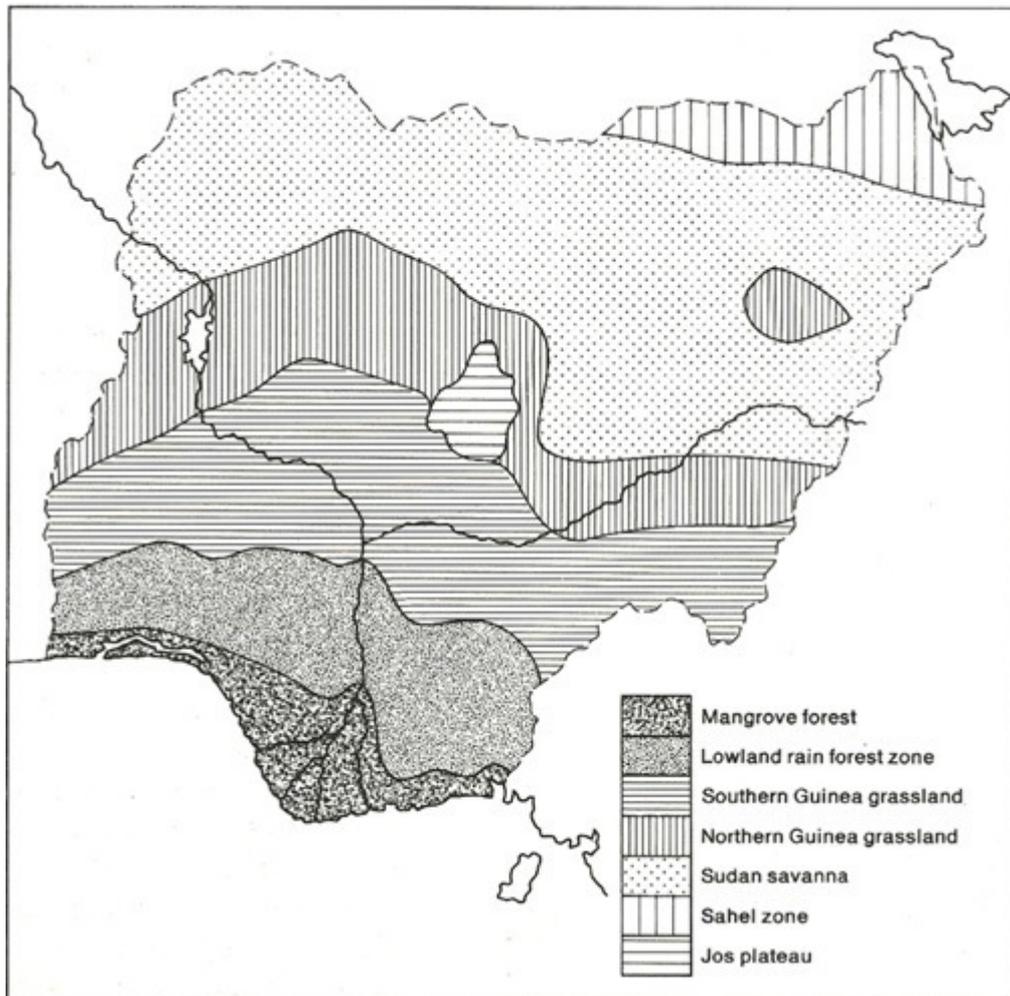


Fig. 2 Map Showing the Six Major Vegetational Zones and the Jos Plateau in Nigeria

Although the three NGOs have different approaches and strategies of tackling environmental problems, they have streamlined their activities in the new partnership to focus on four major activities notwithstanding the activities of their individual organizations. These activities include the following: Tree Planting, Waste Disposal, Briquette Production, and Biogas Production.

Tree Planting

With the gradual expansion of deserts due to climatic changes and man's activities, desertification has become a serious threat to countries bordering the major deserts in the world. Desertification as defined by Osinem (2005) is a process that may act to force the conditions of a part of the earth's surface or its surrounding atmosphere to become unpleasant or less useful to man – an extreme case of land degradation. In an area like North East Nigeria where the main source of livelihood is agriculture, the human misery caused by desertification is better imagined. A report by Musa et al. (2010) stated that a look at satellite images of Nigeria taken in 1978 shows that most of the far north is covered with vegetation. Bare surfaces and sand dunes manifest themselves only after the international boundary between Nigeria and Niger, that is, at latitude 13⁰ N. As at 2001, vegetation had been driven southwards to about latitude 12⁰ N. North of this latitude is characterized by scanty thorny shrubs, bare surface and sand dunes.

Field visit to the study area revealed a frightening scenario (Musa et al., 2010). Settlements very close to the Niger border were practically sitting on sand dunes. Evidence of the feeble attempts made by the North East Arid Zone Development Project (NEAZDA) can be seen, in the form of desert resistant plants, growing around the settlements. The plants were meant to make the sand more stable, thus preventing it from moving. But a casual glance, even by the least experienced visitor, reveals a different scenario. The monstrous sizes of nearby sand dunes leave no one in doubt that it is just a matter of time before the entire villages will be covered up unless drastic and aggressive measures are immediately taken.

Deforestation of trees for use as firewood without reseedling to replace felled ones, land clearing activities for agriculture, indiscriminate bush burning which reduces the vegetative cover of the soil as well as the population of trees, have all further worsen the above situation (Musa et al., 2010).

a) **Nursery:** Our tree planting activity starts here at the nursery where members are taught how to raise tree seedlings and other ornamental plants. The two commonly raised tree

seedlings are the Neem tree (*Azadirachta indica*) and Yellow cassia, which are considered drought resistant in this part of the world.

The raised tree seedlings and ornamental plants are sold out to the public, from which funds are generated for members. In the 2012 World Environmental Day, a large consignment of tree seedlings were bought from our nurseries and were all planted in Taraba and Adamawa States, with the assistance of our members overseeing the re-planting exercise on that occasion.

b) **Landscaping:** This unit is involved in the design, establishment, and maintenance of landscape. The landscape could be in the form hedges, shrubs, flowers and lawns. We do charge moderate fee for our landscaping services, depending on the size, location and topography of the landscape. This activity apart from beautifying the environment and enhancing ecological balance, it creates some wealth to its members from services rendered.

c) **Green Wall:** This is a long term project proposal forwarded to the Ministries of Environment in Borno and Yobe States, where the desert is fast expanding. The goal is to plant trees and create a forest barrier of some length and width to halt the encroaching desertification and help combat climate change. Although the proposal is being considered for approval, we cannot risk moving our experts to those areas to carry out feasibility studies for now due to reasons of insecurity in those states.

d) **Green Club:** This is climate awareness and adaptation campaign clubs that we intend to establish in many secondary schools in the region. So far we have established two in some senior secondary schools, one in Taraba State and one in Adamawa State as our pilot project. For the meantime, their focus is on awareness and sensitization on activities and practices detrimental to the environment. With time, we intend to supply them with items like the wheel barrow, hand trowel, hoe, spade, and seedlings and cuttings, so that they can start a small landscaping activity to improve their school environment.

Briquette Production

The production of fuel briquettes from waste materials as alternative fuel for cooking is not a very complicated process, but definitely a subtle one. It can be long and tedious, but finally rewarding.

According to a report by the Beaverton Rotary Foundation (2012.), about a billion people in our world rely upon wood and charcoal for cooking, resulting in wide-spread deforestation

and loss of about 3% of the world's forests each year. In countries where the average income is \$ 1-2 per day, cooking fuel can consume half of the family's income.

Beaverton Rotary Foundation (2012) stated that fuel briquettes can be made from readily available waste materials. In urban areas, this can be sawdust, wood shavings and shredded paper. In villages and rural areas, they can be made from grass, leaves, maize cobs, rice husks, sugarcane wastes and other agricultural wastes in many combinations. The raw materials are moistened and partially decomposed for several days, then dried and pounded or chopped into small pieces about the size of cornflakes. They are then soaked, mixed in slurry and pressed with a briquette press. The briquettes are dried in the sun for 3-5 days and are ready for use. Drying times depend primarily on heat, humidity and air. Drying times will be shorter during the dry season and longer during the rainy season. Charcoal fines which turn the briquettes black, making them more acceptable to people used to charcoal can be added to any mix.

A wide variety of mixes of raw materials can be used, depending on what is available. If briquettes fall apart, adjust the mix until one is found that holds together. Waste paper has long fibres that help make good briquettes when added at 15-20%.

We are not only producing briquettes for sale, but are also teaching interested individuals or group how to make fuel briquettes for their own use as well as to establish sustainable small businesses that produce a product that helps the producers earn a living wage, provides their customers with a less expensive cooking fuel and improves the environment by reducing deforestation. In a similar vein the Village Volunteers (2012) stated that recycling biomass materials into fuel briquettes contributes to solving rural and urban needs by generating income, providing a new and cheap alternative source of cooking energy, avoiding excess waste disposal on insufficient land, avoiding having to cut down more forests for fuel wood, and ultimately promoting a sound environment.

Fuel briquettes making is an environmentally friendly technology, which needs adoption and promotion by both rural and urban groups and individuals. We charge a moderate amount of money for a one week training period.

Waste Disposal

Nigeria has experienced some growth in its economy and population since independence leading to consequent expansion in infrastructural facilities and social services to sustain the population growth. This structural development has brought about an increase in the commercial and industrial activities resulting in a phenomenal increase in volume and

diversity of solid waste generated on daily basis throughout the country especially in the urban centres (Lewcock, 1994). He further stated that the ugly and irritating sight of these urban wastes is posing a most serious environmental problem in Nigeria with its consequent effect on pollution of water, air and soil.

If the above scenario was reported as far back as in 1994, the situation now is better imagined with the significant increase made in population and infrastructure.

In its effort to keep the environment clean and habitable, the NGO has embarked on household refuse collection. After due consultation with interested household members, plastic bins are provided for collection of waste. The collected waste is evacuated twice a week using cart and barrow and are dumped in designated sites. The sum of N500 (about \$3) is charged per family per month.

We also have beautifully designed and well-constructed public waste bins, which are strategically placed along the major streets of our cities. They carry the logo and names of corporate organizations and big companies, which in turn pay the NGO some amount of money for the advertisement rendered. Some of the organizations have sponsored the construction of the waste bins as part of their corporate social responsibilities to the people in the areas they operate.

For the meantime, these services are only rendered in Yola and Jalingo towns, the capital of Adamawa and Taraba States respectively. With time, we intend to extend these services to other major towns in the other states.

Biogas Production

Biogas typically refers to a gas produced by breakdown of organic matter in the absence of oxygen. Organic waste such as dead plant and animal material, animal faeces, and kitchen waste can be converted into a gaseous fuel called biogas by undergoing anaerobic digestion or fermentation (Olaboya et al., 2010).

Biogas comprises primarily methane (CH_4) and carbon dioxide (CO_2) and may have small amounts of hydrogen sulphide (H_2S) and moisture. The gases methane, hydrogen, and carbon monoxide (CO) can be combusted or oxidized with oxygen. This energy release allows biogas to be used as a fuel. Biogas can be used as a fuel for any heating purpose, such as cooking. It can also be used in anaerobic digesters where it is typically used in a gas engine to convert the energy in the gas into electricity and heat.

Biogas can also be cleaned and upgraded to natural gas standards when it becomes bio-methane. The composition of biogas varies depending upon the origin of the anaerobic digestion process. Landfill gas typically has methane concentrations around 50%. Advanced waste treatment technologies can produce biogas with 55-75% methane.

Table 1. Typical composition of biogas

Compound	Chemical	Percentage
Methane	CH ₄	50-75
Carbon dioxide	CO ₂	25-50
Nitrogen	N ₂	0-1
Hydrogen	H ₂	0-1
Hydrogen sulphide	H ₂ S	0-3
Oxygen	O ₂	0-0

Source: Wikipedia, 2012

Landfill gas is produced by wet organic waste decomposing under anaerobic conditions in a landfill. The waste is covered and mechanically compressed by weight of the material that is deposited from above. This material prevents oxygen exposure thus allowing anaerobic microbes to thrive. This gas builds up and is slowly released into the atmosphere if the landfill has not been engineered to capture the gas (Wikipedia, 2012). The methane contained within biogas is 20 times more potent as a greenhouse gas than is carbon dioxide. Therefore, all safety measures should be in place to ensure that landfill gas is contained and does not escape into the atmosphere to contribute to the effects of global warming.

Biogas technology represents one of a number of village-scale technologies that are currently enjoying a certain level of patronage among government and NGOs and that offer the technological possibility of more decentralized approaches to development (Ilaboya et al., 2010).

The biogas production is the newest of our projects, which is in its pilot stage. In collaboration with the Integrated Community Water and Agricultural Programme (ICWAP) of the Catholic Diocese of Yola, the capital of Adamawa State, we have initiated a six week train-the-trainer course for some of our members, with the hope that at the end of their training they will be better equipped to pass on the knowledge acquired to other members far and near.

Biogas production at our training centre is landfill based, using three pits (ICWAP, 2012). The first pit, which is the inlet pit, is where the cow dung is deposited; the second pit, which

is the digester, is where the fermentation takes place, while the third pit, which is the outlet pit, is where the slurry or effluent after the fermentation is deposited.

From the second pit, the digester, pipes are connected through which the gas is conveyed. There is also a filter which traps all other gases except methane, to ensure clean and more efficient burning. Connected to the pipes are two gate valves that regulate the flow of the gas and from which the gas flow can be stopped outrightly. The slurry is finally collected and used as organic manure on the farm.

One of the major handicaps of biogas production generally is the availability of raw material. Incidentally, that is never our problem because the north-eastern Nigeria is the region with the highest number of cattle in the country. Cow dung is abundantly available free in all the many abattoirs in the cities, slaughter slabs in the villages and the houses of cattle owners.

It is our hope that if this project is fully established and expanded to all nooks and cranny of the states, it will go a long way in reducing the emission of methane, one of the major greenhouse gases into our atmosphere. It will equally create a lot of jobs to our teeming unemployed youth.

Conclusion

Adebayo (2010) stated that, it is no longer news that the earth's climate is changing. Though it has taken a long time for the world to face the fact, the earth is getting warmer and warmer. Majority have now come to term with the problem and ready to take action to limit the damage.

There are both natural and human factors causing climate change. The natural factors include terrestrial causes such as the alteration in the orientation of the earth, extra-terrestrial causes such as the solar activities, etc which we cannot do much about. The human causes include the emission of greenhouse gases and aerosols, changes in land use and depletion of the ozone layer through various human activities such as industrialization, urbanization, and agriculture and land clearance amongst others. The outcome of these human induced changes is global warming which is the most visible symptom of the climate change (Adebayo, 2010).

Our NGO is all out, using its expertise and limited resources, to see that human activities detrimental to the environment are significantly controlled by involving our members in active awareness and sensitization campaign on activities harmful to the environment and also embarking on practical activities that will improve the environment as well as providing a living wage for the teeming unemployed youth.

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