

## GREENING THE DESERT AREAS OF NORTHERN NIGERIA: A PRACTICAL APPROACH TO FOOD SECURITY.

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### ABSTRACT

The study examined desertification, its causes and effects in the northern region of Nigeria and how a green initiative can be adopted to tackle the menace. The study opined that desertification can do severe damage to Nigerian agricultural production the bulk of which is concentrated in the northern region of the country if the problem is not properly handled. The study is of the opinion that greening the desert is a good approach that will help in reclaiming land areas lost to desertification and also help in transforming or regenerating the degraded land areas. Greening the desert has a lot of advantages that are of immense benefits to the environment, man and animals and some of these advantages include carbon sequestration, attraction of tourists, employment creation for the locals, natural rainfall generation, possible return of animal species that left as a result of desertification. The study suggested that halophytes, deep-rooted crops and trees that are of economic value should be planted. It is also recommended that programmes and policies designed to address the problem must move from paper policy to concrete action on the ground. There should be systematic and regular collection of data on the extent of desertification, damage and losses caused by desertification so that appropriate counter measures can be taken. Regular public enlightenment on sustainable use of natural resources was advocated as a de-desertification technique of immense proportion. Also, the Great Green Wall initiative designed to limit desertification should not be abandoned, it must be financially supported to achieve its objective.

**Keywords:** Causes, Effects, Agriculture, Desert, Areas, Greening

### INTRODUCTION

Burgeoning population growth and other factors such as industrialization, urbanization etc have put land under enormous pressure all over Nigeria particularly in the north where the population keeps rising on annual basis as a result of variables such as illiteracy, early marriage, religion and so on. Desertification is the process by which productive or fecund land becomes degraded over a period of time especially in arid, partially arid areas and areas that experience insufficient annual amount of rainfall as a result of climate induced factors (changes in climatic conditions) and anthropogenic activities such as deforestation, excessive animal grazing, poor irrigation practice, bush burning etc. [1] defines it as "land degradation in arid, semi-arid and dry sub humid areas resulting from various factors, including climatic variations and human activities." Land degradation is in turn defined as the reduction or loss of the biological or economic productivity of dry lands. Desertification is an environmental problem that poses a serious threat to man's existence as it is currently being experienced in some states in northern part of Nigeria. Northern Nigeria is a huge expanse of land with sizeable arable land that can feed the whole country with plenty left for export if fully developed. The forest area in Northern Nigeria has continued to plummet as a result of climate change and man-made activities that are harmful to the environment. According to [2], northern Nigeria, by location, is situated in semi-arid region with an average annual rainfall of or less than 600mm bordering the Sahara desert. The steady decline in annual rainfall has been accompanied by a shortening of the rainy season, which lasted 5 months 30 years ago, and lasts only 4 months nowadays [3]. Desertification affects eleven (11) states in northern Nigeria commonly referred to as the frontline states which include Adamawa, Borno, Yobe, Jigawa, Kano, Katsina, Zamfara, Sokoto, Kebbi, Bauchi and Gombe [4]. The main occupation of most people in these states is agriculture which accounts for a reasonable share of the Gross Domestic Product nationally and estimated to be more than 20% making it a pivotal engine and essential driver of economic growth. This is being threatened by desertification. Desertification has forced herdsmen to leave their traditional grazing areas to where there is lush pasture and water for their

animals and this has not gone down well with the host community. In most places across Nigeria this has created crisis between farmers and herdsmen and many lives had been lost with property worth millions of Naira destroyed. A notable example is the crisis between farmers and herdsmen in Agatu area of Benue state, north central Nigeria where so many lives were lost and property destroyed. Desertification also leads to a decline in agricultural productivity as once fertile land has now been rendered unproductive and cannot support crop growth. Arable lands that farmers are using to cultivate crops have now been covered with large expanse of sand dunes that cannot retain water to support crop growth. Along the border with the Niger Republic, farmers complained that crop yields have reduced by as much as 80% and farm lands which used to produce over ten bundles of millet now can barely produce two due to ravaging deserts that are leaving a trail of poverty in their path [5]. Decline in crop and animal production will definitely lead to food insecurity if nothing is done to correct or checkmate it. Desertification is making farmers to migrate from rural areas to urban centres to search for new means of livelihood because their land cannot support agricultural activities.

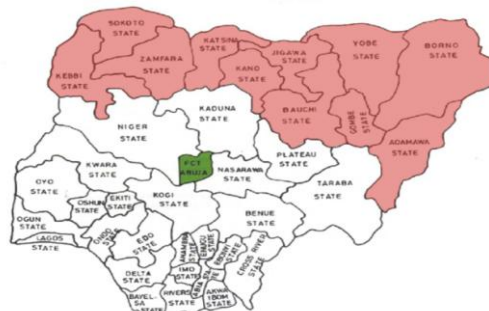


Fig. 1: Map of Nigeria showing states affected by desertification

Source: [6]

Concerned by the problem of desertification, the federal government of Nigeria initiated various programmes or policies to tackle this menace. The establishment of Federal Environmental Protection Agency (FEPA) by Decree 58 of 1988 was probably the most far-reaching initiative undertaken by the Federal Government of Nigeria for the purpose of addressing the multifarious environmental problems (drought and desertification inclusive) and protecting the Nigerian Environment [7]. Government further demonstrated its commitment to environmental issues through Decree 59 of 1989, which increased the powers given to FEPA by government and the decree provided legal backing for the Agency with a broad mandate and specific powers of sanctions in the implementation of the National Environmental Policy and by Law, FEPA is therefore the apex institution for all issues relating to environmental protection [7]. The Federal Environmental Protection Agency also facilitated the establishment of State Environmental Protection Agencies (SEPA) in the 36 states of the Federation and the Federal Capital Territory (FCT). The State Environmental Protection Agency has mandate for addressing or tackling all environmental problems (including Drought and Desertification) at the state level. Other programmes established by the government to address the problem of desertification include River Basin Development Authorities, Arid Zone Afforestation Project, Agricultural Development Programmes, Targeted Poverty Alleviation Programmes, and the Great Green Wall Project etc. In order to tackle the problem of desertification and its attendant consequences such as food insecurity, rural-urban drift, herdsmen and farmer's clashes, greening the areas already taken over by desert is a viable option that must be embraced by all and sundry. If desert areas are populated with trees, most endangered animal species that have run away may likely return to their natural habitat and trees also play a significant role in mitigating the impact of global warming by carrying out carbon sequestration.

#### CAUSES OF DESERTIFICATION

A lot of factors are responsible for desertification and these include drought and anthropogenic (man-made) activities such as poor irrigation practice, deforestation, overgrazing, bush burning etc. Poverty is another key factor that fuels desertification as people continue to exploit natural resources beyond the limits of sustainability.

**Drought:** This is a long period of dryness as a result of insufficient rainfall. Drought also describes a situation when the water content in the soil has gone down drastically to the extent that it cannot support crop growth. When an area experiences dryness for a long period of time, the vegetative cover and crops planted there will naturally dry up leaving the land bare. If the incidence of inadequate rainfall or insufficient soil moisture continues, the land will not be able to support crop production and animal husbandry; people in that area will be forced to migrate to areas that can support their existence and the survival of their animals for those who practice animal husbandry. As a matter of fact, long dry spell leads to desertification.

**Poor irrigation practice:** Irrigation, the artificial supply of water to supplement or make up for insufficient or inadequate rain, is a veritable tool to increase food production and to make crops available throughout the year if carried out properly. As good as it is, if it is poorly done, it can lead to soil salinity, waterlogging which can turn fertile land into a desert. This scenario is already a reality on a number of irrigation projects in Nigeria today, such as the Bakolori Irrigation, South Chad Irrigation and the Hadejia - Jamaare Irrigation Projects [7].

**Deforestation:** Forests are being depleted at an alarming rate as a result of increasing demand for timber either for domestic need or for export. Also, people in rural areas continue to cut down trees which they use as fire wood for cooking. Felling of trees for fire wood without planting another one to replace those ones that have been chopped down is a common practice all over Nigeria especially in the rural areas. This particular trend has gone on for years and there is no indication pointing to the fact that it is going to stop soon because most of the locals are too poor to afford kerosene or gas for

cooking. Industrialization is another key factor that is contributing to forest depletion. Establishment of industry means that the site will be cleared to make way for the construction of buildings that will be used for whatsoever the industry is going to produce or manufacture and road will also be built in order to facilitate the movement of raw materials to the industry and finished products from the industry to the end users.

**Overgrazing:** Open grazing is a common practice all over Nigeria particularly in the northern part of the country. Most of the herdsmen in the region do not have ranch where they can take care of their animals adequately. The animals belonging to these herdsmen graze openly without control. They devour anything green their mouths can chew making the land bare and exposed to erosion. Excessive grazing without allowing time for plants to regrow is one of the factors contributing to desertification in the region. Also, as these animals graze, they compact the soil making it difficult for water to get absorbed into the soil leading to water run-off.

**Bush burning:** This is another factor which is turning vegetative cover into desert. People set bush on fire indiscriminately either for game or to help them clear their farm lands in preparation for new farming season. A lot of farmers are poor and therefore, cannot afford modern day farm implements which they can use to clear their land. Also, the desire by the locals to get bush meat which they see as a good source of animal protein is a driving factor fuelling bush burning. They either sell the bush meat at exorbitant price or use it for household consumption.

**Poverty:** A lot of people that live in this region are poor farmers that depend on what they get from their farms to keep ends meet. Most of them are too poor to afford clean energy and that is why they continue to chop down trees which they use as firewood for cooking at home and sell in order to get money to buy other household items. Poverty is a key factor that is making them to set bush on fire indiscriminately in the hope that they will get bush meat and they also see it as a way of clearing the land for another farming season because most of them are too poor to afford modern day agricultural implements.

#### EFFECTS OF DESERTIFICATION

**Reduced agricultural activity:** Where desertification has taken over, it is practically impossible to carry out any productive agricultural activity without high level of technology which is not common in most developing countries. Desert areas cannot support agricultural practice because the land cannot retain water to support crop growth and there is hardly any nutrients on such land to contribute to crop growth, flowering, fruiting and maturation. When agricultural activity declines, there will be a shortfall in food supply and the price of available food items will soar high (food inflation). Also, when agricultural activity plummets, one of the resultant effects is famine. Agro-allied industries will also feel the impact as there will be a reduction in the supply of the raw materials they use thereby raising the prices of the few available ones and subsequently increase production cost.

**Hunger:** This is an obvious reality because once fertile lands have turned into desert, they cannot support meaningful agricultural practice. Once this has taken place, food production will plummet and the resultant effect is hunger. Hunger is one of the most catastrophic problems affecting millions of people all over the world today especially people in developing countries majority of whom live in rural areas and depend solely on subsistence farming as their means of livelihood. This can have a cascading negative consequence on the people particularly children and sometimes leads to lives being lost.

**Forced migration:** When an area turns into a desert, people and their animals begin to migrate to where they can find better means of survival and pasture for their animals. This movement has created conflict between those who are moving as a result of desertification and people in the new areas where they are moving into. For instance, the clashes between farmers and herdsmen in most areas in Nigeria is unconnected with desertification. As a matter of fact, a lot of lives had been lost in many areas of Nigeria as a result of this

crisis. A notable example is the one between farmers and herdsmen in Agatu areas of Benue state that claimed so many lives and as a result of this, some farmers that are alive are afraid to go to their farms because of fear of being attacked and this is impacting negatively on agricultural practice in the area.

**Loss of biodiversity:** This is one of the most devastating consequences of desertification. Where desertification occurs, most plant species that are native to the area become extinct. In case of animals, some die as a result of lack of pasture and water while some that are able to escape to other areas where their survival will not be threatened either by environmental problem or anthropogenic activities quickly run away. Some species of animals have become endangered as a result of habitat destruction which could be as a result of climate-induced or man-induced desertification.

**Heat waves:** Where vegetative cover is lost as a result of desertification, heat waves become the order of the day. Ideally, where there is dense vegetation, the trees help to absorb some of the heat. But in an environment that has been devastated by desertification, there will be no trees to perform such role. Heat waves are injurious to human health and the outbreak of meningitis among people, particularly common in northern Nigeria is traceable to heat waves. Extreme heat can cause heat exhaustion, cardiovascular diseases (e.g. heart attacks and strokes) [8].

**Health challenges:** In desert areas, it is very difficult to find potable water to drink i.e. there is always water deficit, people in such areas resort to any available water they can find irrespective of whether it is hygienic or not. Sometimes, there is competition between humans and animals for the little available water and this water source can be polluted by these animals which can lead to outbreak of water-borne diseases.

**Sand and dust storms:** Areas of land that have been devastated by desertification are highly vulnerable to sand and dust storms because there is little or no vegetative cover to protect against such occurrences. Sand and dust storms (SDS) are lower atmosphere events that result from wind erosion liberating sediment particles from the ground surface [9]. Sand storms take place relatively close to the surface of the ground while dust particles are lifted high into the atmospheres by violent wind and travel over long distances making visibility extremely difficult which can result in fatal road and rail accidents; and can also cause danger in the airspace. Airborne dust can carry harmful microbes such as bacteria and fungi which can cause serious health problems to man, animals and crops. Exposure to dust particles is linked to some respiratory infections as dust irritates the respiratory tracts. Sand dunes can be carried by boisterous wind from their original location to other areas and the result sometimes can be catastrophic. This can lead to a community being buried or encapsulated by sand resulting in tragic loss of lives and property worth millions of naira being destroyed.

#### GREENING THE DESERT

Greening the desert is the process of transforming desert into a productive land that is green with trees and diverse species of plant that will make it suitable for man and animal's habitation. It is also a system of planting trees on degraded lands thereby turning them into forests of economic fortunes that can be used for agricultural activity, carbon offset project, research centres, timber production, ecotourism etc. Greening the desert must incorporate processes that ensures the establishment of management team with requisite technical skills, water retention technique such as sub-surface drip irrigation, establishment of good quality nursery with capacity to produce drought tolerant seedlings of economic trees and crops, environmental sustainability, excessive grazing control by nomadic herdsmen etc in order to ensure that the green belt created is not misused or degraded. Greening vast expanse of desert requires huge financing and it involves a number of steps and one of the strategies to adopt to lessen the financial burden is to plant economic trees such as Teak, *Gmelina* and oil plants such as *Jatropha* and *Ricinus* that will generate revenues that will be ploughed back into the project. The greening process or system includes de-desertification techniques such as the use of halophytes, cultivation of deep-rooted crops and trees etc.

**The use of halophytes:** Halophytes are salt tolerant plants and they can survive pretty well in the desert. Using them to green desert area is a practical approach that can help in reclaiming areas of land that have been taken over by desert. It must be noted that trenches have to be dug to retain water for the survival of these plants since the amount of annual rainfall in the desert is not much. In a situation where the desert is not all that far from a big ocean, dredging can be done to bring water into the desert to support the growth of the halophytes.

**Cultivation of deep-rooted crops and trees:** In desert areas the amount of water near the soil surface is inadequate for successful crop cultivation as a result of factors such as little or no rainfall, rapid rate of evaporation due to excessive heat from the sun. In order to combat desertification, there must be improved technology to develop deep-rooted cultivars or seedlings of drought tolerant economic crops and trees. Such crops and trees with long roots will be able to reach deep soil water which they can tap for their growth and survival in such an environment. It is also essential that reservoirs of water should be provided in the desert to supplement the water that these crops and trees are getting from deep soil water to avoid complete dryness. The effectiveness of the deep-rooted seedling method has been verified using soybeans (an annual plant) and Japanese black pine (a perennial tree species) as model plants Harada [10]. Soybeans with roots 95 cm long were successfully grown using this method, and it was confirmed that the soybeans had rooted normally. The deep-rooting method was also confirmed using Japanese black pine. The main, elongated root of the deep-rooted black pine seedlings increased up to 2.5 times faster than by normal methods.

#### ADVANTAGES OF GREENING THE DESERT

**Carbon sequestration:** This is the mechanism by which carbon dioxide is removed from the atmosphere or taken off from the original source of emission and is stored in green plants, soil, ocean, wood etc. Carbon dioxide is a major greenhouse gas that contributes to global warming and the major sources responsible for the increase in the amount of carbon dioxide in the atmosphere include fossil fuel combustion and excessive felling of trees for timber and fire wood which is a common practice in developing countries. Greening desert areas with significant number of trees can help to sequester carbon. Trees and other green plants manufacture their food by a process called photosynthesis and during this process they help to fix carbon thereby serving as a sink for carbon dioxide. Trees also clear excess carbon by storing them as biomass. Therefore, increasing the number of trees will undoubtedly reduce the build-up of carbon dioxide in the atmosphere thereby helping to reduce the effect of global warming.

**Protection against sand and dust storms:** Once desert areas have been successfully covered with trees and other plants, there will be a drastic reduction in the menace of sand and dust storms because the trees and other plants in that environment will be able to hold the soil particles together thereby preventing them from being blown away by violent wind that transport sand and dust particles from their original location to other areas. The shelter belt created as a result of planting trees in desert areas serves as a windbreak thereby mitigating the impact of sand and dust storms.

**Natural rainfall creation:** The green forest created as a result of desert greening helps in generating natural rainfall. When rain falls, some of it get infiltrated into the soil and are absorbed by plants through their root systems and they are eventually returned to the atmosphere through transpiration where they form cloud and fall as rain again which ensures adequate supply of water to crops planted in such an environment thereby supporting agricultural activity and making food available to those whose livelihood depends on agriculture.

**Reduction in evaporation:** High temperature is a big problem in desert areas. Desert areas that have been successfully planted with huge line of trees will not encounter such problem. The trees form canopy and protect the soil from direct impact of sunlight thereby reducing the rate at which water is lost from the soil to the atmosphere.

**Ecotourism:** Greening of desert areas will make life return to the once deserted environment. This will encourage the creation of recreational parks, building of roads, hotels and other basic infrastructure. As a matter of fact, various job opportunities will be created which will attract the locals that left as a result of desertification to return. Various jobs created will lead to revenue generation in form of sale of souvenirs or handicrafts by the locals, transport fares for taxi cab and domestic airline operators, money for owners of restaurants and fast food vendors, money for tourist guides etc. This will in no doubt lead to a decline in the rate of unemployment which is a major problem in developing countries which will also help to keep crime rate under check. Success in transforming a desert into a productive land will surely attract tourists who will like to come and sight see the scenic beauty of the environment, have a feel of nature etc. Even researchers will be attracted to such an area to come see how the transformation actually took place, they will like to come and engage in knowledge sharing and see how the project can be replicated in other areas that have been devastated by desertification.

### CONCLUSION

Programmes and projects designed to tackle desertification should not be on paper but must be translated into concrete action. The Great Green Wall project must receive continuous funding from the government until its objective is fully achieved. The ecological fund must be used for what is meant for; it must not be diverted for other uses and corruption must be avoided in its usage. The bulk of agricultural activity in Nigeria especially the production of rice, beans, millet, sorghum, onions, sugar cane, tomato, pepper, potato, cattle is concentrated in the northern region and tackling desertification will ensure that agricultural activity in the region does not take a nosedive. As a matter of fact, addressing the problem of desertification will ensure that agricultural activity in the region continue to bloom thereby avoiding food insecurity. Since anthropogenic activity is a major contributory factor to desertification, educating the people in desert and desert prone areas on sustainable use of natural resources is a paramount factor that must be promoted by policy makers, environmental activists and experts on de-desertification. The idea that God's provision does not end which has made people to use natural resources indiscriminately must be discouraged. People must be enlightened on sustainable use of natural resources to meet their own needs today without putting a barrier on the ability of the coming generations to meet their own needs tomorrow. Also, there should

be systematic and regular collection of data on the extent of desertification, damage and losses caused by desertification so that appropriate measures can be taken to remedy the situation.

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