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Nigeria, Sustainable Agriculture

Fighting Desertification in Nigeria with Regenerative Agriculture

Franklin D. Roosevelt once said that “The history of every nation is eventually written in the way in which it cares for its soil.” Many great civilizations have crumbled alongside their soils, degraded through years of cultivation to the point where food production was not viable. The same is starting to happen for the country of Nigeria. Desertification is raging the country and threatening to dismantle its rich, arable lands. Agriculture is an important part of the lives of Nigerians and if desertification continues at current rates, the agriculture sector and the Nigerian people will crumble. The country of Nigeria has great potential for prosperity and the way it treats the degrading soils will determine the future of its people. It will either rise above the challenge of desertification or fall like other civilizations who have not taken proper care of their soils.

Introduction to Nigeria

Nigeria is an African country “bordered to the north by Niger, to the east by Chad and Cameroon, to the south by the Gulf of Guinea, and to the west by Benin” (Falola et al.). Nigeria has a total land area of 923,768 square kilometers (“Facts about Nigeria”). Of that, water covers 13,000 square kilometers (“Facts about Nigeria”). The climate varies by region with it being arid in the north, tropical with warm temperatures and rain in the center, and an equatorial climate with humid, heavy rainfalls in the south (“Facts about Nigeria”). Nigeria is a major oil country with over 90% of its exports being petroleum-based (“Facts about Nigeria”). Because of this, the country is very vulnerable to fluctuating oil prices. Nigeria is the most populous country in Africa and the sixth most populous country in the world. In 2019, Nigeria’s population was 200,788,000 people with 50% of the population living in rural areas and 50% living in urban areas (Falola et al.). The Federation of Nigeria is led by a democratically elected president.

Poor access to education has decreased chances for Nigerian citizens to solve problems like desertification. In 2018, Nigeria had 13.2 million children out of school which is the highest in the world (Garbaciak). Population increase and lack of family planning have played major factors in the number of children out of school (“Education”). Primary education is free and compulsory but only 61% of 6-11-year-olds regularly attend primary school. In addition, many more girls don’t attend school because of gender inequality and religious beliefs in the North (“Education”). Education is the difference between a life of opportunity and that of poverty. However, youth are not even given a chance at having a quality education. When given access to quality education, youth can change the tide of their struggling country and reverse the effects of desertification.

The average family size in Nigeria is 4.6 persons (United Nations). A typical Nigerian diet consists of the following: beans, root vegetables, and rice. In the north, grains like millet and wheat are a large part of their diet as well as seafood, beef, poultry, and goat (Falola et al.). In the southern areas, many soups containing tomatoes, onions, red pepper, and palm oil are prepared with vegetables and meat (Falola et

al.). Most families in urban areas live in townhomes/duplexes and rural families live in homes made of mud and wood with a roof made of palm leaves (Damilola).

Although oil revenue boosts the country's GDP, the Nigerian agriculture sector is the foundation of the economy. The sector employs 70% of the population (Garbaciak) and makes up 22% of the country's GDP (DeMarco). Of the 91 million hectares of land area, approximately 82 million hectares of this land is arable ("Arable Farming"). The sector is "dominated by smallholder farmers who work an average of 4-5 acres each, under rain-fed conditions" ("Nigeria-Agriculture"). The agricultural economy depends on rainfall and is affected by fluctuating weather (Olagunju 197). Most farmers engage in subsistence farming, eating their produce or selling it locally (Falola et al.). The lands of Nigeria are filled with cocoa, peanuts, palm oil, corn, rice, sorghum, millet, cassava, yams, rubber trees, cattle, sheep, goats, pigs, and fish ("Facts about Nigeria"). The country is the number one producer of cassava in the world and one of the top producers of rice in Africa ("Nigeria at a Glance"). After the oil boom of the 1970s, agricultural output in Nigeria declined and the country began to import major staple foods like rice, wheat, sugar, and fish (Nwankpa 175). Since then, Nigeria has tried to unleash the potentials of its agriculture sector to feed the nation but efforts have largely failed because of corruption (Nwankpa 176). Currently, 30 million hectares of farmland are under cultivation, but 78.5 million hectares will be needed to feed the growing population ("Nigeria-Agriculture"). Desertification is depleting this arable land and urgent action must be taken so Nigeria can feed its citizens. If the country does not do enough to combat desertification, the agriculture sector, the foundation of the economy, could crumble, leaving more people hungry and malnourished.

Effects of Desertification in Nigeria

With its abundant oil, arable land, and a large population, Nigeria has the potential to become a prosperous country. However, problems like desertification are making prosperity harder to achieve. According to the United Nations, "desertification is land degradation in arid, semi-arid, and humid areas resulting from various factors, including climatic variations and human activities" (Olagunju 198). The country loses over \$34.3 million to desertification and drought each year (Unah). Of the 909,890 square kilometers of the Nigerian land area, 63.83% of it is threatened with desertification (Olagunju 196). It mainly affects the 15 northernmost states. These states are very valuable to the economy and agriculture sector because they supply most of the country's agricultural products like beans, soya, pepper, onion, melon, and more (Olagunju 197). Not to mention that the drylands host "about ninety percent of the cattle population, about two-thirds of the country's goats and sheep, and almost all donkeys, camels, and horses" (Olagunju 201). Since a large part of the agriculture sector rests in the areas threatened by desertification, urgent action must be taken. According to a report from Tercula, "Nigeria loses about 350,000 hectares of land each year to desertification" (Olagunju 197). This directly and indirectly affects about 62 million Nigerians (Olagunju 199). More people will be affected through food insecurity and poverty if the agriculture sector in the north crumbles from desertification. Desert encroachment is advancing and moving southwards primarily because of deforestation, over-cultivation, and overgrazing. Desertification and land degradation from these man-made occurrences are causing catastrophic problems for Nigerians.

Depleted soil is decreasing agricultural productivity across the country. Abbas Gandi, a farmer in northwestern Nigeria, lost a large portion of his crops because of desertification. "Instead of getting at least 200 bags of yield, I got between 25 to 30 bags." (Unah). Most households depend on agriculture for their income. However, with more soil erosion and loss of soil structure, hundreds of thousands of farmers are at risk of abandoning farming due to reduced agricultural output (Olagunju 204). Lower productivity is also leading to more hunger, migration, conflict, poverty, and lower economic development. This is

having detrimental effects on Nigerians. The country already has a low food security index score and desertification will only increase the number of hungry people in Nigeria.

With less arable soil to farm and graze livestock on, conflict is rising in Nigeria's Middle Belt. Christian farmers and Fulani Muslim herders have historically lived peacefully, but desertification is sparking deadly conflict (Edwards). With wells, rivers, and streams running dry and land becoming infertile, Christian farmers and Fulani herders are becoming more desperate for land (Edwards). So desperate that "sporadic feuds between the two have resulted in 10,000 casualties and more than 100,000 children have been displaced" (Edwards). Clashes between farmers and herds in Nigerian's Middle Belt have been considered much deadlier than all of Boko Haram's activity, a deadly terrorist group located in Northern Nigeria (Edwards). The Middle Belt is Nigeria's breadbasket and if violence ensues, food production will grind to a halt. If violence continues, starvation and food shortages could plague the population.

Desertification is leading to widespread poverty all over Nigeria. The country is currently the poverty capital of the world (Garbaciak). Approximately 124 million people live without enough means to sustain themselves and their families (Bramlett) and more than half of Nigerians live below the poverty line of \$1.90 a day (FAO). Northern parts of Nigeria, desertification frontline states, have the highest poverty rates in the country with more than 77.7% of the region in poverty (Olagunju 206). The lack of agricultural productivity greatly impacts rural populations and has forced many rural people into poverty. As a result, many people migrate to urban areas or other rural areas with better economic success and job opportunities. Rural people have no choice but to leave their homes when unproductive land threatens poverty and food insecurity. If not enough is done to combat desertification, Nigeria will never be able to eradicate its poverty problem.

Desertification in Nigeria is depleting one of the most precious resources on Earth - water. Many Nigerians already do not have access to clean drinking water. Only 19% of the population has access to acceptable drinking water (Jones) and "90.8% of Nigerian households drink water contaminated with feces and other substances like E. Coli" (Bramlett). "The WHO considers an average of 1000 m³ per person per year to be a necessary amount of water for modern domestic, industrial, and agricultural uses." (Olagunju 204). Nigeria cannot meet the minimum needs of its citizens and desertification is largely to blame. Desertification and drought have caused imperative water resources like Lake Chad to shrink. Wells are drying up and sand dunes have threatened life-supporting oasis (Olagunju 204). This means that water resources will not be able to meet the needs of agriculture and civilians.

Solution for Nigeria

Nigeria needs to develop a more integrated approach to the management of land and water. To prevent desertification and reverse widespread degradation, soil quality needs to improve. Regenerative agriculture is one of the best solutions to improve soil quality in Nigeria and address the main causes of desertification and degradation. Regenerative agriculture is farming and grazing practices that rebuild soil organic matter and restore degraded soil biodiversity ("Why Regenerative Agriculture?"). The practice draws from research on organic farming, agroecology, holistic management, and agroforestry ("Regenerative Agriculture"). Regenerative agriculture uses agroforestry, no-till, intercropping, crop rotation, cover crops, compost, and holistically managed grazing practices to improve and revitalize soil health. It goes one step further from "do no harm" to improving the land. Working with nature, instead of against, will help farmers restore their degraded land and improve yields. Many regenerative practices can reduce the acceleration of desertification by addressing key causes like deforestation, over-cultivation, and overgrazing.

Deforestation has become a huge obstacle in reversing land degradation and slowing down desert encroachment. Many afforestation efforts from the government have unsuccessfully solved Nigeria's deforestation problem. Nigeria has the largest deforestation rates in the world with an annual forest loss of 350,000-400,000 hectares (Yakubu Balarabe). Nigerians depend on trees for survival. Because Nigeria's electrification rate is so low - only about 45% of the population has access to electricity ("Nigeria") - fuelwood and charcoal account for 50% of primary energy consumption (Unah). Deforestation for energy purposes is causing Nigeria's fertile soil to turn barren and unproductive. Trees play a vital role in reducing soil erosion, increasing soil fertility, and reversing desertification. However, lack of education about the importance of trees is threatening prosperity. To address high deforestation rates and reverse desertification, the practice of agroforestry must become a key role in Nigerian agricultural operations. Agroforestry is a regenerative agriculture cultivation method that merges trees and agriculture. Typically, trees are seen as a threat to crops, but integrating trees with agriculture enhances resilience, biodiversity, and the productive, profitable use of land ("What is Regenerative Agroforestry?"). Agroforestry will help farmers reverse desertification and improve their yields. Integrating trees with agriculture can improve nutrient cycling in the soil, protect soils from erosion, improve soil structure, and create good conditions for soil microflora and macrofauna (Karlsson).

The success of agroforestry in the Sahel region of Africa shows how beneficial it would be for Nigeria. Agroforestry has lifted hopes for impoverished farmers like Margaret Muchanga, a native Kenyan who has reaped numerous benefits from implementing agroforestry on her farm (Lipton). When she implemented agroforestry into her operation, the bags of maize she collects after harvest increased fivefold as well as the milk from her cows (Lipton). Planting trees increased her profits so she could pay for health insurance and her children's education (Lipton). Imagine how much this would help Nigeria's poverty levels, hunger levels, and education levels if farmers implemented agroforestry into their livestock and crop operations. According to the INRA, farmers can double their income by incorporating trees into their agricultural lands (Lipton). Acacia trees could grow in the north where the climate is arid and cashew, avocado, and cocoa plants in the south where the climate is more tropical. The oils from agroforestry biomass could be used as an alternate energy source to fuelwood, which would lead to less deforestation. Agroforestry has the potential to lift Nigerians out of poverty all while mitigating desertification.

Unsustainable agricultural practices such as over-cultivation, heavy tilling, monocropping, overuse of pesticides and fertilizers, and soil erosion have plagued Nigerian agriculture. Yields run far below their potential because these practices are degrading the soil fertility and accelerating desertification in agricultural regions. Lack of sustainable management has resulted in lower agricultural productivity, increased poverty, food insecurity, hunger, migration, and conflict. Rural people who depend on the land for food and for their source of income are unknowingly degrading it. Poverty has caused many people to tend to the land in an unsustainable way because of the need to increase household income. Poverty and the dependence on natural resources for survival have led to inappropriate agricultural use on Nigeria's valuable land (Nwokocha 10). This combined with agricultural growth policies that have increased expansion of cropland in marginal lands unsuitable for cultivation, have made growing nutritional crops much more difficult in the severely degraded parts of Nigeria (Nwokocha 10). However, regenerative agriculture can be the silver lining for Nigerians suffering from the effects of desertification.

Nigerian farmers can help replenish the tired soils by implementing regenerative agriculture practices such as no-till, intercropping, crop rotations, cover crops, and compost. By letting nature do the work and thinking of the farm as an agroecosystem, soil can be restored and yields can increase. Helping farmers implement no-till practices into their crop production will reduce erosion and topsoil destruction. Millet

and cowpea - two important crops in Nigeria - can be intercropped to improve soil fertility by incorporating nitrogen into the soil while also increasing yields (Omae et al. 110). Cereal-legume crop rotation can have the same effect on soil fertility and yields in Nigeria (Omae et al. 110). Maize and cassava intercropping also holds many benefits as it increases total food production, decreases pests, reduces erosion, increases soil moisture and water infiltration rates, builds resilience to climate change, droughts, and floods, and benefits ecosystem services (Romero). These practices have been shown to improve productivity and increase yields for farmers in the Sahel who deal with poor soil fertility and cannot afford mineral fertilizer (Omae et al. 110). Implementing legume cover crops can also have immense benefits for the farmer and the soil. Maintaining soil cover with legume cover crops preserves and encourages organic matter balances in the soil, leads to greater crop productivity and soil and water conservation, and decreases the effects of pests and disease. It is an economically feasible way to improve soil organic matter and increase resilience. In addition, compost must play an essential role in Nigeria agriculture because it provides many benefits that will help reverse desertification. Compost enhances overall soil health and increases resilience to drought and climate change (“Composting”). Composting reduces the risk of erosion, regulates soil temperature, increases moisture retention capacity, provides essential micronutrients and macronutrients like nitrogen, phosphorus, and potassium, improves carbon sequestration, and improves soil biodiversity (“Composting”). These advantages reduce cropping risks, produce higher yields, and lower dependence on inorganic fertilizer and pesticides. Strengthening and replenishing the soil with compost helps reduce erosion by wind and water because water can enter the soil better (“Composting”). With the utilization of regenerative agriculture, farmers can improve the productivity of their soils and their income - something that Nigeria desperately needs.

Overgrazing is another agriculture-induced cause of desertification in the country. “In Nigeria, it was reported that between 1950 and 2006, the livestock population grew from 6 million to 66 million, making an 11-fold increase.” (Nwokocha 10). Many Nigerians living in poverty are using improper grazing management for this large population of livestock. Because of this, many herders are unknowingly accelerating desertification. However, with proper grazing management, livestock can be part of the solution, not the problem. Herders can implement holistically managed grazing into their operations. This practice, established by Allan Savory, is vital to reversing desertification. Holistically managed grazing is a planning process to integrate livestock production with crop, wildlife, and forest production while helping to ensure land regeneration and profitability (Savory Institute). This management practice uses large herds of livestock to mimic the natural movement and behavior of wild herbivores (Blasiak). The livestock intensely grazes one patch then moves on to another. Researchers have found that overgrazing is not due to animal numbers but to the amount of time, a plant is exposed to grazing and then re-exposed (Blasiak). Herders use careful planning to establish recovery periods and grazing periods on the land (Savory Institute). This grazing practice has worked in other countries like Zimbabwe and Kenya where Savory Global Hubs are located. By collaborating with hubs in their regions, smallholder farmers in a village/community work collectively to manage their animals as a single herd with a single grazing plan (Savory Institute). This system not only improves the land, but it also bonds the community as they work towards a common goal. The Savory Global Network provides classes to farmers/pastoralists, NGOs, and government ministries who want to implement this practice where they reside. There currently isn't a Savory Global Hub in Nigeria, but partnerships between Nigeria-based organizations and the Savory Global Hub can provide farmers/pastoralists the opportunity to implement holistic management into their herds. This second chance is just what the country needs. By properly planning out grazing and recovery periods with holistically managed grazing, we can reverse desertification from overgrazing and restore degraded grasslands in Nigeria.

Regenerative agriculture has the potential to revolutionize Nigeria's agriculture sector while reversing and preventing desertification. It can lift Nigerians out of poverty and improve the well-being and standard of living in the country. It is the silver lining that the Nigerian people need but the government must cooperate and make this a national priority. Government corruption has been the roadblock in past desertification initiatives. All too often the Nigerian government has not provided the money they pledged for these projects and instead given it to people of power. Continuing to fight against government corruption through its agency Economic and Financial Crime Commission will help increase the funding that goes toward reversing desertification and reduce or eliminate corrupt practices that worsen desertification (Nwokocha 12). Africa-based organizations like the Savory Institute, the Alliance for Food Sovereignty in Africa, and the International Institute for Tropical Agriculture can also help Nigerian farmers implement regenerative agriculture practices into their operations. These NGOs can partner with farmers and the Ministry of Agriculture to accomplish widespread and lasting change. Having NGOs in the mix could hold the government more accountable and empower farmers to make their voices heard on the local and national scale. Employing extension workers from the NGOs and the Ministry to small regions of the country to work with farmers will also be critical in the advancement of regenerative agriculture. In past projects, farmers have not been given much say in the design and implementation of government programs that affect their livelihoods (Unah). Therefore, making sure their voices are heard during this transition will lead to better cooperation and advancement of regenerative agriculture. It takes a few years for farmers to reap the benefits of regenerative agriculture so providing government subsidies for farmers as they transition from conventional agriculture to regenerative agriculture will encourage farmers to continue with the process until they witness the positive results. These subsidies can be funded by the Nigerian government, the World Bank, the United Nations Food and Agriculture Organization, and private organizations. The long term environmental, economic, and social benefits will surely outweigh the initial cost of transition. By helping the agriculture sector transition to regenerative agriculture, prosperity and hope will fill the fields of Nigeria once again.

Works Cited

“Arable Farming in Nigeria: All You Need to Know.” *Nigerian Finder*, <https://bit.ly/2QWFBgz>.

Accessed 15 March 2020.

Blasiak, Robert. “Reversing Desertification with Livestock.” *Our World*, 30 May

2012, <https://bit.ly/2UqOvVM>. Accessed 20 March 2020.

Bramlett, Sam. “Top 10 Facts About Poverty in Nigeria.” *The Borgen Project*, 25 Feb.

2018, <https://bit.ly/3dBh5v4>. Accessed 7 Feb. 2020.

“Composting: let’s give the soil something back.” *Food & Agricultural Organization*, 20 March

2015, <https://bit.ly/3asDb19>. Accessed 19 March 2020.

Damilola, Awosusi. “Types of Houses in Nigeria.” *Property Proinsider*, 16 Aug.

2018, <https://bit.ly/2JIUO6z>. Accessed 18 Feb. 2020.

DeMarco, Nicholas Anthony. “Sustainable Agriculture in Nigeria.” *The Borgen Project*, 14

March 2019, <https://bit.ly/39nLuKg>. Accessed 6 Feb. 2020.

- “Education.” *UNICEF Nigeria*, www.unicef.org/nigeria/education. Accessed 19 Feb. 2020.
- Edwards, Andrew. “Land and Conflict in Nigeria’s Middle Belt.” *Borgen Magazine*, 6 Sept. 2019, <https://bit.ly/2wKPUgL>. Accessed 23 Feb. 2020.
- “Facts about Nigeria.” *World Facts*, <http://worldfacts.us/Nigeria.htm>. Accessed 4 March 2020.
- Falola, Toyin O., et al. “Nigeria.” *Encyclopædia Britannica*, 21 March 2020, <https://bit.ly/3bz5ACJ>. Accessed 31 Jan. 2020.
- Food and Agricultural Organization of the United Nations. “Small Family Farms Country Factsheet.” 2018, <https://bit.ly/2UQHsVA>. PDF. Accessed 31 Jan. 2020.
- Garbaciak, Miranda. “Hope for Reducing Poverty in Nigeria.” *The Borgen Project*, 5 Jan. 2019, <https://bit.ly/2wLRLSx>. Accessed 3 Feb. 2020.
- Jones, Jessica. “Improving Water Quality in Nigeria.” *The Borgen Project*, 21 Oct. 2019, <https://bit.ly/2JiJMiy>. Accessed 10 Feb. 2020.
- Karlsson, Linus. “World soil day – Agroforestry can help to reverse the trend of global soil degradation.” *Agroforestry Network*, 5 Dec. 2018, <https://bit.ly/2UI2goS>. Accessed 11 March 2020.
- Lipton, Gabrielle. “Where – and why – is agroforestry hiding?” *Landscape News*, 12 June 2019, <https://bit.ly/39qMc9i>. Accessed 11 March 2020.
- “Nigeria.” *U.S. Energy Information Administration*, 23 May 2016, <https://bit.ly/3aoQwrB>. Accessed 23 Feb. 2020.
- “Nigeria-Agriculture.” *International Trade Administration*, 13 Oct. 2019, <https://bit.ly/2QSIhLD>. Accessed 5 Feb. 2020.

“Nigeria at a Glance.” *Food and Agriculture Organization of the United Nations*,

<https://bit.ly/2xweKBa>. Accessed 7 Feb. 2020.

Nwankpa, Nneka Ngozi. “Sustainable Agricultural Development in Nigeria: A Way Out of

Hunger and Poverty.” *European Journal of Sustainable Development*, vol. 6 no. 4, 2017, pp. 175-184, <https://bit.ly/2WPigBj>. Accessed 5 March 2020.

Nwokocha, Chibueze. “Effect of Desertification on Environmental Management in Northern

Nigeria.” *Arabian Journal of Business and Management Review*, vol. 3, no.6, 2015, pp. 7-13, <https://bit.ly/2QVTtI2>. Accessed 5 March 2020.

Olagunju, Temidayo Ebenezer. “Drought, desertification and the Nigerian environment: A

review.” *Journal of Ecology and the Natural Environment*, vol. 7, no. 7, July 2015, pp. 196-209, <https://bit.ly/2w1qJGA>. Accessed 24 Feb. 2020.

Omae, Hide, et.al. “Improving Millet-Cowpea Productivity and Soil Fertility with Crop Rotation

Row Arrangement and Cowpea Density in the Sahel, West Africa.” *American-Eurasian J. Agric. & Environ. Sci.*, vol. 14, no. 2, 2014, pp.110-114, <https://bit.ly/2xw4kBq>.

Accessed 18 March 2020.

“Regenerative Agriculture.” *Terra Genesis International*, <https://bit.ly/2JnUZOI>. Accessed 11

March 2020.

Romero, Madelline. “Strength in diversity: How cassava intercropping benefits the crops, the

farmer, and the environment.” *CIAT*, 20 Oct. 2017, <https://bit.ly/2QTiB23>. Accessed 19

March 2020.

Unah, Linus. “Briefing: Nigerian farmers can’t fight desertification alone.” *The New*

Humanitarian, 14 Nov. 2017, <https://bit.ly/39pmW3v>. Accessed 13 Feb. 2020.

United Nations. "Household Size and Composition Around the World

2017." 2017, <https://bit.ly/2UOk5M4>. PDF. Accessed 18 Feb. 2020.

Savory Institute. "Stories of Impact: Zimbabwe." *Savory Global*,

<https://savory.global/stories-of-impact-zimbabwe/>. Accessed 26 July 2020.

Savory Institute. "What is Holistic Managed Grazing?" 2017, <https://bit.ly/3bBxOgg>. PDF.

Accessed 20 March 2020.

"Why Regenerative Agriculture?" *Regeneration International*, <https://bit.ly/2vDWfdp>. Accessed

11 March 2020.

"What is Regenerative Agroforestry?" *reNature*, <https://bit.ly/2QRLfAz>. Accessed 11 March

2020.

Yakubu Balarabe, Ladidi. "Nigeria: Tackling Deforestation Problems." *allAfrica*, 3 June

2011, <https://allafrica.com/stories/201106031011.html>. Accessed 11 March 2020.