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Nigeria, Sustainable Agriculture

### **Nigeria's Two-Headed Agricultural Crisis**

Nigerians take Jollof seriously. Jollof is a regional dish that comprises spices, rice, tomatoes, and onions and it is a symbol of Nigerian pride. Even their soccer derby against their most bitter rival and West African neighbor, Ghana, is called the Jollof Derby, a reference to the ongoing debate about the superiority of Nigerian or Ghanaian Jollof. However, if Nigeria maintains its agricultural development of the status quo, most Nigerians won't be able to produce/afford the dish of their nation.

Before talking about the problems of the status quo, Nigeria needs an introduction. In a country of 230 million, 54.3% of the population lives in urban sectors with a somewhat high urbanization rate of 3.92% (CIA). Nigeria is a federal republic, which has a similar style of democracy to America (CIA). In its 356,669-mile area, Nigeria utilizes 76.25% of it for agriculture (Trading Economics). The average hectares for small Nigerian farms, which accounts for 88% of Nigerian farms, is 0.53 and the nationwide average is 0.85 hectares. These totals are much lower than their neighbor Ghana, which has a nationwide average farm size of 2.56 hectares. Nigeria has an arid north, due to the Sahara, tropical center, and equatorial south, climate-wise (CIA).

Nigerians have an average family size of 5, with rural populations having a slightly larger average than urban (DHS). The Nigerian diet consists of high carbs and low fat and protein. They eat food such as cassava and rice, a shift from the traditional millet and sorghum (Petrikova). Most Nigerians use fuel such as kerosene and propane to cook their food, and 80% of Nigerians get their food from markets (DHS).

70% of all Nigerians work in the agriculture sector, however, it only makes up 21% of Nigeria's GDP (CIA). Another disproportionate statistic is that 72% of small farm holders, which make up the majority of Nigerian farmers, live under the poverty line (FAO). In contrast, the national proportion of the population under the poverty line is only 40%.

Nigeria's current agriculture is unsustainable for two reasons: soil degradation and climate change. Both of these have hindered the efficiency and security of agriculture.

First, soil degradation has limited the efficiency of Nigerian agriculture. According to Onyeiwu, “Declining soil fertility is considered to be the major constraint to agricultural production even though more land is under cultivation.” Nigerian farmers are being limited by soil fertility, but the reason for that is their own doing. “The Global Assessment of Human-Induced Soil Degradation survey done in 1990 found 69% and 27% of the soils in Ghana and Nigeria, respectively, to be degraded due to, in large part, unsustainable farming practices and deforestation. None of the soils found in Nigeria are conducive to productive agriculture, and many are considered the worst, putting farmers at an immediate disadvantage.” A significant cause of the degradation is just due to miseducation, according to Akinfenwa. Onyeiwu agrees, saying, “Soils are not adequately protected by cover crops as crop rotation is hardly practiced, resulting in fragile soils that are easily eroded, a problem exacerbated by overfarming and overgrazing.” In addition to poor maintenance, the growing population of Nigeria has contributed to degradation, “As a result of population increase, pressure on land has reduced the 8-15 years natural fallow period that is required to regenerate soil fertility after 1-3 years of cropping to only 2-3 years, further reducing soil fertility.” Any solution that helps make agricultural practices more sustainable will be able to revitalize soil fertility and furthermore increase the efficiency of Nigerian agriculture.

In addition to soil degradation, unsustainable agriculture has helped influence and increase the effects of climate change, which has hurt agriculture. Specifically, climate change has made rain more sparse, sporadic, and harder to predict. This is all very detrimental to Nigerian agriculture because 80% of crop production is run under rainwater (Tajudeen). Tajudeen further elaborates, “Agriculture in Lagos, Nigeria, is largely rain-fed and climate change negatively impacts crop productivity by decreasing crop yield and soil fertility, limiting the availability of soil water, increasing soil erosion, and contributing to the spread of pests. A decline in crop production due to climate change may be further exasperated by a lack of access to farming technology that reduces over-reliance on the rain-fed farming system and subsistence agriculture.” Since everything agriculture derives from rain, climate change has made Nigerian agriculture more unreliable and insecure.

But in addition to being unsustainable, Nigeria’s soil degradation and climate change are critically exacerbated by Nigeria’s growing population. According to the Guardian, Nigeria will almost double its population by 2050. On top of that, even right now, Nigeria cannot support the food demands of its current population. 25% of the population is underweight and in a region of Northern Nigeria, malnutrition has ballooned to a 84.3% figure. So Nigeria can’t even support itself presently and Nigeria isn’t projected to scale up agricultural production to its growing population either. According to Tajudeen, “Currently, a wide gap exists between overall food crop production and Nigeria’s growing population, with food production increasing arithmetically and the population increasing geometrically.” Essentially food production is

expected to scale linearly, while the population is increasing exponentially. Any solution catered to bypassing/solving Nigeria's soil and climate problems needs to be scalable.

As Onyeiwu alludes to in a prior quote, a major reason for Nigeria's infertile soil, is the lack of cover crops. According to Brodt, cover crops are, "crops that have the potential to increase soil organic matter and fertility, reduce erosion, improve soil structure, promote water infiltration, and limit pest and disease outbreaks." While the other benefits are an added extra, the main benefit that will help the farmers of Nigeria is the increase in soil organic matter and the overall benefit of increased nutrients. This overall increase of nutrients will insure crops will be more nutritiously dense and higher yielding. Specifically, a great choice of cover crops for Nigeria would be green-manure cover crops, GMCC for short. According to Peden, "GMCCs are efficient, low-cost sources of Nitrogen. They improve soil structure, increase the soil's biological activity." Soil would be revitalized for a relatively cheap price. However, GMMCs have another huge advantage: weed control. They can "control noxious weeds such as *Imperata cylindrica* that are choking out crops in many regions." And in addition to that, GMMCs can be used as animal feed (Peden). GMMCs have already been tested in West Africa, so if farmers were to implement them in Nigeria, there would be little risk. While some farmers may be apprehensive due to it not being a through-and-through sustenance or cash crop, it would make the soil more fertile and improve long-term financial and agricultural productivity. However, if the absence of cash from the GMMC is too off-putting, there are cover crops that can be sold. An example of one would be Cover Cress. Cover Cress is a company based in St. Louis, Missouri, that produces their namesake crop. Cover Cress has the same benefits as any cover crop. It boosts nutrients in soil and helps fertility, however, the specialty of Cover Cress is its ability to be turned into oil. An edited field pennycress, Cover Cress can be transformed into oil that can be used in sustainable diesel and jet fuel (Cover Cress). While fertilizers could be used to make soil more fertile, cover crops are much more sustainable. Runoff from fertilizer can cause pollution, algae bloom, and overall ruin soil long term. Cover crops bypass all these harms by organically infusing Nitrogen into soil. One way to acquire funding for this project is through AGRA. AGRA, which stands for Alliance for a Green Revolution in Africa, is an agricultural humanitarian organization established by the Rockefeller Foundation and The Bill and Melinda Gates Foundation. A central part of AGRA is that they will, "support work across all key aspects of the African agricultural value chain to help millions of small-scale farmers and their families lift themselves out of poverty and hunger. (Adensina)" Providing funding for cover crops would fit in line with this message, and AGRA already has offices in Ghana, so Nigeria wouldn't be far away from a base of command and AGRA lists Nigeria as one of its "focus countries" so AGRA would be familiar with the Nigeria socioeconomic climate. Another option for farmers would be to go through the Anchor Borrowers' Programme, or ABP for short. The ABP is a loan that the Nigerian government already gives to "smallholder farmers to boost agricultural production, create jobs, reduce food import bill towards conservation of foreign reserve. (ABP)" Cover crops would

boost agricultural production through soil revitalization, so cover crop farmers would be eligible for this loan.

As said earlier, Nigeria is highly reliant on rainwater for their agriculture, and while that worked in the past, due to climate change relying on rain is no longer viable. Rain is too erratic and too scarce in the current world. A way that Nigerian farmers could bypass this is through drip irrigation. According to URI, “drip irrigation involves placing tubing with emitters on the ground alongside the plants. The emitters slowly drip water into the soil at the root zone. Because moisture levels are kept at an optimal range, plant productivity, and quality improve.” On top of the production and quality improvements, its main advantage comes to play: its water efficiency. “Unlike other forms of irrigation, such as sprinklers that are only 65-75% efficient, drip irrigation is 90% efficient at allowing plants to use the water applied. And, it reduces runoff and evaporation. (URI)” With drip irrigation, Nigerian farmers would be able to make water access less erratic and use less water overall. In addition, drip irrigation is highly sustainable because it saves so much water. With water scarcity on the rise, drip irrigation will be able to sustain farming till the far future. But at the very least, drip irrigation would improve Nigerian agriculture, because there is so little irrigation use in the status quo. According to You, “Currently, only 1 percent of Nigerian cropland is irrigated, meaning most farmers can cultivate their fields only during the rainy season.” It is obvious that Nigeria has untapped potential through irrigation. While farmers, again, might be apprehensive about new technology like drip irrigation, there is proof that drip irrigation works in countries like Nigeria. In neighboring Niger drip irrigation has seen much success, “Niger now has access to solar-powered drip irrigation technology, enabling them to produce more with less water and energy, improving their incomes and resilience to drought, floods, and other climate-related extremes. (Palmer)” Niger has been used as a trial for drip irrigation. It has had failures in the past due to lack of education, but now they have perfected drip irrigation in the West African landscape by educating farmers (Palmer). Besides the extreme agricultural benefits, the implementation of drip irrigation has helped the women of Niger, “women no longer have to drill their own wells, or to irrigate their fields with buckets... they have more income because they have the knowledge and a production schedule. (Palmer)” Women, who are often made to do the menial/laborious tasks on the farm, would be spared from it with drip irrigation. And in a very patriarchal society like Nigeria, this would save hard labor from millions of women. While drip irrigation skeptics challenge its scalability, drip irrigation has the capacity for widespread use. In Ramthal, India there is a 60,000 square acre area that is all irrigated by drip irrigation (JAIN). This project benefits 15,000 farmers and while Nigeria doesn't need to adopt the high degree of drip irrigation that is in Ramthal right off the bat, Ramthal shows that drip irrigation can be scaled up and potentially feed millions. Again drip irrigation could be funded using the ABP, however, Nigeria could try to fund drip irrigation similar to how Niger did it. Niger partnered with the International Finance Corporation (IFC), the Climate Investment Funds (CIF), and Netafim (Palmer). These three groups helped bring the technology to Niger (Netafim) and they helped fund it (IFC and CIF) and these groups are now

familiar with the West African territory, so it would be a smooth implementation process when compared to Niger. In addition, the CIF has a fund called the Pilot Program for Climate Resilience, which has 1.2 billion dollars in its reserves (Palmer). Nigeria could use some of this money, like Niger did, to help invest in drip agriculture. With this money, the Nigerian government can set up drip irrigation subsidies like India did, so that farmers can get the money for drip irrigation (Netafirm). Drip irrigation shows the potential to save water, has become a proven method in a similar climate, has the ability to scale, and has been able to get funding in the past, which is why the Nigerian government needs to implement it for the sake of Nigerian Agriculture.

Nigeria has two major problems: its soil and climate change. And with their rapidly expanding population looming over these issues, it is clear that solutions are needed if Nigeria wants to be agriculturally viable in the future. They can fix their soil problems through cover crops that help fertilize the soil and can help feed the ever-growing population. And to reverse the effects of climate-change-affected rain, Nigeria can implement drip irrigation which has a track history of working and funding. These two sustainable options will make Nigeria prosperous in the future.

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