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Nigeria, Factor 1: Plant Science

Nigeria: Combining Sense and Science for Agriculture and the Common Good of a Country

Nigeria, Africa's largest country, is nestled in the heart of the western portion of the continent, filled with lush hills and valleys and desolate plains and plateaus. However, the people of Nigeria face the serious issue of hunger each day, and with a continually worsening food security issue, the country's agricultural leaders are constantly urged to make big improvements in the nation by increasing yields and the amount of technology available to farmers. However, there is a lack of biotechnology and modern plant science in Nigeria. Genetic engineering and access to genetically modified crop varieties is crucial to fight the critically dangerous hunger situation in the country.

Nobel Peace Prize Laureate Norman Borlaug famously said, "Food is the moral right of all who are born into this world" (Dil 60). However, many people, including children are being denied this right to food because of a lack thereof. Over thirty-one percent of children under the age of five are underweight, most due to malnutrition; the twelfth highest rate on Earth (The World). This statistic is very scary, especially with an average fertility rate of around six children per woman (Nigeria- Family). While most households are composed of a mother, father, and children, grandparents, aunts, uncles, and other family members live in some homes, as in other countries.

Nigerians live a very specific lifestyle. Part of this lifestyle includes a unique, distinct diet. A typical Nigerian diet is typically based around starches. Corn, yams, cassava, plantains, millet, and sorghum are used in many different ways in lots of traditional dishes (Our Africa). Papaya, mangoes, pineapples, oranges, and bananas are also grown in the country's southern regions (Our Africa).

Education plays a major role in the lives of Nigerians. Contrary to popular belief, the country's education system is much better designed than that of many of the surrounding nations. "In 1999, the government introduced Universal Basic Education (UBE), which gives each child nine years of compulsory learning (six years of primary and three years of junior secondary)" (Our Africa). Most Nigerian children have access to free education starting at the age of six (Nigerian- Education). "Children spend six years learning biblical and Islamic studies, [the] English language, mathematics, science, and an ethnic language according to geographical location (there are three). At primary schools in cities, they may study computer science, French, and art, too" (Education System). At age twelve, following the completion of primary school, students advance to junior secondary school, with the assumption that they score high enough on the Common Entrance Exam (Nigeria- Education). Some students drop out at this point, because, although the tuition is free, they are often expected to purchase their own books and uniforms, which can create some hardship for families (Education System). After three years of junior secondary school, some students decide to continue their education at a senior secondary school, typically from age fifteen to seventeen. At this level, students not only take what American students would consider common core courses, but also often have the opportunity to enroll in classes such as agriculture, accounting, auto mechanics, and chemistry (Nigeria- Education).

Following senior secondary school, students have many different options. Nigeria plays host to one hundred twenty-eight colleges, universities, vocational schools, and other institutions of higher learning (Nigeria- Education). Over 1.5 million students apply for admission into a post-secondary institution, but less than 32% are accepted (Education in). However, the federal government is continually looking for new ways to increase the student load that colleges and universities can handle effectively.

Although one of Africa's more developed countries when it comes to education, Nigeria's healthcare infrastructure is overloaded, ineffective, and outdated. The country does have a primary, government funded healthcare system, but it fails to keep up with the demand of it's inhabitants; it is estimated that there are less than four or five physicians per 10,000 Nigerians (The World). The nation is losing many of their best healthcare workers to other countries, because they want greater career opportunities in North America or Europe. (Lecky, Segun). Even as they are making attempts to improve the primary healthcare system in the country, making strides is very difficult. "At a 2001 African Union (AU) meeting…African countries agreed to allocate 15% of their budgets to healthcare. To date, only six countries (Botswana, Burkina Faso, Malawi, Niger, Rwanda and Zambia) have met this commitment" (Our Africa). Although private practices do exist, most Nigerians cannot afford their services, especially when they need them most (Lecky, Segun).

Agriculture is a large part of Nigeria's economy. A little over 20% of their Gross Domestic Product (GDP) comes from the agriculture sector, with about 70% of the country's work force employed in this category (The World). Subsistence farming accounts for the majority of the production agriculture in the country, with a typical farm size between .7 and 2.2 hectares (Akunlua, et al.). Most of these small, family farms raise crops, including yams, rice, corn, cassava, citrus fruits, peanuts, and tomatoes, as well as livestock, such as cattle, sheep, goats, and pigs (The World, Our Africa). There are a few commercial agriculture operations that harvest lumber, fish, cotton, cocoa, and rubber; these large enterprises only account for around 10% of the nation's farming (Our Africa). Many of Nigerian farmers' practices would be considered primal by agriculturists in developed nations. Crop rotation and slash-and-burn farming is very common in the country, but implements are very simple (i.e. hoes, cutlasses), and the use of fertilizers or irrigation is very scarce (Etuk).

There are many barriers a typical family in Nigeria faces. Arguably, Nigeria has the geographical and climatic needs for an acceptable level of crop production. However, with over 90% of the farmers in the country growing products at subsistence levels, there is a lack of money circulating in the majority of Nigeria's agriculture industry (The World). Nigeria has also felt the negative impacts of trade liberalization, which has given more-developed countries a competitive edge when it comes to buying, selling, and trading goods (Nsikak-Abasi, Nkeme). Additionally, Nigerian agriculturists have taken a hit from the reduced subsidies, which were not very much to begin with (Our Africa). Unlike the United States and Western Europe, Nigerian farmers face major problems when storing their grain and processing their crops, as well, simply due to a lack of adequate facilities within the country (Nsikak-Abasi, Nkeme). This makes it difficult to produce agricultural commodities, especially when combined with the lack of technology in the hands of farmers in Nigeria; although there are over 50 million farmers in the country, there are only about 30,000 tractors between them (Our Africa). The country faces other barriers as well. A lack of higher education and diverse skills amongst the population has resulted in over a 10% unemployment rate in Nigeria (Our Africa, The World). The low federal minimum wage in the country is also barring most Nigerian's ability to make a living wage; with a minimum full-time income at N18,000 (about $90) per month, many workers make the equivalent of a mere $1080 each year (Eremionkhale). It is because of this that over 70% of the country's population lives below the nation's poverty line (The World). With poverty comes hunger, and the lack of nutrition and access to affordable food sources is due to the sheer absence of product in the country (Nsikak-Abasi, Nkeme).

Plant science and genetically modified crop varieties could make tremendous changes and improvements to Nigeria's agriculture industry. However, it is a lack of that life changing technology that is resulting in a food deficient country and high percentage of the population hungry. Many of the small, farm families that make up much of the population struggle to grow enough food to feed themselves. In fact, because of the small amount of not only quality food, but any extra food at all, it is difficult for families to access the nutrition they need- many Nigerians are deficient of many very important vitamins and minerals in their diets, including Iron, Vitamin A, Iodine, and Zinc (Miller 31, Our Africa). Although many advancements

in genetic engineering in plants have been made in the United States, genetically modified organisms (GMOs) have almost no presence in the country because farmers are simply unable to get their hands on them (Effiong). Relatively new science to the country, as well as some skepticism towards the safety of GMOs have resulted in extensive federal research to verify that new hybrids are equivalent to conventional crops, however there are high hopes that a variety of GMO cotton will be made available to agriculturalists in the country by 2018 (Nnabuife-Abuja).

Although improvements to plant science in Nigeria are constantly being made, progress seems to be at a standstill. The nation's government is making an effort to allow a GMO seed market to be introduced to the country's farmers (Effiong). Unfortunately, genetically modified seeds are not legal in Nigeria, and face much resistance from some members of the population, resulting in unnecessary fear (Conko, Prskash 148-149). Growing opposition to the biotech revolution and a "Monsanto Monster" has been evoked in many Nigerians, resulting in backlash towards any attempts to legalize the use of GM seed varieties (Oladimeji). For every attempt to promote genetically engineered seeds in Nigeria, it seems there are two attempts to prevent their appearance in the country.

There are countless ways improving this factor would benefit Nigeria. As Nigeria's former minister of agricultural and rural development, Hassan Adamu, points out:

> Fertilizer, herbicides, pesticides, machinery, fuel and other tools that richer nations take for granted… are luxuries in poorer countries. Moreover, the soil in tropical climates… cannot be farmed successfully in more traditional ways. These circumstances demand unique agricultural solutions, and many have been made available through the advances of biotechnology (44).

In other words, the introduction of genetically modified hybrids would drastically increase yields, not only because the seeds are designed for a much higher return anyways, but also because the plant will be able to adapt to adverse conditions better, including droughts and floods (Adamu 45). The introduction of GM seeds in Nigeria could also result in a revived agricultural market (Pai). In addition to a higher volume of crops produced, more job opportunities will be made available to the population due to many news types of careers that may have not existed before (Pai). Higher yields will furthermore result in lower food prices, increasing the average Nigerian's access to affordable food (Paarlberg 56).

With that being said, there are many outside factors in Nigeria that will affect the country's ability to introduce new plant science and GMO technology to its people. Perhaps the biggest factor interfering with the nation's ability to introduce biotechnology, other than misinformation, is the policy choice at the federal level that deals with GM crops (Paarlberg 61). At this point in time, growing or creating genetically modified organisms, including seeds, is considered illegal (Effiong). Government leaders are not all necessarily against the idea of introducing biotechnology to their country's farmers, however, because of a vast amount conflicting information about GMOs coming from private and corporate sources has scared them into the easy way out- no GMOs, no problems (Richer 141).

Plant science can greatly reduce world hunger in Nigeria, but many steps must be taken in order to reach a point when GMO seeds are easily accessible to farmers in the country. A federal legislation change must be made as soon as possible to make genetically engineered seeds legal in the country. The current law is in place because Nigerian leaders do not want to allow anything to be grown that has not been backed by extensive research. I would strongly recommend adopting a policy that allows hybrids that have already been tested and approved in another country to be used in Nigeria. This would allow the idea of the use of genetically engineered hybrids to be introduced to agriculturalists while the federal government continues to perform GMO research as they see fit. Additionally, passing a law allowing tax exemptions or reductions for agricultural products for farmers could be beneficial. I would also suggest that each state

make a goal to devote 13.5% or more of their fiscal year budget to the agriculture sector by 2020, with reverse-tiered increases every 12 months. This money is to be put towards the improvement of general agricultural technology available in the country, as well as the implementation of effective farm subsidy programs. Some of that money shall also be set aside to fund education for farmers, somewhat similar to the land-grant university extension program in the United States. Free, state funded education, such as this, will not only result in better farming practices across the country, but may also lead to a higher confidence in the benefits of planting genetically-modified seeds.

There are very few large projects in Nigeria working to promote plant science and genetic engineering. However, the federal research being done on genetically modified crop varieties is very promising. This funded research shows the rest of the world the country is interested in the possibility of legalizing biotech seeds. The biggest thing that can be done to scale up this research would be to complete the necessary work as quickly as possible. If needed, offer jobs or internships to university students in biology or agriculture; not only will the research speed up, but hands on experience and jobs are being made available to young adults in the country as well. Another suggestion would be to combine research efforts with a nearby country in a similar situation. In addition to a greater amount of knowledge about genetically engineered crops, a multi-country research project could save the involved country or countries time and money; two very precious resources.

In contrast to efforts within Nigeria, there are many organizations with global presence that increase the effectiveness of implementing the plan outlined above. The World Bank must offer more grants specifically for genetic engineering and biotech research, as well as minimal interest rates on loans taken out to accomplish all goals surrounding the implementation of GMO seeds. The Food and Agriculture Organization of the United Nations is the best organization to assist in executing the plan for heightened education. Through centrally located video screenings, hands on teachings, reading material, and other public resources, Nigerian farmers will be better able to learn new skills to try on their own farms. However, the most crucial support in expanding the use of plant science in Nigeria will come from individual farming communities. Members of these communities must work together to implement the new skills they learn to use. It may also be a good idea to place “learning offices” amongst clusters of communities as a resource when farmers have questions or need advice about the agricultural operations on their farms.

In order for any master plan to introduce GMOs to work, each family must be willing to learn. With new seeds will come new methods, and each family will need to learn how to properly implement those methods on their farm. All families will also have to trust lawmakers that the plan and policies in places will prove effective; if the farmers don’t trust the government, nothing will be accomplished. The small farm families must also be honest when filing taxes, selling their grain, or filling out paperwork to receive government subsidies- if the farmers are not honest, the entire system will fail. However, regardless of whether a family lives in a rural or urban area, one thing is certain: if people do not trust the science behind genetic engineering repeatedly proving GMOs are safe, legalizing their use does nothing.

Nigeria is a country in trouble. But with the right combination of science through research on genetically modified plants, and sense to implement the correct procedures, the country can begin to fight its own hunger issue by itself. Many of the necessary components are in place, but without the legalization of genetically modified seeds, the country will never dig itself out of the economic and hunger rut it has gotten itself into. However, if the government, world organizations, states, communities, and individuals all work together for the common good of the country, there is still hope.

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