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Nigeria, Sustainable Agriculture

Nigeria: Spoilage and Waste

Almost 100 million Nigerians are currently living on less than a dollar a day, with poverty rates continuing to rise. From 2004 to 2010 there was a 6.2% increase of families living in absolute poverty, with the current percentage reaching 60.9% (Nigerians). Absolute poverty percentages are determined by the amount of families who are unable to earn enough income to provide for basic human needs such as shelter, food, water, and clothes. The root of such high and increasing poverty rates stems from high unemployment rates, rapidly growing population, little to no infrastructure to transport goods and preserve foods, low electricity access, low irrigation access, and an underperforming agriculture sector (Youth). Nigeria is ranked number 12 in the world for highest percentage of children under five years old who are underweight and malnourished (World).

Nigeria is located in Africa, bordered by Benin, Niger, Chad, and Cameroon. Along the southeast border of Nigeria is the Gulf of Guinea, which flows into the South Atlantic Ocean. The current population is 190,632,261 with about half of the population living in urban cities and the other half living on rural lands. However, Nigeria is rapidly urbanizing with many people migrating to the cities in search of better opportunities (Urban). Only 33% of Nigeria's 356,669 square miles are currently cultivated, and only 2.7% of the cultivated land receives consistent irrigation (Nigeria). Average smallholding farms, which produce up to 90% of the total food output, range from 0.53 to 3.44 hectares (FAO). Average families consist of five people and are typically patriarchal. Only half of Nigerian families have access to electricity and potable water. About 18% of families own a refrigerator, and food can only be purchased through nearby markets (Household).

The population of Nigeria is rapidly increasing with 42.54% of the population under 14 years old and another 19.61% between 14 and 24 years old. Nigeria is the most populous African nation and is projected to be the fourth largest nation in the world in 2050. With almost 40% of the population illiterate, many citizens work trades such as blacksmithing, fishing, and subsistence farming (World). However, jobs do not pay enough to sustain basic needs. The average annual salary in Nigeria is \$3,596 which is roughly \$10 a day. For an eight-hour work day, this means the average worker is paid \$1.25 per hour (Obi). Such low pay for usually labor intensive jobs leaves workers overworked, malnourished, and leaves families in poverty. Further, the agriculture sector provides nearly 70% of occupations but is only producing 22% of the overall GDP (World). This means that the agricultural sector is underperforming and failing to produce valuable finished goods.

Food spoilage and post harvest losses are one major source of the low agricultural GDP output. Annually,

750 billion dollars are lost to food waste alone (Francis). With little infrastructure, large portions of produce are lost during transportation. This limits markets to nearby areas, and even then many sellers do not have access to storage facilities. Without adequate storage, fruits and vegetables have a shelf life of only two to three days. High humidity or incorrect drying and storage methods cause increased amounts of poor quality produce. In order for grain to be milled or stored it must be properly dried, usually within two to three days after harvest. However, if farmers sell grains immediately after harvest many of them will not fully dry the grain in order to keep the weight higher. This will provide the seller with more profit based on a higher weight. While there are regulations in place to prevent the selling of grains that do not meet the moisture standard, in many places these regulations are not enforced (Economic). Purchase and consumption of such grains can lead to disease, and deaths in consumers. Besides the possibility of high profit, many farmers will also sell products soon after harvest because storage is unreliable and can cause major loss due to food wastage and spoilage.

Africa Commodities Exchange, AFEX, is a holding company that is beginning to create safe storage facilities through the reconstruction and leasing of old government warehouse facilities. For a small fee, farmers can hold products in the storage facility without the fear of waste or contamination. Proper storage allows farmers to wait until they can receive sufficient profit for their goods without allowing poor quality goods to enter the market. AFEX will also provide farmers with a grading value of the products to further prevent contamination in the market as well as providing farmers with a better understanding of the quality of food they are producing. Funded by U.S. and Nigerian investors, AFEX has already expanded across eight states and 60,000 farmers (Downie).

However, many areas do not have old facilities that can be converted to storage areas or need a cheaper alternative. AFEX is planning to develop mobile warehouses to reach less accessible areas. A cheaper solution, presented by Opportunities Industrialization Centers International, OICI, is the use of silos. Currently projects are developing in Ghana, but ideas and projects could be transferred to Nigeria. The spread of ideas from one country to another can bring solutions to a larger expanse of issues. Constructed out of local materials, these storage units only cost \$25 to make and can last up to 50 years. Mud bricks, dried grasses, and other available materials can be used to construct these silos. With proper drying and treating methods under close control as well as proper storage, food waste is reduced to almost zero (Vark). OICI also provides an education system for local farmers. The education program teaches farmers about the most effective material to use, proper construction, and maintenance (Mud). Because silos are cheap to build and resources are readily available, individual communities can construct silos for local use. This will reduce travel time and will allow products to be dried and stored quickly after harvest. Farmers can use community silos for personal grain storage as well as storage for grains sold at market. Through the education program, communities can teach other communities until these silos become a nationwide storage method.

Fruits, vegetables, and other fresh produce still struggle to reach markets in Nigeria before they rot and are wasted. Even in households, fresh produce only lasts a few days before it must be consumed or thrown out. With only 18% of families having access to refrigeration, purchased food will not remain

fresh for long. Weak infrastructure leaves gaps for food to waste, either on the trip to market or in the consumer's house. Unfortunately, efficient infrastructure is a long way away. To keep produce fresh, in the market and in the home, a new portable food preserver has been developed. The Wakati is a solar powered, tent-like box that can increase shelf life of fruits and vegetables to almost ten days. A ventilator inside the Wakati is powered by three solar panels that rest atop the box. Water is evaporated to create a humid environment to keep produce fresh and free of mold. The amount of water necessary is dependent on the size of the Wakati and the amount of produce. One liter of water can store up to 200 kg of fruits and vegetables for a week (BVBA). The Wakati is not built as a long term solution because the actual temperature of the produce is not regulated; however, it does improve short-term storage methods. Less food will be wasted, and with increased shelf life farmers will have longer to sell produce and make profits. Families will also be able to purchase fresh foods and store them at home for longer.

Wakati has already sent over 100 systems to developing countries such as Haiti, Uganda, and Afghanistan, but has not reached Nigeria yet. Wakati plans to begin mass producing the systems and selling them at \$100 per unit. Since this technology is just starting out the price is high, but once widespread selling begins the price is expected to lower. Starting in June 2017, Wakati became an open source project to allow other scientific and entrepreneurial communities to update and modify the technology as they see fit. This will help expand the Wakati as well as improve the technology to improve storage as much as possible. Wakati is also starting an ambassador program to help provide Wakati to developing countries. The ambassador program is used to test Wakatis and improve the product through results and feedback. People all around the world can also help by purchasing a Wakati to be sent to developing countries. By reaching out for global support, the Wakati can be brought to Nigeria and other countries which would not be able to purchase a Wakati (BVBA). It is important that this technology is brought to Nigeria. This will allow fruits and vegetables to reach further markets and last longer in homes.

While there is advancement for sponsorship and other improvements, the Wakati still has flaws. It is expensive and unachievable for many families not to mention it requires access to clean water. With only half of the Nigerian population having access to potable water, the Wakati is simply not practical for many towns. Until other aspects of infrastructure, water access, and more can be improved, it could be beneficial to look back at simple yet effective technology. The Zeer pot is simple and made of completely local materials. A large clay pot is set on a metal stand to let air flow underneath. A smaller clay pot is placed inside the larger pot and the gap is filled with sand. Fruits, vegetables, and sorghum can be placed in the smaller pot, covered with a damp cloth and placed in a dry area. The sand is watered twice a day and as the water evaporates, the inner pot is cooled. This system can increase the shelf life of produce up to twenty days (Zeer). Huge benefits are that non potable water can be used to moisten the sand as long as there is an impermeable separation layer between the food. It is inexpensive and uses readily available materials so only the method would need to be spread. On the other hand, the zeer pot is less effective in high humidity so the southern region of Nigeria that has tropical climate would not be benefited as much. Still, the northern, arid/ semi-arid region would be able to utilize the zeer pot. Spreading this simple, yet effective technology can help step in until larger improvements are made.

The Lagos-Kano-Jibiya corridor is one of the most important transport routes in Nigeria. It connects the coastline to the northern regions. Shipping a 20-foot container from the Lagos coastline port to Jibiya in the north, can take almost 19.5 days and cost \$5,000.(U.S.). Nigerian Expanded Trade and Transport Project, NEXXT, is working with USAID, U.S. Agency for International Aid, and the Ministry of Transportation to clear up traffic jams along the Lagos port. Congestion in the overcrowded ports can cause the traffic to extend almost 100 miles north. NEXXT plans to create truck stops for vehicles waiting for the port (Downie). This will lower shipping cost and transit time, which will allow less time for food and products to be wasted. By starting a partnership with Wakati, NEXXT could set up Wakati storages at the truck stops to keep fruits and vegetables fresh while transporters wait for the port or access to any other market area. USAID is working to increase businesses and agricultural opportunities along the corridor. Setting up easily accessible markets along the main road that have safe storage methods, such as Wakatis, can help expand the market outside of nearby areas for Nigerians. Expanding the market beyond local markets can help provide more income for families by having access to a wider consumer pool.

With a rapidly growing population, more sufficiently paying jobs will need to be available to lower unemployment and poverty rates. Programs such as PROSPERER partnered with International Fund for Agricultural Development, IFAD, are working to find rural micro enterprises or RME's that could host and are willing to take youths in as apprentices. Each RME can host five to ten apprentices and are give ten USD for each apprentice each month to fund any materials needed. Not only does PROSPERER promote the future education of youths, it also educates the mentor in order to successfully train apprentices (Five). Apprentices range from 16-25 years old and a validation committee ensure the selection is fair and vulnerable families are given priority. Each apprenticeship last two to six months and at the end graduates can choose to become paid worker or entrepreneur. However, PROSPERER has yet to be expanded to Nigeria (Youth). Nigeria has a rapidly growing population and is in desperate need of educational programs such as PROSPERER to lower unemployment rates and increase education. Around the world there are numerous programs and ideas around the world that can be expanded to benefit other countries. Ideas are the most powerful form of technology and deserve to be spread regardless of borders. By focusing on creating well educated businessmen and women concentrated along the corridor markets will expand, food waste will decrease due to accessible storage, and traffic can be diverted to lower transport time.

With so much of the Nigerian population below the poverty line, a change for a better future must start now. More plentiful, high quality, and lower cost food can be provided to the people by reducing food waste. Providing safe storage methods and growing the education of youths, in Nigeria can lift Nigeria out of poverty. Step by step, farmer by farmer, and crop by crop, Nigeria will be able to sustain future generations.

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