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### **Nigeria: A ditch amongst the lands**

Off the West Coast of Africa lies the oil rich country of Nigeria. It is a tropical land as with all of Africa's Providences, meaning that there are only wet and dry seasons that vary in their length and time during a given year between geographical positions of Nigeria. To the South of Nigeria, a short dry season of roughly three to four weeks is observed during August. Preceding this is a short wet season during September to mid October which in turn precedes a long dry season during late October to early March ("African Government, Government of Nigeria, Economy of Africa.", 2002) . From here, a long rainy season from March to July comes over Southern Nigeria, and with that the cycle of seasons repeats ("African Government, Government of Nigeria, Economy of Africa.", 2002). Similarly, the North has both wet and dry seasons, with the dry season lasting from mid October to May and a wet season that last from June to September ("African Government, Government of Nigeria, Economy of Africa.", 2002). The per capita income of the average Nigerian is approximately 2,600 US dollars, whilst the GDP of the country itself is estimated at 414.5 billion US dollars ("Central Intelligence Agency", 2012 ; "Nigeria.", 2012). Should they not perish by either malnutrition in their youth or by diseases that are borne to their environment, most citizens live to see life into the fifties on average ("Central Intelligence Agency", 2012). Of these diseases and/or health issues malaria is the primary cause of most disease related casualties ("Nutrition Landscape Information System: Nutrition Landscape Information System (NLIS) Country Profile.", 2012; Ori, 2012). However, if the health implications that come with the ailment of malnutrition are taken into account as a major source of casualties, then the malaria epidemic of Nigeria is rivaled if not succeeded as the primary cause of deaths within the standing population ("Nutrition Landscape Information System: Nutrition Landscape Information System (NLIS) Country Profile.", 2012).

Of Nigeria's labor force seventy percent work in agriculture, twenty percent work in services, and ten percent work in industry. As a result, a majority of Nigeria's population lives in villages rather than cities, which have a tendency to take a role as an economic center than a community of residential areas. Seventy percent of the total population classify as living in poverty and cannot afford the foods required for proper growth, giving way to the various health problems that have become so common in Nigeria, mainly in the villages where agriculture is the primary source of income ("Central Intelligence Agency", 2012). However, it is perhaps the outside influences of Nigeria that place the greatest burden on the natives in the form of petroleum drilling companies, terrorist, and even government officials. These forces have all played a role in Nigeria's world status in a way very much alike to dominoes. Bribed and/or corrupt government officials allow for oil companies to drill without consideration to the environment, an environment that is quickly polluted by prevalent oil spills that go unnoticed as a result of there being no form of government regulation of water purity and security. Ruined environments leave no chance for natives to fish or grow foods in subsistence or for profit upon the land. They, the ever troubled civilians are left to move elsewhere, starve, or otherwise become desperate enough to steal from oil wells, sometimes sabotaging these as well. Others turn in support of local extremist/terrorist (Boko Haram in the case of Nigeria) that thrive in poverty ridden environments as a means to fighting against the Western ideals/values that have manifested themselves in the form of the petroleum companies and similar groups (in their perception) that exploit their land.

A struggle for food has been the cause of all of Nigeria's pains, thus making the search for sustainable crops as well as pollution regulation the key to a better state; a better Nigeria. I propose that the addressed issues of Nigeria may be fixed by way of a system of ditches of which span from the South and reach into

the North, yet are seemingly disconnected, barring a small group of ditches that link the Northern system to the Southern system. These ditches, connected by the polluted but greatly depended upon waters of the local Niger Delta would be constructed of concrete, a water permeable material, allowing said ditches to pass water through their interior, yet also exude some water from the exterior. Inclined sides of the ditches would be lined with terraces holding both or either sunflower and hemp, two plant species that possess the capability to phytoremediate, or absorb and grow from metals in their surrounding environment. ("Phytoremediation: Using Plants to Clean Soil.", 2000). Metals are a key component in the chemical makeup of petroleum and crude oil, which are the roots of the Niger Delta's polluted state ("Tox Town - Crude Oil - Toxic Chemicals and Environmental Health Risks Where You Live and Work - Text Version.", 2011). As sunflowers and hemp phytoremediate if given the necessary environment, the use of these species could warrant the slow cleaning of crude oil that had mixed into the delta's water ("Phytoremediation: Using Plants to Clean Soil.", 2000). In addition, the absorbed metals would allow for the crops to grow in a way that would be homogenous to if they received fertilizer. The seeds of both hemp and sunflower are edible, as are the oils that can be created from processing them. Both seed and oil derived from sunflower seeds are an excellent source of carbohydrates and, in the case of hemp, proteins. Hemp seeds can also be synthesized into milks, plastics, while stems may be utilized in the production of fabrics, no doubt helping to create more industry in Nigeria. Both plant species will also grow in hot (sunflowers) and/or tropical environments (hemp), meaning that the crops could be alternated for dry and wet seasons if needed. Nutritionally speaking, sunflower kernels contain thiamin as well as vitamin B6 and vitamin E, key nutrients required for proper development yet have little sodium and cholesterol ("Nutrition Facts (Seeds, Sunflower Seed Kernels, Dried).", 2012). This complements the protein rich properties of hemp seeds, a food that is similarly low in sodium and cholesterol ("Nutrition Facts (Hemp Seed (shelled).", 2012).

In general, taro, lotus, and cattail are plentiful in carbohydrates, iron, and sodium whilst having very little concentration of cholesterol and trans fats. They easily spread by their edible bulbs, rhizomes, corms, and/or runners, each proving to be a filling meal even when taken in meager portions ("Nutrition Facts (Lotus Root, Raw).", "Nutrition Facts (Taro, Raw).", "Nutrition Facts (Cattail, Narrow Leaf Shoots (Northern Plains Indians).", 2012). Each grows to maturity in a matter of weeks and requires no watering as they are aquatic, preferring to grow in stagnant, water saturated environments. In the ditches these crops would be grown from the bottom upward, with the waterline marking the point at which a third of the terrace's bottoms along the ditch are permeated. These root crops would be harvested once they have been judged to be mature, but in a fashion that leaves some of the previously existing root systems behind so that the next harvest may grow from them. For ease of access to the crops, a drainage system would be installed on the inclined sides in the form of plugs, along with steps to the bottom of the ditch so that the roots are reachable after the water has been drained. Excess water released during the processes associated with collecting of aquatic root crop could also be irrigated to where there is an overwhelming presence of dryness or during the dry season, when water has become scarce.

To control the water moving outward via permeation from the ditch's body, dandelions are to be planted along the edges/upper edges of the ditch. Dandelions absorb water by their deep root systems from the soil around them, enough so that any given dandelion is roughly made up of seventy percent water, most evidenced by their hollow stems and leaves of which ooze with water and other liquids when snapped apart. All parts of the plant are edible and are an excellent source of A, B, C, E, and K vitamins along with iron. These vitamins and mineral are needed in high concentration by the body to develop correctly both mentally and physically, particularly vitamin A and iron, which are used to develop the epidermis and bones, or produce red blood cells respectively ("Nutrition Facts (Dandelion Greens, Raw).", 2012). Dandelions can regenerate from their root systems, allowing for a redundant cycle of harvesting foliage and flower. Additionally, their roots, which may be harvested as well if needed, as the roots have a chemical property that can alleviate stomach pains, something that is common for those afflicted by hunger, such as villagers (Ehrlich, 2012).

Soybeans grow where weather is both warm and wet: an environment similar to that of Nigeria. Towards the end of the wet season going onto the start of the dry season, soybeans could be planted somewhere not immediately near the river, but linked via irrigation provided by the ditch's caps. They, the soybeans, require balance between water and heat/light as with all plant life. Planting soybeans at the end of the wet season insures they receive enough water to reach a stable point in age, yet not enough heat to otherwise stifle germination. Soybeans are a protein, zinc, iron, and carbohydrate rich food source, and also a possible fuel source ("Nutrition Facts (Soybeans, Mature Seeds, Raw).", 2012). More importantly however, soybeans have been used primarily in the creation of soy milks and cakes, both proven staples in the Eastern Asian countries, giving way to the possibility of these being used in Nigeria as staples in conjunction to pre-established staples, such as yams, which are less nutritionally rich than soybeans. This all hinges on the possibility of the food establishing itself well in the common dietary preferences of the Nigerians.

Much of Nigeria's citizens live in villages, their only source of water being from streams and rivers aside from water sold in the city's markets. Petroleum companies often find their work nearby these streams and rivers, occasionally breaking their machinery. An example of such carelessness is well observed in the Dutch petroleum mining company Shell, which has actively added to the growing number of oil leaks caused by malfunctioning oil derelicts. An estimated 300 spills are attributed to Shell in the span of a single year in just the Southernmost reaches of the Niger Delta (Duffield, 2010). Some of these accidents go unchecked and are even left to continuously spill oil for years on end, thus polluting both the water and eventually the surrounding land (Duffield, 2010). To rectify such circumstances the ditch systems would utilize "caps" as a means to filter oil sullied water from the Niger Delta to the ditch, where villagers could collect water from if needed. These "caps", much like the stretches of aquatic crops and accompanying plants would be marked at their end by a concrete wall, both to serve as a reference point, but also to contain the filtration mechanism itself: groves of hybridized cattails (*Typha Angustifolia* x *Typha Latifolia*) (Selbo and Snow, 2004). *Typha A.* x *Typha L.* are a sterile breed of cattail, leaving them to only reproduce via stolons and rhizome budding. By this limitation unintended cattail propagation is curbed in spite of previous invasive ventures by the species in the state of Jigawa ("NIGERIA: Cattails Smother Livelihoods of Farmers and Fishermen in Jigawa State.", 2008; Selbo and Snow, 2004). This hybrid was developed to improve upon the inherent abilities of phytoremediation in the cattail genetic paradigm and as such use their growing medium's available metals to develop themselves (Selbo and Snow, 2004). This would make the water much cleaner or rather, more refined for the plants growing along or in the ditches as well as any citizens within reach in need of safe, usable drink.

Malaria and other diseases that employ mosquitoes as vectors are an inevitable factor in tropical environments placed near perpetually standing or still water. However, there do exist solutions to the implications of the mosquitoes. *Gambusia Affinis*, more commonly known by the common name mosquito fish, are a breed of fish that bear their offspring live. *Gambusia* receive their common name for their voracious appetite for mosquito larvae and most closely resemble the common guppy, albeit with a dull gray and metallic blue cast. On average, *Gambusia* reproduce three to four times a year and bore broods of 40 to 100, of which mature in two to three months, sometimes less if the conditions are abnormally warm, which would be any given day of a year in the case of Nigeria when looked at in relation for a fish species native to the temperate climate of North America ("Maryland Department of Agriculture.", 2012). Their implementation in the ditch systems stretches could mean the reduction/control of any forthcoming blooms in epidemics of those diseases that have made themselves so integrated in Nigeria's ailed. Alternatively, should too much of the *Gambusia* population of the ditches die off, then another mosquito eating breed of fish or organism(s) could be put in place: killifish and/or branchiopods. Killifish are a large genus of fish that, though resemble guppies and other live-bearing fish, lay eggs that possess the unique capability of sustaining a period of suspended animation. These eggs will only hatch in the presence of water and can remain dry for months, much like triop's, fairy shrimp's, and

water flea's can, other natives to the environment of a typical vernal pool. Also native to these vernal pools are the branchiopods: fairy shrimp, triops, and water fleas, which also have the propensity to consume mosquito larvae as well as the ability to lay eggs that can remain inactive for years. Both killifish and branchiopods mature in a few weeks, making them ideal to counter mosquitoes. Branchiopods more often than not reproduce by parthenogenesis, meaning that the females of the species reproduce without any input by males since they have both female and male reproductive organs. The ditch system itself is much like a vernal pool, with water coming and going in every so often, making the environment of the ditch more tolerable to the organisms' nature. In either case, the fish's abilities lend themselves to mosquito and disease control which would prove vital in changing Nigeria for the better.

Yams, papayas, cassava, plantains and other tropical produce are traditionally eaten by the Nigerians as a result of a culture wide reliance upon these to survive, both in the past and present. However, these food staples do not possess all the nutrients necessary to thrive, and as evidenced in the stunted growth of much of Nigeria's children (Ori, 2012). Undoubtedly, introducing new produce would yield positive results in the national health of Nigeria via dietary variation and exposure to foreign foods and thus foreign nutrients that are lacking in their current diet. With the exception of taro and soybeans, the foods of and around the ditch systems are obscure if not unknown by the common Nigerian. These foods are foreign to them just as taro or yam are to most United States citizens, with neither group of citizens likely knowing little to nothing over the others foodstuff. Foreign foods, as their name implies, are exotic in the perceptions of Nigerians, and as such are likely to not be fully certain as to how they would safely prepare the foods provided by the proposed rationing system. Government sponsored programs would need to be established so that proper education of both consumption and food safety are assured. Additionally, programs to teach Nigerians new recipes that make use of both old and new foods to further facilitate the adoption of the foreign produce into Nigeria's culture. Doing so will leave the Nigerians to gradually grow familiar with the ditch foods and thus more willing to make a serious commitment to eating and maintaining the sustainable nature of the ditch.

Harvest of the ditch's crops and maintenance is a task well suited for a large sum of laborers. As such, these laborers would be hired villagers or anyone else in need of money, making the ditch system a source of work and wage. The job would not be a daily service for most laborers since the plants will take care of themselves aside from the cleaning of the ditch should too much trash gather in or around it's area. This would allow Nigerians to retain their current jobs without feeling at loss of their previous job that they may have taken pride in. Resources of the ditches are to be pooled into a united collection of foodstuffs that would be rationed out monthly by metric weight to all citizens of Nigeria. Each ration would have portions of taro corm, lotus bulb, cattail rhizome, cattail flower(s), sunflower seed, soybean produce (oils and beans), hemp seed and/or hemp based milk, along with dandelion greens in addition to dandelion roots. Regulation of food stock via rationing allows for a controlled and assured equality in national diet/health standardization, which should quell the threat of hunger, as most Nigerians can afford to purchase yams and the few other traditionally eaten crops. Standardization also allows for Nigeria's citizens to feel at peace knowing that they shall always have some amount of food either nearby or coming soon. Sustainable agriculture is all that can counter the threats that face Nigeria both in the present and the future. No man, woman, or child can focus when they cannot find food for them self, as all animal's intuition is to eat so that it may live on. The crops chosen for the ditch were selected because of their unique characteristics that are native to their species. Each species has the property of relatively fast paced growth that tends to span only a few months or weeks excluding any extraneous offshoots that come about from the original plants' root systems. Multiple purpose plants, like hemp are both edible yet also can be refined into a variety of materials. These plants, when their life spans have come full circle, yield more than enough seed to support the mass production of oils, future crops, and/or associated foods. A similar end is noticeable in the ditch's crops with growths of rhizomes, bulbs, and corms in place of seeds.

In developing countries like Nigeria, or other regions grasped by poverty, it is often times the lack of wealth and food that push individuals to acts of violence and/or thievery, having no other way to support themselves. They cannot be totally blamed for their behavior, for this is only the result of instinct reacting to an environment that has become precarious. Most feel as though the government has turned their back to their pleas for help, which have gone unrecognized for the most part. Should any such ditch system be efficiently put into play in Nigeria a series of changes would be of the utmost importance, as the government is who has final say as to what is permitted in its territory. If the government is so full of corrupt officials, then what guarantee is there that they have the capacity to make way for the ditch when they've become preoccupied with attempting to carve out an needlessly over secure living? Ironically, their hustle for luxury is only an illusion they chase, attempting to escape the results of a perceived danger that they only furthered by selfishness. There is a great fear in Nigeria over one's future and well being, and it is this fear that manifest itself in the socially and, in some cases, professionally irresponsible actions by the ones who contribute to Nigeria's plight. However, if they wish to escape their circumstance a great leap of faith needs to be taken. The Nigerians must realize as a collective that their lives their lives can be better should they cast aside their inhibitions and fears regarding what may lie before them. To do so would mean the first step is Nigeria bettering itself as a nation as well as excising the source of its troubles that have rooted. It is then that Nigeria could finally begin its ascension, with some input and moderation by the United Nations or others that have the ability to shape an entire state into something greater than its past self.

#### Works Cited

*African government, government of nigeria, economy of africa..* (2002, June 4). Retrieved from <http://www.onlinenigeria.com/links/adv.asp?blurb=69>

*Central intelligence agency.* (2012, May 10). Retrieved from <https://www.cia.gov/library/publications/the-world-factbook/geos/ni.htm>

Duffield, C. (2010, June 15). *Nigeria: 'world oil pollution capital.* Retrieved from <http://www.bbc.co.uk/news/1031310>

Ehrlich, S. D. (2012, January 2). *Disclaimer.* Retrieved from <http://www.umm.edu/altmed/articles/dandelion-000236.htm>

*Maryland department of agriculture.* (n.d.). Retrieved from [http://www.mda.state.md.us/plants-pests/mosquito\\_control/mosquitofish\\_fact\\_sheet.php](http://www.mda.state.md.us/plants-pests/mosquito_control/mosquitofish_fact_sheet.php)

Nigeria: Cattails smother livelihoods of farmers and fishermen in jigawa state. (2008, March 6). *IRIN Africa.* Retrieved from <http://www.irinnews.org/Report/77143/NIGERIA->

*Nigeria.* (n.d.). Retrieved from <http://www.who.int/countries/nga/en/>

*Nutrition facts (cattail, narrow leaf shoots (northern plains indians).* (n.d.). Retrieved from <http://nutritiondata.self.com/facts/ethnic-foods/10462/2>

*Nutrition facts (dandelion greens, raw).* (n.d.). Retrieved from <http://nutritiondata.self.com/facts/vegetables-and-vegetable-products/2441/2>

*Nutrition facts (hemp seed (shelled)).* (n.d.). Retrieved from <http://nutritiondata.self.com/facts/custom/629104/2>

*Nutrition facts (lotus root, raw).* (n.d.). Retrieved from <http://nutritiondata.self.com/facts/vegetables-and-vegetable-products/2478/2>

*Nutrition facts (seeds, sunflower seed kernels, dried).* (n.d.). Retrieved from <http://nutritiondata.self.com/facts/nut-and-seed-products/3076/2>

*Nutrition facts (soybeans, mature seeds, raw).* (n.d.). Retrieved from <http://nutritiondata.self.com/facts/legumes-and-legume-products/4375/2>

*Nutrition facts (taro, raw).* (n.d.). Retrieved from <http://nutritiondata.self.com/facts/vegetables-and-vegetable-products/2673/2>

*Nutrition landscape information system: Nutrition landscape information system (nlis) country profile.* (n.d.). Retrieved from <http://apps.who.int/nutrition/landscape/report.aspx?>

Ori. (2012, February 16). Nigeria children suffer stunted growth . *The Africa Report*. Retrieved from <http://theafricareport.com/index.php/2012021651708702/west-africa/nigeria-children-suffer-stunted-growth-51708702.html>

*Phytoremediation: Using plants to clean soil..* (2000, February). Retrieved from [http://www.mhhe.com/biosci/pae/botany/botany\\_map/articles/article\\_10.html](http://www.mhhe.com/biosci/pae/botany/botany_map/articles/article_10.html)

Selbo, S. S., & Snow, A. S. (2004). *The potential for hybridization between typha angustifolia and typha latifolia in a constructed wetland.* (Master's thesis)Retrieved from <http://www.biosci.ohio-state.edu/~asnowlab/SelboSnowAqBot04.pdf>

*Tox town - crude oil - toxic chemicals and environmental health risks where you live and work - text version..* (2011, October 27). Retrieved from [http://toxtown.nlm.nih.gov/text\\_version/chemicals.php?id=73](http://toxtown.nlm.nih.gov/text_version/chemicals.php?id=73)