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Sudan, Factor 6: Sustainable Agriculture

Sudan: Methods of Sustainable Agriculture

In the thick of an exponentially growing human populace, there is a demand for the reciprocated increase of agricultural productivity to satiate the needs of pandemic hunger in areas throughout the eastern hemisphere, one of which being Sudan. Sudan is a nation left unscathed by overpopulation and the lack of cultivable land that plague most other developing nations. Even so, Sudan's potential for agricultural production is not yet being fully utilized, leaving millions of its people in hunger and 46.5% of its people in poverty (World Bank). Although in recent years Sudan's agricultural production has seen an increase, this is only due, in part, to the expansion of farmlands rather than the improvement of methods that would otherwise contribute to the increased efficiency of agricultural production. Many Sudanese agricultural practices, that are a result of the immediate demand for food, add to the degradation of the soil that has already been marred through centuries of harmful exploitation of its natural resources. Sustainable agriculture allows continued use of the land without harm to the nutrients in the soil or the environment whereas other methods of farming damage the soil while also contaminating water supplies and contributing to a further polluted environment. For this to be achieved, government incentives should support the transition into better methods of agriculture with the help of different humanitarian organizations such as the Food and Agriculture Organization (FAO) and the World Bank. Assisting those in need is the responsibility of everyone, and with the support of these organizations as well as first world nations, the living standards of developing nations such as Sudan can greatly increase.

Though the world around them is constantly changing, Sudanese traditions have remained, for the most part, impervious to change. Gender roles and patriarchy are still practiced throughout Sudan and define everyday living: work done by women are mainly domestic, whereas men often find a living outside of their home. Men and women, in most everyday activities and social gatherings, remain segregated. Rural areas more readily endure these practices while cities are beginning to change (Sudan Embassy). In a Sudanese family, the values of a family often dictate where they lie on the social pyramid. Family names are very important to uphold and include those married into the family, those related by blood, and those even taken in through the measure of their honor.

A typical Sudanese household consists of about 7 people, composed of immediate family, who live in a community with their extended families (United Nations Population Fund). These Sudanese households have a high-carbohydrate diet which make up about 65.7% of the population's dietary energy consumption, or DEC, followed by fats, which make up about 21.9% of the DEC, and then by proteins, which make up 12.4% of the average DEC in Sudan (FAO). These macro-nutrients are found in millet, wheat, bread, and the Cassava flour which are the staple crops for the Northern and Western Darfur States, Northern State, Khartoum and Red Sea and River Nile States, and the Western Equatoria State, respectively.

Having a public education system that is free and readily available to the populace is imperative to all nations, even more so for developing nations. This is the case because developing nations tend to have higher rates of infectious diseases in the populace. Those with even a primary education are better equipped to prevent the spread of these diseases and are less than half as likely to contract HIV compared to those with little to no schooling (Center for Global Development). Those with a greater education also earn higher wages which contributes to the national economic growth. Education also supports the growth of the nation in that it allows its people to learn their rights as well as how to exercise them, leading to a more politically stable nation. Sudanese primary education consists of 8 years, 6 to 13 years of age,

followed by a secondary education of 3 years. Enrollment varies widely as many of the schools are concentrated in urban areas. Out of all the eligible pupils, only 46% of them enroll into primary education and only 21% enroll into secondary education (World Bank).

Though enrollment into schools is a problem, another setback in their education system has its roots buried deep in their customs. Education for girls is far more basic than it is for boys and has an emphasis on religion rather than learning secular topics compared to boys. Parents are also reluctant to send their daughters to school in fear that it would corrupt their morals. Providing education for both boys and girls equally should be a top priority for the government and in recent years, changes for the better have been seen. Although there is still room for improvement, literacy rates have seen an increase; in 2002, the literacy rate in adults of ages 15 and older was 60 percent and has slowly increased since then (Sudan). Education reforms should be one of the top priorities of concern — Unicef and the Sudanese government must work together to support a growth in education. This can be done through the building of schools, educating a class of teachers, and providing money for school supplies. Education is important to sustainable agriculture in that the education of its people will lead to the development of a more knowledgeable class that can contribute to the expansion of sustainable agriculture.

Ironically, the most damaging to Sudan's crop supply come from a source of life: the Nile. The Nile River, along with the Mediterranean and the Red Sea, establishes a perfect environment for locusts to thrive. Seeing as the agricultural sector employs more than 80% of the work force (Sudan Embassy), biting insects that thrive during the wet season, when the plants flourish, can have serious effects on the well-being of the country. These desert locusts swarm together in Northern Africa and migrate to different fields causing millions of US dollars in damage annually. From 2003 to 2005, one of the largest locust plagues was seen and more than half a billion dollars was needed to control the locust plague which caused US\$2.5 billion in damage to the crops. During the two year plague more than 13 million liters of pesticide were used to combat the locust swarms. An amount as great as this negatively affects the environment by decreasing biodiversity and increasing climate volatility. Along with the environmentally harmful methods of harvesting agriculture, pesticides used to fight crop-infesting pests contaminate water supplies which harms livestock and the human health.

Most Sudanese farmers are subsistence farmers: surviving on their own harvests and livestock. Any harvests they have left are usually sold at markets. The majority of livestock in Sudan are raised by pastoral groups which have anywhere from 50 to several thousand heads per household (FAO). Main livestock include cattle, sheep, and camels, and the main crops of Sudan include sorghum, wheat, millet, sesame, and cotton. The methods of production used to harvest these crops are irrigated farming, traditional rain-fed, and mechanized farming. Of all the arable land in Sudan, only 13 percent of it is used for subsistence farming. Due to the lack of education among the majority of Sudanese farmers, many have not been introduced to alternative types of farming. Old fashion techniques, such as tillage farming, harm the topsoil while other techniques that require artificial irrigation can cause the water supply to become polluted: harming livestock and human health.

Agricultural production is increasing in Sudan mostly due to the expanding area of cultivated land rather than the maximizing of efficiency in their agricultural practices. Some of these practices are costly and ultimately lead to the degradation of the soil, harming the environment in the process. Current agricultural practices add detrimental amounts of phosphorus and nitrogen into the ecosystem which can cause an excess amount of algae to grow in streams, lakes, bays, and other sources of water. Though some aquatic beings feed off of algae, the overabundance of algae and algal blooms depletes the oxygen in the water, killing large numbers of fish and other marine life. Furthermore, algal blooms have the potential to hurt humans by producing toxins and facilitating the growth of bacteria — this can cause illnesses in humans through contact, eating tainted sea life, or through directly drinking contaminated water (United States Environmental Protection Agency).

Since only 30% to 50% of the nitrogen and 45% of the phosphorus are taken up by crops, increasing nutrients in fertilizers for raised yields are both unnecessary and environmentally detrimental. Expanding production and decreased deterioration of the soil can be achieved through the development in nutrient-use efficiency. Fertilizers that have superfluous amounts of nitrogen and phosphorus are ineffective in enlarging yields as only a fraction of the nitrogen and phosphorus are used up by the crops while the rest is channelled into the ecosystem around the crops; these non-point nutrient losses run off into water supplies, harm the atmospheric composition — which contributes to climate volatility — and harms sea life (Tilman, Cassman, Matson, Naylor, Polasky 3). Nutrient efficiency can be obtained by matching spatial and nutrient supply with the necessities of the crops. This is done by fertilizing crops during the times that the nutrients will be the most absorbed and needed, near the plant roots, and by applying the fertilizer in small but frequent amounts.

The Sudanese are blessed with the Great Nubian Sandstone, which is part of the largest source of freshwater on Earth, the Umm Ruwaba, and many aquifers as well as the Nile River Basin, which is responsible for providing 80-85% of the water used by the Sudanese people. The majority of the Sudanese work force are invested in Sudan's agricultural sector which constructs 40% of its GDP. 97% of the available water is used for agriculture, and the remaining 70% of agriculture in Sudan is rain fed (Circle of Blue). Though Sudan's irrigation systems have the largest area among other countries in Sub-Saharan Africa, the country's water supply is not being used to its fullest potential. Despite having the ability to create a successful irrigation agriculture, these nutrient-rich groundwater supplies are being neglected, often being damaged and wasted by inefficient irrigation, harmful rain fed farming methods, the overgrazing of livestock, as well as the destructive mechanized systems of agriculture practiced by the Sudanese. These mechanized systems cause deforestation, salivation, and river bank erosion. However, the implementation of irrigation techniques, such as drip and pivot, greatly desalinates water supplies while producing greater yields. Drip irrigation is an irrigation method that slowly waters the plant at its roots, and center pivot irrigation waters plants in a circular pattern. Both are irrigation methods that conserve water and fertilizer.

Crop rotation is also an agricultural practice that should be exhibited to limit the amount of pesticide used while also optimizing nutrient and water-use efficiency. Continuous production of cereal crops contributes to greater chances of damage to the harvest by disease and insect pests. A prevalence of these pests leads to the abusive use of pesticides, which along with harmful methods of agriculture, taints water supplies. The contaminated water then becomes a host for many disease-causing agents. The lack of water treatment and health care increases the rate of illnesses even further.

The abundance of water beneath Sudan can be used to help clean itself — Hydroelectricity. By harvesting the energy of the water that lies beneath Sudan, the Sudanese can sanitize their water supplies as well as use the excess power for any other agricultural technology. Government projects, funded in part by the World Bank, can create these hydroelectric generators to utilize Sudan's massive water sources.

Without the diversity created through crop rotation, there is no time for the soil to restore its nutrients leading to the inability to use the land overtime. Crop rotation should be used along with agroforestry, which implements the usage of trees for a variety of purposes, including to store carbon, nutrients in the soil, and to inhibit erosion.

Methods of water and nutrient-use efficiency, crop rotation, and other sustainable-agriculture techniques can be implemented through the creation and enforcement of laws that the Sudanese government can promulgate. Government incentives and projects to help initiate the transition of lands to sustainable agriculture will lead Sudan to a nation with decreased poverty and starvation.

Polluted water allows for the prevalence of diseases such as typhoid, cholera, and other disease-causing agents, such as parasites. Vaccinations are recommended for typhoid and hepatitis A, both of which can be contracted by contaminated food or water, as well as malaria (Center for disease control). Malaria is a disease with a strong presence in Africa and virtually everywhere in northern Sub-Saharan Africa. Death by mild, uncomplicated malaria occurs less than 1% of the time, however, in developing countries where there is insufficient immunity and malnutrition, malaria becomes life-threatening (Oxford Journals). In Sudan, the Plasmodium falciparum malaria strain makes up about 90% of the variations of malaria in the area and is also the type that is responsible for the most deaths caused by malaria (Center for Disease Control).

With a mortality rate of 81 deaths per 1,000 live births, infants who are able to survive birth also are put up against another hurdle; 112 Sudanese children out of 1,000 are not expected to make it past 5 years of age (United Nations International Children's Emergency Fund). Many factors add up to these mortality rates such as 68% of children not being immunized, the inability to acquire safe water, and the ongoing conflicts in regions where tension between different ethno-religious groups are boiling past the top: such as Eastern Sudan, Darfur, and the Blue Nile. However, Sudan has begun to invest 7% of its gross domestic earnings into healthcare so that it may become more easily accessible for its people (Our Africa).

Sudan is a country stricken by ethno-religious division: a predominantly Islamic Arab North and a largely Christian African South. In a feud driven by the desire for greater political power, religious power, and control over oil, two civil wars were fought between the north and south leading to the deaths of 1.5 million people. Continued conflict in Darfur led to the relocation of 2 million people which led to the death of 200,000 more in the process (BBC). The South seceded in July 2011 after negotiating and voting for their freedom. However, since much of Sudan's economic power came from the South's oil production, conflicts still arise which manifests itself into the further destitution of the Sudanese. These time and money consuming conflicts and divisions make it difficult for the government of Sudan to take a major role in the promotion of practicing sustainable agriculture. Sustainable agriculture is of paramount importance, and the government must spend its money and resources into this practice if it wishes for continued use of their precious land.

Progress is being made through humanitarian effort, and progress will be furthered through the continued aid from organizations such as the Food and Agriculture Organization. However, with the staggeringly increasing population comes the immense amount of food needed to satisfy human hunger. "Imagine all the food mankind has produced over the past 8,000 years. Now consider that we need to produce that same amount again — but in just the next 40 years if we are to feed our growing and hungry world," said by Paul Polman, CEO of Unilever, and Daniel Servitje, CEO of Grupo Bimbo. This statement offers insight on the magnitude at which agricultural production and efficiency must increase on the global scale, but the United Nations Secretary-General, Ban Ki-moon, states that there can be a world where hunger does not exist: "In a world of plenty, no one, not a single person, should go hungry, But almost 1 billion still do not have enough to eat. I want to see an end to hunger everywhere within my lifetime." With this said, there are improvements occurring globally and more specifically, in Sudan.

In response to locust plagues in the northern region of Africa, scientists have begun research involving different pathogens as well as insect growth regulators. After the 2 year locust plague, which affected 20 countries in Northern Africa, the Commission for Controlling the Desert Locust in the Western Region (CLCPRO) began its work with some of the countries to prevent a disaster like this from happening ever again. In addition to this, there are over 80 projects dedicated to making Sudan a stronger nation with a total of over ten million US dollars invested into these projects (World Bank) including the Sudan Sustainable Natural Resources Management Project. Though there are many areas of success, there are still various areas of opportunities as well. Organizations such as UNICEF should assist in the equal

education of Sudanese children: increased education for females since 1970 contributes for more than 40% of the declined malnutrition (Center for Global Development). In order to establish a greater food security, the Sudanese government should invest in farms that practice sustainable agriculture. They provide more food and more jobs for the population, in turn, increasing living standards and the economy. Sustainable agriculture is also less degradative to the environment and allows for the continued use of the land to harvest crops; whereas today, most farming practices strip and starve the soil of the nutrients needed to cultivate crops. Furthermore, improved infrastructure through sustainable development is necessary to facilitate trade and to transport goods. Mr. Sha Zukang, the United Nations Under-Secretary-General for Economic and Social Affairs stated that, "Sustainable agriculture is not an option! It is the only path that allows all of humanity to share a decent life on this one planet." As a leader in global affairs, America should aid the Sudanese by assisting in the implementation of a stable government. The first step for any developing nation to become prosperous, is to have a government that provides security and stability to its people. Then, can the Sudanese focus on sustainable agriculture. With the great minds that inhabit our young planet, innovations in technology will be made to improve food security and to guide a thriving, healthy human populace throughout the adolescent years of our vibrant planet and beyond

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