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Sudan: Stopping Soil Erosion

Introduction

While Sudan is not one of Africa's most impoverished countries, it still faces many issues. Soil erosion has been a continuous obstacle in Sudan, with papers referencing it dating back to the early 1970's. Since most of Sudan's population relies on farming to make a living, soil erosion has made a substantial negative impact on many people and families.

Background

Sudan is located in the northeastern part of the African continent, sitting in between Egypt and Eritrea, and bordering the Red Sea. The country spans over 1,861,484 square kilometers, and while 8.34% of that land is arable, meaning that it is good for growing crops, 28.7% of it is used for agricultural purposes, including livestock (Trading Economics). The average farm size for a family in Sudan would be roughly 20 acres according to a report by Farida Mahgoub, which is very small compared to an average Iowan farm of 351 acres (Mahgoub, 2014). The major crops that are grown in Sudan are millet and sorghum, both of which are cereals, and gum Arabic, which is used as both a food and a binder for glues and paints. The country's main imports are various food items and manufactured goods, and their main exports are oil and petroleum (Central Intelligence Agency, 2018).

Sudan has a population of 45,561,556 people; 35.3% of those people live in an urban area, therefore, the remaining 64.7% of the population lives in a rural area (Central Intelligence Agency, 2018). The climate in Sudan varies depending on the region, but it is a mostly arid and desert-laden country. Temperatures range from 90 to 100 degrees Fahrenheit in eastern and central regions, and usually have 20 to 30 inches of precipitation annually. In the north and northwest regions, temperatures range from 80 to 90 degrees Fahrenheit, and there is little to no annual precipitation (Collins, 2020).

Sudan was formerly controlled under a presidential republic by the previous president, Omar al-Bashir, and the prime minister, Bakri Hassan Salih. They are, however, in the middle of a transitional period, where they are currently being led by the Sovereignty Council, comprised of a group chaired by General Abd-al-Fatah al-Burhan, and made up of six civilians and five generals. General Burhan is serving as the head of government and chief of state until elections can be held in 2021 to transition the country to civilian leadership (Collins, 2020).

A Typical Family

In Sudan, an average family would be made up of five people (ArcGIS, 2019). That family would most likely live in a rural area in a small, round, mud or brick house with a straw or thatch roof (Advameg, 2010). Their diet would consist of tea, millet, various vegetables and beans, and sweet potatoes. Meat is usually only eaten at special occasions because it is so expensive (Advameg, 2007). They usually cook their food on a tin grill called a *kanoon*. The produce would come from a local market in a nearby village or city that they would have to drive on an unpaved road to (Country Reports). This family would most likely be involved in the agriculture industry, since 60-80% of households in Sudan generate income from the agricultural sector (Mahgoub, 2014).

The average Sudanese family makes around \$17,000 to \$18,000 in a good crop-bearing year. They do not have the best access to education or healthcare. Although the government funds primary education in Sudan and supposedly is free to the public, many fees are tacked on to schooling that make it expensive for families to send their children (Fanack, 2018). Healthcare is usually expensive for families, especially when they only made \$17,000 a year. Many hospitals and clinics are understaffed and often lacking supplies (Alamin, 2016). Around 56% of families in Sudan have access to electricity and cellular devices, and 68% of families have access to clean drinking water (The World Bank, 2019). About a third of Sudanese families practice open defecation due to the lack of sanitary resources, thus leading to a higher risk of disease in the poorer communities (Unicef). The major barrier that a typical Sudanese family would face is how well or poorly the agricultural production went that year. In the more recent years, agricultural production has been lowered due to the effects of climate change and soil erosion.

The Issue: Soil Erosion

Soil erosion is defined as the wearing away of topsoil by natural forces (Ministry of Agriculture, Food and Rural Affairs, 2012). Sudan is severely impacted by the effects of soil erosion, with nearly 64 million hectares of land eroded, and continuing to erode. That is about the equivalent of 158 million acres (about a third of the country). 44.5 million acres of the eroded land is due to water erosion, while around 66.7 million acres is due to wind erosion. The remaining eroded land is due to human-related activity, which includes deforestation and overgrazing (Ayoub, 1998). On average, over 1,000 pounds per acre of soil is eroded every year in Sudan (Elgubshawi, 2017). With that much soil eroding every year, major consequences impact a large percentage of people's lives. Rural farmers and urban residents are impacted greatly by soil erosion due to an estimated 20% decrease in crop production resulting from the erosion. This forces farmers to find different jobs. In addition, many refugee runaways and migration towns associated with the farming community are left to search for other means of support and employment (United Nations University). Soil erosion also impacts the Urban population by decreasing the availability of food to buy, therefore creating "food deserts" in urban areas.

While soil erosion affects many different community's lives, it also has a grave impact on the environment. Soil erosion causes the soil to become unfertile and difficult for plants to grow in, and while that is bad for farmers, it is also bad for lots of wildlife that are losing what was once a great food source. Soil that is degraded tends to be less likely to hold on to water, which can increase and worsen flooding. It also increases pollution from runoff and sedimentation in rivers and streams, which leads to blocked waterways and a decline in various aquatic species (World Wildlife Fund).

Solutions

Much like any other environmental related problem, soil erosion is near to impossible to reverse. What can be done to help control the problem is taking preventative measures, such as laying geotextiles on the soil to help keep it from eroding, converting to different ways of farming altogether, such as small-scale farming, or even something as simple as planting more trees. In the past, Sudan has tried to combat soil erosion by using mesquite and eucalyptus sap as external belts in order to protect crops and irrigation canals (United Nations University).

Geotextiles have been used since the ancient Egyptian times, with plant fibers mixed into the soil to strengthen it, and act as a root system to take place of nonexistent plants. The United States has

used the same idea, but instead of natural plant fibers, synthetic polymers have been used for the fake root system since the 1950s. Geotextiles keep the soil stable so plants have a sturdy base to grow on, and make it hard for other elements to erode it (Study.com). The downside to using geotextiles, especially in a third-world country, is the price and the amount of material it would cost to make a significant change on the amount of land soil erosion effects.

Many charities across the world fight deforestation and work to replant trees. The World Wildlife Organization promotes sustainable agriculture specifically, and also fights soil erosion by aiding in sustainable forest management and working to eliminate deforestation altogether. They understand the need to keep healthy root systems and stable soil to maintain ecosystems, and for people in the agriculture industry to maintain their jobs (World Wildlife Fund). The downside of planting trees to reduce soil erosion is the sheer amount of open land that farmers need to plant their crops. While tree abundant environments will keep the soil stable, they also get in the way of crop planting. However, a study has shown that an agroforestry system could be beneficial to the soil depending on the trees that are used. This agroforestry system would allow farmers to gain income from both their regular crops and the trees used to combat the erosion. According to that study, 93% of the farmers participating showed the gum Arabic tree made a significant contribution to their family income. The study also recommends multi-purpose trees, such as *Acacia senegal*, be planted to protect the soil from erosion (Fadl).

Small-scale farming is the most sustainable and realistic option for Sudan to fix soil erosion. Small-scale family farms are self-reliant and less expensive, making them sustainable for the whole family. Additionally, they also allow the family to be responsible for the land that they do have, thus making the soil easier to control in smaller portions compared to large expanses of land (Food and Agriculture Organization of the United Nations, 2017). This solution also would lessen the need to overgraze and over crop the land, which leaves more natural roots and vegetation to keep the soil stable. The best thing about small-scale farming is both agroforestry and geotextile systems could be incorporated within the small-scale environment. The downside to this solution is it only targets those who live in rural areas. While the majority of the population lives in rural areas, small-scale farming does not necessarily solve the problem of diminished food availability in urban areas. However, small-scale farming would increase the number of farms to buy produce from, thus possibly increasing the food available to urban residents.

Funding

With any solution to a large problem, such as soil erosion, there are usually materials and money that are needed to execute said solution. A Stanford article talks about different nonprofit funding models for several situations in which money is needed. There is one in particular that would suit the small-scale farming solution very well. It is called Big Bettor, and this model relies on large grants from few sources. One example used in this model is the nonprofit organization called Conservation International, who attracts donors willing to give large amounts of money to preserving global biodiversity (Foster, 2009). If the small-scale farming solution were to be carried out in Sudan, a charity such as The World Wildlife Organization would attract major grants through a donor or a major business to provide the needed seeds, farming equipment, and tools.

Another example of a funding solution would be to have a large company, such as a paper company, donate part of their proceeds to plant trees in Sudan. Just as McDonalds has donations to the Ronald McDonald House, it makes people feel good about spending money on what they buy if it goes to a good cause.

Although money and materials would be necessary for fixing soil erosion in Sudan, the implementation of the solution would be needed as well. The government of Sudan would have to encourage people of rural populations to switch to small-scale family farming, while also working with organizations, such as The World Wildlife Organization, to show how funding and materials can be provided, and also how achievable the solution actually is. This could be done by setting up a model farm system to show the success of small-scale farming. A model farm system would operate much like U.S. seed company demonstration plots. Operational model farms would be set up to allow farmers to see the success of solutions being implemented. The farmers could then decide to take those successful solutions back to their own farming regions. Currently, the government of Sudan may not be the most conventional means of leading the push to re-organize farming in Sudan, although small-scale farming would probably not be at the top of their radar. However, the government has mentioned soil erosion in the past and recognizes that it is a problem. A few concerned citizens, or a group of environmental activists could bring attention to this problem very easily.

Conclusion

Every country has its difficulties, whether that is with politics, humanitarian issues, or even environmental issues. In Sudan, soil erosion has been a substantial issue for many decades, and has continued to lack a sustainable solution. If the government and other organizations worked together to promote and fund small-scale family farms within rural populations, the families that participate can feel self reliant while helping save their environment, and possibly their future.

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