

Ella Brandt, PA School for Excellence in the Agricultural Sciences

Lancaster Mennonite School, Lancaster, PA

Pennsylvania, Factor 5, Climate Volatility

### The Impact of Climate Volatility in the Republic of the Sudan

Climate volatility is a severe problem across the globe with dramatic implications that impact the families of Sudan. Even in the modern day, the typical family faces many agriculture problems affecting their day-to-day lives. There are many unique factors that impact the average family and increase food insecurity in Sudan.

In order to investigate the effects of climate volatility in Sudan, it is important to first learn about the Sudanese culture. In Sudan, family relationships are highly treasured. A typical Sudanese family is composed of the mother, father, children, grandparents, nephews, nieces, cousins, in-laws, and godparents. Typically, the father is the head of the household and is responsible for the financial aspects of family life. The father will also make all the decisions in the household and if needed, can consult brothers or brothers-in-law. Once the sons of the family reach adulthood and after marriage, it is common to live near their parents, and eventually inherit the father's wealth after his passing. Although women do not traditionally have much power in the household, they are responsible for important roles such as maintaining the home and raising the children. In Sudanese culture, families support each other both financially and socially, ensuring the welfare of the elderly and ill in the family as long as necessary. In a typical Sudanese household there is a typical of 6 residents, which is a contrasting number to the average of 2.6 in American households (Statistica). Although school is of no cost to parents for children six to thirteen years of age, the quality of education in Sudan is very poor due to low school funding and the Sudanese society not valuing education as a necessary part of adolescence. As a result of this, many people in the community turn to the most popular occupation of agriculture, which comprises 80% of the workforce in Sudan.

In Sudan, there are four different types of agriculture sectors including irrigated sectors, livestock sectors, mechanized agriculture, and traditional rain-fed agriculture. Irrigated sectors utilize the process of irrigation from groundwater and rainwater to provide water to crops in the field without manual watering. Within the irrigated sector of agriculture, there are four different types of irrigation. These types of irrigation includes surface, sprinkler, drip/trickle, and subsurface, the most popular of which being drip irrigation (Cornell). Mechanized agriculture is the process of using agricultural machinery to automate the day-to-day work, which greatly increases farm work productivity. A traditional rain-fed agriculture is a type of farming that relies on rainfall for water, which is the method that provides a majority of the food consumed by poor communities. The last agriculture sector, livestock, is an agricultural method of raising animals and selling the goods the animals produce. A good example of this would be a farmer raising cattle and poultry to milk the cattle and collect eggs, and bringing them to the market to be sold. The main three productions from livestock agriculture are meat, milk, and eggs. A typical civilian farm in Sudan is on average 0.4-1.7 hectares (South Sudan: An Infrastructure Action Plan), which converts to 3.7 acres. On the other hand, mechanized farms are usually utilized for large factories and are normally over 420 hectares (ITA), which is about 1,038 acres. The most common crops grown in Sudan include wheat, sorghum, millet, corn, rice, sesame, groundnuts, sunflowers, beans, chickpeas, and lentils. Sudan also produces certain cash crops, which is a crop that although less common, is purposely made to be sold for as much money as possible. Cash crops grown in Sudan consist of cotton, sesame, peanuts, sugarcane, dates, citrus fruits, mangoes, coffee, and tobacco. Another category of crops grown in Sudan is called

principal subsistence crops. Principal subsistence crops are grains and legumes that are raised to maintain the farmer and the farmer's family only. These crops consist of sorghum, millet, wheat, beans, cowpeas, pulses, corn, and barley. Along with crops being grown on their farms to use for sustenance, most Sudanese families have some form of livestock as well. This typically includes animals such as donkeys, goats, poultry, cattle, and sheep. Main agricultural practices on these civilian farms include landscape management, soil preparation, sowing, manuring, irrigation, weeding, integrated pest management, and integrating livestock and crops. The irrigated agriculture sector area consisted of about two million hectares, or 4,942,107 acres, in 2015 (International Trade Administration). Although this may seem like a vast amount of land and Sudan has a high record of agricultural jobs, many parts of the country have been going through challenges with changing weather patterns that in turn impact their livelihoods.

Currently, Sudan is facing one of the worst food insecurity crises in history. Nearly 25% of their population of 45 million is incredibly food insecure, even including some in Sudan's capital, Khartoum. Climate change is a leading factor to food insecurity and prices throughout the country are rising as a result of crops being scarce and hard to grow. Climate change has had negative impacts all around the world, but in Sudan particularly it has caused major flooding of houses, and destruction of farmland. Food insecurity has also been causing poor large-scale economic conditions, serial production shortages, low access to livestock products, and high food prices. Many vulnerable families in South Sudan continue to depend on food assistance to get the bare minimum amount of nutrition for their families. As a result of undernourishment and food scarcity in the community, prices go up and more families are not able to afford food, causing more disruption to their daily lives. As a result, most households that do not harvest their own crops and livestock are at a higher risk of famine and malnutrition.

One of the biggest concerns in food scarcity for the Sudanese is malnutrition in children and pregnant women. In 2020, there were about 290,000 children facing severe malnutrition, one million children facing moderate malnutrition, and 470,000 malnourished pregnant women. There are also many barriers in the workforce in Sudan, and most are directed towards women and working-age young adults. Almost half of the unemployed Sudanese population are under 25, and female youths are 55% less likely to be employed (World Bank Blogs). Unlike most women, most men in Sudan have a basic education and have better opportunities finding employment than women because of this. Sudanese women have less than a third of the legal rights men have and much less access to economic opportunities. In addition to this, women in Sudan face more constraints beyond the legal framework, such as access to personal independent finance and authority in the family and workplace. Although women are legally allowed to participate in the workplace, they are restricted in their options of clothing, do not have adequate representation in the government, and are often forced into marriage at a very young age, preventing them from building a career of their own. Overall, Sudan is not a progressive country for women's rights and is one of eighteen countries in the world where women need permission from a male guardian to work for a wage.

The topic of this research paper, climate volatility, is the greatest opportunity to address the challenges facing Sudan. Climate volatility is a barrier to food security because Sudan's temperatures are expected to rise between 1.1°C and 3.1°C by 2060, which causes plants to wilt faster and droughts to occur (CNN). Increased temperatures can also result in rainfall becoming erratic and inconsistent, which would be increasingly unsuitable for irrigation agriculture. A change in weather conditions could lead farmers to lose a large amount of their crops and would raise prices of goods as a result. This relates to food security because as the temperature increases due to climate volatility, so will the price of goods and services in the agriculture community, which many Sudanese people cannot currently afford. It is estimated that 1.9 million Sudanese people will be impacted by reduced agricultural and livestock production as a result of climate change (The World Bank).

As of right now, Sudan is one of the most vulnerable countries in the world to climate volatility and the worsening conditions in which to produce crops. Droughts and low amounts of rainfall over the past few decades have put a lot of stress on the region's agriculture and livelihoods in rural areas. Droughts have been affecting all countries in the Sahel belt, but the worst areas impacted include Northern Kordofan, North States, Northern and Western Darfur, and Red Sea and White Nile States. To improve food security, it is imperative to first look toward ways to subsidize the farmers and food production areas to aid in the ways climate change has been affecting their agricultural production. Once a cause of the decrease in food production is identified, a solution can be found by either learning to adjust to a new climate or taking more precautions. An example would be drought and uncommon weather problems from climate change. If there is a drought it would be recommended to attempt different methods of caring for the soil. For example, if there is a drought it would be helpful to reduce tillage, since tillage compacts the soil below the tillage level and leaves less room for water to reach the roots, starving the plants of necessary water.

The second solution that I would focus on would be to look toward trading policies. A major factor in improving food security is focusing on how to get food and supplies to countries that need them. Commercial importing played a major part in improving food security by sending food to countries with low incomes and low amounts of food. By allowing other countries to send in food and resources, with this subsidization, a balance between the level of consumption and production can slowly form without members of the community being food insecure. Historically, international trade has helped many by connecting regions with limited potential and large populations with other countries that have highly advanced agriculture procedures. So far, Sudan has made an improvement within their environment for trade and investments. Sudan has already opened the trade regime by phasing out food and fuel subsidies (African Development Bank Group) and therefore increasing the economy.

To mitigate the effects of climate volatility, the last solution that I would focus on would be to work within the community and adapt to the challenges in agriculture. The United States as a country has resources and funds to quickly adapt to climate change like genetically modified seeds to thrive on low amounts of water and pesticides, but low-income countries like Sudan do not have these technologies. The Sudanese people need more than just food shipped from other countries, they need a solution to the climate crisis and a plan. The government of Sudan has attempted to make plans to battle climate change in the past, however not many have come to fruition due to political volatility in the country. Recently there has been more of a political movement in agriculture by the Agricultural Revival Program (ARP) in 2008. The ARP organization is designated to address weaknesses with Sudan National Program of Action (NAPA) objectives for the betterment of their people. Throughout Sudan, there is a local competition for land and water which has only increased over the past forty years. In the 1970 land registration, unregistered land was formally assumed by the state and has been a factor of added conflict in Sudan. Although there are many ideas to adapt to climate change by the Sudanese people, efforts to help agriculture have been complicated by systems put into law such as the conflict between land ownership under customary law and land ownership under statutory law. Land ownership under customary law gives the rights of government-owned land to indigenous communities, whereas statutory law provides land to those who purchase it regardless of who owned it originally. The problem with this is that many government policies favor foreign investors over the indigenous people and as a result many Sudanese people who have farmed land for generations are bought out by large corporations and forced to leave (World Resources Institute). This as well as internal government conflict has been halting the progress of Sudan to fight the effects of climate change overall.

Overall, there has been work done to help climate change in Sudan, but unfortunately it is not nearly enough to bring those living in Sudan out of food insecurity. Throughout history, Sudan has been

consistently challenged by drought, erratic rainfall, and uncommon weather patterns, all caused by climate volatility. However, with the increases in average daily temperature from year to year, these challenges are all magnified and unfortunately, there have not been many real steps taken in recent years to help combat these issues. Unless these issues are addressed, conditions will continue to worsen and agricultural crops will become lower in supply than ever before, causing more families to suffer from food insecurity and malnourishment.

## Sources

- A. (2020, May 21). *South Sudan*. AFS-USA. <https://www.afsusa.org/countries/south-sudan/> a Href=/Team/Alvin-Etang-Ndip Hreflang=En>Alvin Etang NdipJonna LundwallEiman OsmanJennifer WistrandSudan's women and youth are severely economically deprived: A study on Sudanese market trends. World Bank Blogs. <https://blogs.worldbank.org/africacan/sudans-women-and-youth-are-severely-economically-deprived-study-sudanese-market-trends#:~:text=Almost%20half%20of%20unemployed%20Sudanese,opportunities%20finding%20employment%20than%20females.>
- Africa, J. S. (2021). *Sudan offers jobs in mining, agriculture, tourism, oil production by* *Jobserveafrica.com*. Job Serve Africa. <http://www.jobserveafrica.com/country-fact-file/48/sudan>
- Agriculture - Sudan - located, export, area, crops, farming, infrastructure*. (2010). Nations Encyclopedia. <https://www.nationsencyclopedia.com/Africa/Sudan-AGRICULTURE.html>
- Britton, B. C. (2016, December 8). *Climate change could render Sudan "uninhabitable."* CNN. <https://edition.cnn.com/2016/12/07/africa/sudan-climate-change/index.html#:~:text=Sudan's%20temperature%20is%20expected%20to,either%20floods%2C%20or%20severe%20droughts.>
- Buckler, E. (2022, January 11). *List of Agricultural Practices | Steps and Importance*. CropForLife. <https://cropforlife.com/list-of-agricultural-practices/>
- Certified Crop Advisor study resources (Northeast region)*. (2021). Cornell University-Soil and Water Management. <https://nrcca.cals.cornell.edu/soil/CA3/CA0324.php>
- Climate Change Adaptation and Decision Making in the Sudan*. (2013, September 23). World Resources Institute. <https://www.wri.org/our-work/project/world-resources-report/climate-change-adaptation-and-decision-making-Sudan>
- Education*. (2020). UNICEF Sudan. <https://www.unicef.org/sudan/education#:~:text=Conflict%2C%20a%20lack%20of%20awareness,from%20sending%20children%20to%20school.>
- How does trade improve food security - Google Zoeken*. (2001). United States Department of Agriculture. <https://www.google.com/search?q=how+does+trade+improve+food+security&oq=how+does+t&aqs=chrome.69i59l2j69i57j0i512l7.3676j1j7&sourceid=chrome&ie=UTF-8>
- subsistence farming | Definition, Characteristics, & Facts*. (1998). Encyclopedia Britannica. <https://www.britannica.com/topic/subsistence-farming>
- Sudan*. (2020). Global Climate Change. <https://www.climatelinks.org/countries/sudan#:~:text=Sudan%20is%20among%20the%20most,dominant%20livelihoods%20in%20rural%20areas.>
- Sudan - AfDB Agricultural Agreement*. (2017). *Africa Research Bulletin: Economic, Financial and Technical Series*, 53(12), 21547B. <https://doi.org/10.1111/j.1467-6346.2017.07476.x>
- Sudan - Agriculture, forestry, and fishing*. (2022). Encyclopedia Britannica.

<https://www.britannica.com/place/Sudan/Agriculture-forestry-and-fishing>

*Sudan - Food and Agriculture Value Chains*. (2012). International Trade Administration | Trade.Gov.  
<https://www.trade.gov/country-commercial-guides/sudan-food-and-agriculture-value-chains>

Thelwell, K. (2020, September 17). *5 Facts About Women's Rights in Sudan*. The Borgen Project.  
<https://borgenproject.org/5-facts-about-womens-rights-in-sudan/>

*What can increased heat do to agriculture - Google Zoeken*. (2016). United States Environmental Protection Agency.  
<https://www.google.com/search?q=what+can+increased+heat+do+to+agriltute&oq=what+can+increased+heat+do+to+agriltute+&aqs=chrome..69i57j33i10i299l2.12130j0j9&sourceid=chrome&ie=UTF-8>

World Bank Group. (2021, October 18). *Moving Towards Sustainability: The Livestock Sector and the World Bank*. <https://www.worldbank.org/en/topic/agriculture/brief/moving-towards-sustainability-the-livestock-sector-and-the-world-bank>