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Mozambique, Climate Volatility

Mozambique: Fighting a Vast Problem With a Small-Scale Solution

Introduction

To an outsider, Mozambique is a beautiful tourist attraction, brimming with endless beaches, delicious food, and wonderful cultural experiences. Adventurers can scuba dive or view the magnificent art of different cultures, such as the sculptures made by the Makondo people. There are national parks and other projects made to preserve the environment and to protect the amazing wildlife ("Mozambique Travel Guide", 2021). This all sounds like a dream. The 31 million Mozambicans have a different perspective, unlike this fairytale description. The mostly rural population experiences the burdens of a lacking infrastructure and insufficient agriculture. On top of this, are the seemingly uncontrollable impacts of a rapidly changing climate.

Country and Family

On the southeast coast of Africa, Mozambique is within the range of the Tropic of Capricorn, directly below the equator. This position puts Mozambique at great risk of climate volatility. The coasts are drastically affected by major cyclones and floods, while droughts eat away at agricultural possibilities inland. This relentless climate has also destroyed an already capsized infrastructure ("Mozambique - World Food Programme", 2021). The Mozambican Civil War has left this developing country in pieces (Momodu, "The Mozambican Civil War", 2020). Although the livelihoods of Mozambicans are improving with help from worldwide organizations, there is still a lot of room for stronger enhancement of their lives.

The lives most influenced by climate issues are the rural population, making up 63% of the population ("Rural Population - Mozambique", 2020). A majority of Mozambicans are farmers and fishermen, who rely on their precious land to survive. 98.9% of these people own around 2.5 hectares of land per household ("Mozambique - Agriculture" n. d.). Women work agriculturally or indulge in domestic tasks. Farmers make stews, maize, and arroz, among other meals, created by their own hands. In addition, much of the rural population build their own homes out of woven straw and other similar resources. On the other hand, the urban population, making up 37% of the total population, has the luxury of food stalls, which are readily available with fresh seafood ("Urban Population - Mozambique", 2020). Disregarding the urban and rural differences of Mozambique, 2 out of 3 people live near and depend on coastal areas for fishing and agriculture ("Mozambique - World Food Programme", 2021). This poses an issue, considering the vulnerability of the coast to such a destructive climate. The war-torn infrastructure of urban areas can not handle the wrath of the weather. Flooding causes erosion and seizes the productivity of farms. On top of these problems, is the farming practice of monocropping, which intensifies the devastation. The large scale natural disasters and smaller scale outdated farming practices withhold the longevity of farms, and greatly derail food security from its tracks.

There are other factors that make the situation in Mozambique worse. 70% of people under age 35, a majority of the population, cannot find stable employment. Extraction projects of mineral and gas, despite making up much of the nation's exports, are unreliable (Cowie, 2014). This leaves most people as farmers, as it is the most stable occupation available, even with the climate's attacks. Families also lack access to important resources that could make the difference between life and death. 30% of Mozambicans have no access to healthcare (Olivier, 2019). This leaves people vulnerable to diseases caused by unsanitary living conditions. To put this into perspective, there is an open defecation rate of 36%, and 49% of the population has no access to clean water. Along with this, are the low levels of

education (“Water, Sanitation, and Hygiene” n. d.). Grades 8 and above are not mandatory, leaving Mozambicans with a missed opportunity to learn. Along with this, there are only 82 secondary schools (“Education Fact Sheet” n. d.). For comparison, America has 24,000 (TBS Staff, 2018). In addition, only 1% of girls who go through the school system actually go on to college (“Education: Mozambique”, 2016). Living in these circumstances, without a reliable food source, is an exponential problem. There are clearly many factors that play into Mozambique's food insecurity, all of which are exacerbated by climate volatility.

Challenge and Impact

To elaborate, access to resources is difficult, especially when those resources are increasingly degraded and scarce due to weather patterns. Focusing time and effort on education is a challenge when you are fighting every day to survive. Focusing time and effort on sanitation is a challenge when you are farming and fishing with barely enough money to support your family of 5, let alone yourself (“Data Center: International Indicators” n. d.). There are various impacts of global climate change on Mozambique, many of which are directly and indirectly tied to food security. With the climate destroying chances of reliable farming, a majorly farm reliant population feels the drastic effects. Droughts also cause once valuable land to be worthless, as they aid in amplifying erosion and desertification. In terms of society, droughts have caused men to migrate inland to find new jobs to support their families (Ribeiro and Chaúque, 2010). This leaves women to do more agricultural work, all while having more pressure on them to care for their children.

Unsustainable farming practices greatly augment the severe effects of the climate. Monocropping causes crops to be powerless against disease and pests. The soil is also depleted of nutrients and organic matter (“How Industrial Agriculture Affects Our Soil", 2019). The use of pesticides allows water sources to be vulnerable to eutrophication, a depletion of oxygen, as well. With reference to water sources, saltwater intrusion is also becoming a stronger enemy. This issue leads to more scarce freshwater resources, which are vital to agriculture. Exposing farm land to the effects of the climate, along with harmful agricultural practices, puts food security in a position of greater risk.

Susceptible to climate volatility, Mozambique is facing a challenge larger than itself. The destructive climate trends revealed in Mozambique are likely to increase, and the severity and frequency of these natural disasters will continue. By the 2040’s, Mozambique’s receding coast could force 1 million people to migrate inland (“Mozambique” n. d.).

Solutions and Recommendations

The climate itself seems like an unstoppable villain, but there are many organizations that are currently helping Mozambique get back on its feet. The World Food Programme of the United Nations has key steps to reach the goal of a zero hunger status. This organization delivers food to developing countries, and encourages communities on a small scale to use sustainable farming practices. 97 million people across 88 countries were given aid by the World Food Programme (“Overview: World Food Programme” n. d.).

Even with foreign organizations putting their heart and soul into assisting Mozambique, there are still valuable solutions that could be even more effective. One solution entails raising the standards of living in rural areas. This includes infrastructure, which refers to the basic structures upon which a society stands, and Mozambique is lacking this keystone. Drainage systems and strong infrastructure will result in less coastal damage, which will allow for more focus on agriculture and the needs of Mozambique's people in terms of food security. The nation spent approximately $664 million per year on infrastructure in earlier years. This massive number’s significance declines when you know that at least $204 million has been lost annually due to being incompetent against the weather (“Mozambique's Infrastructure: A Continental

Perspective", 2013). Investments in infrastructure have to be towards buildings and structures that are guaranteed to withstand inclimate weather, or else the funds poured into this cause will be useless.

A $120 million project funded by the World Bank tried to fight against flooding. Retention basins and drainage canals were built to protect buildings from the bully of rushing water. Mayor Daviz Simango of the city Beira had faith in these systems, saying they would cause "the end of suffering of a whole population". (Cara, 2019). That is, until Cyclone Idai stormed in mercilessly. The newly set up networks that brought so much hope were ultimately demolished by the category four cyclone. It is clear that if infrastructure is strong enough to withstand the worst, it will bring the best out of Mozambique. If government policies can validate a specific design, composed of a strong, flexible foundation, with concrete and other resilient materials, the safety of Mozambicans can be assured, and so can their food security. The cons of this solution are the willingness of the government to approve such expensive operations, and the expenses themselves. However, with organizations like the World Bank and World Food Programme, this solution could be closer to a reality.

Since the damage of the climate is affecting the coast the worst and most directly, people should also take advantage of the vast farming area inland. Only 16% of land suitable for farming in Mozambique is currently cultivated ("Agriculture and Food Security: Mozambique", 2017). There is so much potential acreage available if the more arid land can be irrigated. There are many types of irrigation, a couple being surface and subsurface irrigation. Due to Mozambique's climate, surface water irrigation would not be ideal due to evaporation, but there are countless groundwater sources that can be taken advantage of. Drip irrigation has the most potential, due to it being highly effective in tropical and subtropical climates. Evaporation is kept to a minimum, which creates a highly efficient system. Water is distributed into the soil through tubes, either in or above the soil. Watering frequency does not have to be extremely high, and it works in sandy soil. ("Chapter 4: Criteria and options for appropriate irrigation methods" n. d.). Irrigation's practicality is perspicuous when researching the results of groundwater studies done in the nation.

The hydrogeology of Mozambique reveals that almost an entire third of the country consists of sedimentary rock, which is very permeable. This relates to how easily a liquid, water in this case, can flow through a pervious solid. High permeability is a significant characteristic that indicates the ability of certain rocks to be high quality aquifers or retainers of water. Connecting back to irrigation, groundwater, found in abundance in aquifers, is extremely beneficial as a supply for irrigation. Therefore, finding these naturally occurring zones of sedimentary rock aquifers is advantageous for irrigation systems in Mozambique. The most productive sedimentary rock in this regard is the cenozoic variety, which is easily replenished through high rainfall. ("Groundwater Quality: Mozambique", 2002). This kind of rock is mainly found near the coast, but it can also be located inland. The groundwater in Mozambique is fairly close to the surface as well, ranging mostly from 7 meters below ground level to 25-30 in the south ("An initial estimate of depth to groundwater across Africa", 2011). This would make irrigation much easier to provide, considering the low depth, as well as the groundwater locations themselves, which are near populous areas of the country. However, the expenses and movement of people inland would be an obstacle. Education on the mechanics of the irrigation systems would be tough as well. And even though arid land is not beneficial to people, there are still a vast number of species that live there, so habitat could potentially be destroyed. Despite these cons, the World Bank has managed to fund an irrigation project in Mozambique before, and there was a lot of success on a small scale ("Mozambique: World Bank Approves $55 Million", 2018). Even if a larger scale project can not be approved, there are still opportunities to gain a lot of positive impact by reaching out to smallholders.

Overall, it seems that large scale solutions regarding infrastructure and irrigation may be out of reach. Helping out farmers on a small scale is more realistic than making drastic changes to government policies in regards to the prior solutions. This is not to say these solutions can not be implemented, but rather,

sustainable agriculture will bring about the best results. Infrastructure can be improved upon, but if farmers still use detrimental practices, then the cost it takes to build infrastructure will not be worthwhile. Irrigation will also lack success if Mozambicans don't pair it with healthy methods of farming. Both of these situations could be worsened by the rapidly changing climate. So while these other solutions may come in the future, sustainable agriculture should be focused on in the present. It will provide a foundation for the other methods to be built upon.

The best countermeasure to the pressing issue of climate volatility is small-scale agriculture. Mozambique's climate is subtropical, and due to this, has very extreme seasons, on both the scorching, dry end of the spectrum, and the wet, humid side as well ("Climate Data" n. d.). Rainy and dry seasons result in floods and droughts, both of which doom the livelihood of crops and the farmers growing them. By farming during growing seasons with the most desirable weather conditions, more food can be made over time. Even so, the impact of this change can be even more promising. This variable is sustainable agriculture. Introducing more practices that can be taken advantage of during favorable seasons can increase the productivity of farms.

Crop rotation is a great practice for Mozambicans to utilize. Rotating the crops that are being grown in a specific plot helps the soil retain nutrients. For example, one growing season could consist of corn, while the next could consist of a species of legume. Therefore, the crops themselves will be more nutritious, leading to Mozambicans not only being less hungry, but also being more healthy. This is a major game changer, considering that the level of chronic malnutrition is 43% ("Nutrition" n. d.). Another great practice is polyculture, which also takes advantage of growing more than one crop, but it differs slightly, in the fact that it refers to growing them all at the same place, at the same time. These balances between crops are much more beneficial than monocropping. This harmful method confiscates nutrients out of the soil, due to planting the same crops repeatedly. This action results in nutrients constantly being taken from the soil without cessation. The soil is then depleted of moisture and any organic matter, rendering it useless. Destruction is pushed further by the weather, in which the barren soil can now be eroded and washed away. Moreover, since agriculture is occurring on the weather-worn coast, where the bulk of the population is, land will still be destroyed despite changes in practices. This means that to fight against climate volatility, truly making the most of growing seasons will yield the best results.

Another technique that is highly efficient is agroforestry. Building up the land with a collective number of shrubs and trees not only protects the soil from erosion, but also establishes greater biodiversity, to fend against disease and parasites (Rinkesh, 2020). These practices highlight the importance of sustainable agriculture in regards to food security. Preventing the land from being overworked ensures that food will be available for generations to come. Having a reliable source of sustenance also means Mozambicans will be prepared for inclement weather conditions. In addition, since Mozambicans are already highly adapted to a farming lifestyle, implementing new practices is not an extreme challenge. Asking Mozambicans to shift away from traditions may cause conflict, but actions speak louder than words. With the distinguishable difference between soil quality and food availability, it will be clear to farmers that these new changes will help them in the long run.

To continue, the needs of Mozambique, which are attacked by the climate, would be met successfully with a stronger focus on sustainability. As time goes on and people take advantage of the new knowledge of these practices, agricultural management at a small scale will spread rapidly, and lead to having much more reliable food sources. Future generations will not have to be so wary about when their next meal is coming. Farmers can take advantage of the growing season which occurs mainly during October and November, when it is the rainy season. Tropical cyclones occur at their highest activity in January and February ("Why Cyclone Idai was so destructive", 2019). This means that the most productive growing season is not in alignment with inclement weather. The fact that the growing season occurs a month before the cyclones are at their worst incurs that Mozambicans will be prepared and stocked with food.

By utilizing crop rotation, polyculture, or agroforestry techniques, for instance, Mozambicans can gain a larger income of crops without vitiating fertile soil, all while not having to worry about destructive weather.

These sustainable methods can, during growing seasons, resolve this problem and lessen the effect the climate has on the country's food security. The way in which these solutions would meet Mozambique is relatively simple. It is less expensive to have teams teach communities, rather than having organizations lobby the government to make policies that allude to sustainable agriculture. Organizations like Farm Africa and World Agroforestry send teams to African countries ("Community Agroforestry" n. d.). They teach small circles of people about sustainable practices ("What We Do" n. d.). Supporting these non-profit efforts can really make a substantial change in Mozambique. Just as people have made differences in their communities by working together, people can make differences outside of their own sphere of influence. First world citizens, and developed countries in general, can donate to these organizations, to push them further in their missions. Manifesting a true image of what Mozambicans experience to developed nations will lead to more support for the country.

Some policies in Mozambique's past have entailed nutrition and food security, but lack the idea of adopting sustainable practices. The Technical Secretariat for Food Security and Nutrition, for example, was created to increase security in food and consolidate governance aspects of the country ("The Right to Food", 2013). The Southern African Development Community (SADC) enacted the Declaration on Agriculture & Food Security (2004), which more strongly focused on sustainability. The Member States, including Mozambique, promote and advocate for sustainable agriculture, as they recognize its importance in food security and the overall development of the economy. As of the Declaration, 80% of people in the Southern African community rely on agriculture for food and income ("Agriculture and Food Security" n. d.). This distinctly reveals the significance of ameliorating agricultural practices. The Food, Agriculture and Natural Resources (FANR) Directorate of the community creates sustainability programs, specifically in food security, crop and livestock production, and fisheries ("Food Agriculture and Natural Resources" n. d.). The Southern African Development Community has the ability to monitor conditions in several African countries, and has programs in place to aid them. Policies which advocate directly for sustainability will be most beneficial for Mozambique, and will help agricultural practices to actively stop the climate's teeth from sinking in and stagnating the economy.

There are difficulties that arise with the ideas of the solution of sustainability. For example, there is the fear of foregin aid. Garret Hardin, an influential ecologist with a pessimistic view, was concerned that foregin aid would lead developing nations to rely on their developed counterparts. Hardin was apprehensive because he hypothesized that foreign aid would lead to the unproductivity of developing countries, as well as their inability to care for themselves (Hardin, 1974). However, this view does not apply to sustainable agriculture. Once farmers understand the ups and downs of sustainable methods, they will be helping and supporting themselves, without the need for reliance on an industrialized nation.

Conclusion

Just as Mozambique's crops grow from the Earth, so does it's solution for securing food. Although climate volatility can not be stopped easily, its effects on the livelihoods of Mozambicans can be brought to a halt. With a base founded on farmers utilizing agriculture, a phenomenon of a structure will be supported, in which society will be improved upon. The defeat of hunger opens a door to eliminating poverty and unsanitary conditions, and enhancing the lives of Earth's people. Sustainability is and should be the starting point of saving nations from food insecurity, especially those impoverished by the climate. The amazing country of Mozambique is no different. Irrefutably, sustainable agriculture is the thorn in the lion's paw of climate volatility.

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