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**Zimbabwe, Factor 5: Climate Volatility**  
**Planting Seeds of Change for Zimbabwe's Drought**

All life on earth depends on plants. They are our oxygen suppliers, energy producers, and nutrient providing organisms that let all of the human race thrive and flourish. Most of those plants, of course, started out as seeds. Seeds are the embryo of mother nature, bring with it the ability for humans to develop and evolve into more complex creatures. The countries of the world should often be seen as seeds: some are sprouting from their cotyledons, other countries are still buried in the ground, failing to come up into the surface as a result of not receiving enough nutrients. The one thing they all have in common though is that they have the capacity and ability to mature and develop into beautiful flora that can help the human race reach its fullest potential. Zimbabwe is one of these countries. Located in southern Africa, Zimbabwe is bordered by Mozambique, Zambia, and Botswana. Currently, they are facing one of the most horrific fluctuations between droughts and floods anyone has ever seen. The cause of this is directly influenced by El Niño, deteriorated by politics in the country and both resulting in a domino effect that has economically and socially destroyed the lives of Zimbabwe citizens. Examples of such destruction include the rise in food prices, poverty, and illnesses within this western African country leaving “2.8 million people in need of food” (Green, 2016). It is imperative that a new program is administered within the country. One that picks up Zimbabwe back on its feet, guiding it towards a brighter future. This program would be referred to as “the Systematic Elimination of Emergency Drought Service (SEEDS) Program”. It would entail four types of “SEEDS’ ”: drought-resistant seeds, cloud seeding, seeding new farming knowledge into Zimbabweans, and ceding away old memories. All four combined would help the country to germinate, blossom, and bloom into a new era of economic and social reform, leading to food security.

To first provide solutions for the issue, though, it is important to understand the background of Zimbabwe itself. The population of Zimbabwe is around 14 million. A family, on average, consists of four kids and a 20-year-old mother (Central Intelligence Agency, 2018) and kids should expect to live up to 60 years old. 13.5% of the population suffers from HIV and/or AIDS, and the risk of diseases, such as malaria and typhoid fever, is very high (Central Intelligence Agency, 2018). The food insecurity has resulted in the people affected to have worsened symptoms as they have no food to take with their medicine, to fully absorb the chemicals within a certain medicine.

Meals generally consist of vegetables, mainly corn (Central Intelligence Agency, 2018). Thus crop production is an important aspect of Zimbabwean life. A typical farm includes a few acres of a crop such as wheat, 20-30 cattle, and the techniques are often rich in tradition. Most of the population will go into the agriculture field of the labor force already. The nation as a whole should focus on and strengthen this field. The fact that the country relies so heavily on agriculture, is another reason why this drought is so disastrous. Zimbabwe also focused on food crop rather than cash crops, meaning it is not in heavy contact and trade with foreign countries outside of Africa.

The main countries in which they partake trade with are South Africa (47.8% of trade) and Zambia (20.5% of trade) (Central Intelligence Agency, 2018). This, of course, backfires in the past years because they have no one to turn to during the drought as a result of their business partners going through the same climate fluctuations as well. Another aspect that leaves Zimbabwe isolated from foreign help is that

it is in debt with both the world bank and African Bank. Zimbabwe owes both banks around 1.7 billion dollars in total. Both banks are refusing to help Zimbabwe any longer until it can strengthen its economic and political status (Central Intelligence Agency, 2018).

One major political aspect that Zimbabwe employed that the UN did not approve of, was a result of its leader Robert Mugabe. Mugabe was the president of Zimbabwe from 1987-2017. In this time frame, Robert Mugabe has become a controversial figure for his extreme measures in political situations, with one such decision that resulted in the inflation from 2008 to 2009. A dollar soon became worthless. Before that, Mugabe also initiated a land reform program in 1980. Led by a small group of Zimbabweans, known as “Squatters”, they forcefully took white-owned farms and land known as farm seizures. This conflict first began with the colonialism of Africa in which countries, such as Zimbabwe, were invaded by white settlers from Britain. The British settlers also employed the Land Appointment Act which limited what land Zimbabweans could hold in 1930. Zimbabweans were forced into pre-established areas in which they were to farm products to send into Britain, limiting them to farming as their main form of economy.

This also resulted in low crop variance. Their current crops include tobacco, wheat, coffee, and peanuts (Central Intelligence Agency, 2018). This inadequate selection of crops is a mark left by the British that has been carried throughout the history of Zimbabwe for years. It is a selection of plants that are not suitable for the environment as they draw too much water. The crops themselves should be perennial, as they hold more water than annual plants. Out of all of the crops they currently focus on, coffee is the only perennial. In an area in which receives very little water, and in the current years almost no water, it would be important to focus on crops relying on such amounts of water.

The main reason as to why there is such little amounts of water available is due to El Niño. El Niño is the warming of the Pacific Ocean (specifically in the western and central areas). The weather phenomena occurs every four to seven years and results in some places losing rainfall, while others begin to lose rainfall (L'Heureux, 2014). Due to the 2015-2016 El Niño event, there has been a dramatic shift in their climate and a heavy decrease in the rain. 16,000 cattle have died and around “75% of crops have dried up as well” (Liberto, 2016). After the event, Zimbabwe has been oscillating between droughts and floods over the last couple of years. The flooding washes away any seeds or small germinated crops. While the drought immediately dries out any seedlings. The two extreme weather phenomenon work together to decimate any hope of reshaping the economy of Zimbabwe.

Zimbabwe is a mixture of a semi-arid and tropical climate. This is an important factor for considering what types of crops should be focused on in this area. It would be no use growing crops that are drought resistant if they can not handle the climate as well. Some crops that favor this type of climate include wheat (common, Durum, and hard), olives, corn, watermelon, pomegranate, cashew and artichoke (Creswell & Martin, n.d.). Out of these selections, only olives, pomegranate, cashew, and artichoke are perennials which are the first SEEDS. What is also great about perennials is that most of them will appear year after year as long as the plants themselves are not severely damaged. This will also save Zimbabwe money as they do not have to buy seeds repeatedly in large batches, leading Zimbabwe immediately into independence. For mass crop production, sorghum and millet could be used as well for their well-known ability to maximize little amounts of water. Another option for seeds are Genetically Modified Organism (GMOs). Currently, there are seeds being developed that are genetically modified to take up less water (Hu & Xiong, 2014). The seeds span from wheat to corn to melons, letting drought-ridden countries to expand to various crops. Implementing these GMO crops would ensure that the plants can handle the

heavy droughts. While the perennials are drought resistant, it doesn't ensure that they can handle extreme weather. The GMO crops are full proof in their effectiveness against lack of water. The only issue is that the seeds are still in the process of being developed. Perhaps in the future, Zimbabwe could implement this part of the program.

The second SEEDS that will be implicated is cloud seeding. Cloud seeding is the "application of silver-iodide, dry ice, or salt to nearby clouds" ("Cloud Seeding," 2013). The distribution of the chemicals is done through ground-based generators, rockets, and various aircraft. When the chemicals reach the air, the water vapor quickly cools down to ice crystals, that then melt due to warm surrounding temperatures ("Cloud Seeding," 2013). This causes precipitation to occur at a faster rate than previously observed in the climate, resulting in better and quicker plant/crop growth. This could be implemented during drought periods and stopped during flooding seasons, thus avoiding the addition of more water when it is not needed. It is also important not to implement cloud seeding tremendously to avoid the integration of humanitarian assistance into the ecosystem. Some are also concerned about whether or not the process will work in Africa. Tests have already been implemented in South Africa in which cloud seeding was successful (Mather, 1997). The seeding process has been modified to suit the stratosphere in Africa, thus accelerating precipitation. While yes the test was done 21 years ago, companies have developed even better technologies for cloud seeding, meaning that if it worked in 1997, it will work today.

A prominent issue with this method lies in silver-iodide. The silver-iodide is a disputed method with many believe it is toxic to lower organisms. While other methods utilizing this compound may have harmful results, traces of silver iodide or its components have not been found in areas where cloud seeding has taken place. A study was done in Nevada, a state where this process is often implicated, in which one hundred lakes near cloud seeding zones were analyzed. Each lake showed an average of only 0.01 micrograms per liter in water formations. The limit of the amount of silver in water before it becomes poisonous is about 50 micrograms of silver per liter (Korneev, Potapov, & Shchukin, 2016). Not to mention that the lakes themselves have been studied since the 1980's and since then, the makeup of the water itself has not changed dramatically (Korneev, Potapov, & Shchukin, 2016). Dry ice and salt, on the other hand, have no environmental detriments. While in the air, the components of each break into harmless molecules. Many are also concerned about the fact that the rise in the rain will greatly affect the ecosystem. In the case of Zimbabwe though, the original ecosystem requires a large amount of rain. By administering cloud seeding, it is benefiting the plants and animals restoring the ecosystem.

Education is another one of the SEEDS that can be planted within the mind of Zimbabweans. If they chose to follow through with the program, they will need to be taught about the components of cloud seeding. It is also important as they might need a guide to farming new products such as artichoke and millet. To minimize the price, college students and professors could set up a global education program, specialize in teaching a certain area of one of the SEEDS, and bring it to Zimbabwe. They could have a foreign cultural experience while gaining credits, and the Zimbabweans will be better prepared for the new age of agriculture. It is also imperative that the Zimbabweans educate us on what they know will not work, or whether or not the program is effective. Learning is a two-way street in which both persons involved have to educate each other.

The last of the SEEDS is one that Zimbabweans are going to plant themselves: Ceding of hated and damaging governmental figures. The past president Robert Mugabe has created an environment in which the Zimbabwe people don't trust people in power anymore. They need to let this distrust go to fully integrate the program and move forward as a nation, while still being somewhat alert enough to recognize

a detrimental political figure. If their new president Emmerson Mnangagwa is showing signs of suspicious activity or choices, the people need to stand up and remove him from office as quickly as they can. If need be, they could call upon the help of the UN for help against government. Hopefully the government will be for the people and for the improvement of agriculture. To show their support, they could help organize the funds they have (or will receive) and put it towards the SEEDS program. Of course, this doesn't happen overnight, and it will take time, but the government and people need to work together efficiently to bring the country back from its knees.

A major issue for the SEEDS program is the funding. As stated earlier, Zimbabwe is no longer receiving funds from the UN or the African Bank, the largest sources of loans. To get a loan from either program, Zimbabwe needs to become financially stable. To become financially stable though, they need loans. This creates a cycle in which drives the economic prosperity down the drain. As of May 2018, the UK gave Zimbabwe one hundred million dollars. Theoretically, it could cover most of the costs associated with cloud seeding, and the new seeds. Another option would be a secondary program referred to as Students Eliminating Emergency Droughts by Localized Investing in Newly Generated Seeds (SEEDLINGS). SEEDLINGS would be implemented in schools across America. Each school would "purchase" an acre of land and raise enough money to cover the price of seeds per that acre. There could be officials to track the money and make sure its being properly used for seeds. This avoids any conflict in stolen funds or misuse of the money obtained. It also creates new job opportunities while getting more students involved in global issues.

As stated earlier, Zimbabwe is a seed in which needs outside assistance to solve it's growing issues. Through the four SEEDS, Zimbabwe can strive to be a more independent and drought resistant country. The first step includes crops that use the minimum amount of water possible. Whether its artichoke, millet or genetically modified crops, any one will boost the economy and trade. Cloud seeding would mechanically manipulate the environment for a short period of time to increase amounts of rain. Crops would stay healthy during the drought, increasing the amount and quality of the product produced. In all of this, students will be engaging and educating Zimbabweans on the SEEDS program and new farming techniques. Both groups would benefit greatly, and the Zimbabwe people could carry the program into the next generations. Finally, the people themselves will have to take charge of their government. They must step up to those who are bringing the country down to fully rise out of the ground. The four-step Systematic Elimination of Emergency Drought Services will lead Zimbabwe into a new era of prosperity and growth. Soon, the world will truly see the seed that is Zimbabwe bloom into what it once was: the breadbasket of Africa.

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