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Mali, Factor 5: Climate Volatility

### **Mali: Increasing Food Production by Adapting to Climate Volatility**

About nine billion people will live on planet earth by 2050 (*Global Challenge*). Scientists have currently found no other place in the solar system where human life can exist. Since there is no other planet that people can go to, our only choice is to make changes and sustainable choices here on Earth. Everyday the people of Mali struggle from inconsistent weather and climate conditions. Although more than half of the economy in Mali is sustained by agriculture, land in Mali is very dry and barren due to sparse amounts of rain, and increased seasons of drought. Affected by these conditions, farmers are inadequately prepared to protect and sustain the crops they have grown. Without regular rainfall, farmers struggle to sustain their crops, and are therefore unable to provide for their families and communities. Changes in the climate are leading to many diverse health issues and a decrease in amount of food available for the people. Being unable to fight against climate volatility is leaving many struggling, as Malians need to feed their families each day. Without climate adaptation and a plan of action, the people of Mali will continue to struggle with climate change.

Located in the Northwestern part of Africa, Mali is surrounded by six different countries. Unlike most countries, northern and southern Mali are complete opposites from each other. Northern Malians are mostly nomadic, moving from place to place. The north has an arid climate, whereas the very populated south is fertile due to the Niger river ("Mali." *CultureGrams*). The people of Mali depend greatly on the Niger river for trading goods throughout the country and transportation (Clark). The Niger valley and the flooding of the Niger river are both very important in sustaining the agriculture of Mali, providing nutrient rich soil for farmers. Areas outside of the Niger valley struggle with keeping nutrient rich soil, and often struggle with farming due to evaporation and the hardened crust (Clark). Farming and herding are responsible for almost half of Mali's GDP. Of the 1.4 million hectares of cultivated land in Mali, most of the land is used for subsistence farming. Farmers are mainly known for their production of corn, cotton, millet, peanuts, rice, sorghum, sugarcane, and vegetables (Library of Congress). Farming and growing crops and other agricultural produce is very important as farmers need to be able to sustain their lives and their families. Millet and corn are both used in a variety of meals in the north and south along with milk, dates, fish, and meats ("Mali." *Our Africa*). Although the people of Mali seem to have a good balance of food types, malnutrition is still a huge problem in Mali. During the dry seasons, when there are no grain crops, people eat fruit as a main meal because of the scarcity of crops ("Mali." *CultureGrams*). However, even in hard times, when food is scarce, families and communities are still very important to the people of Mali.

In Mali, households live as an extended family in compounds. These compounds are surrounded by a wall, and consist of many buildings that are used as homes, cooking huts, washing rooms, and storage. Malians use a mixture of different materials to build thick mud-like bricks to build up a home. Since Malians are not using sustainable materials for building, the people are having to frequently fix and maintain their homes in order to keep them in working condition ("Mali." *CultureGrams*). Urban homes compared to homes found in rural areas differ greatly. Although urban homes are modern, and consist of more luxuries, they are typically smaller than rural homes ("Mali." *CultureGrams*). Families and communities are very important to the people of Mali, but still do not see education as an important aspect of their daily lives.

The educational system in Mali is struggling. The literacy rate in Mali is 26.2 percent, meaning that about one fourth of the population above the age of fifteen have the ability to read and write. Students that

should be in school have dropped out, and the students that are attending school do not learn anything new. (“Major Problems Facing Mali Today”). The people of Mali are working so often, they feel as if they have no time for school, and do not see education as a high priority in their lives. Not only do Malians lack education, the healthcare system in Mali is also very poor. These healthcare problems can relate to unstable hygiene and sanitation practices, poverty, and malnutrition. “Mali has one of the world’s highest rates of infant mortality with 111 deaths per 1,000 births and a life expectancy of only 52 years. Medical facilities, medications and doctors are in short supply. One doctor usually serves about 20,000 people” (“About Mali”). The northern territory of Mali struggles more with very hot temperatures, not much rain, and an increase in desert area in the country. According to the USAID from the American People, the people of Mali face different changes in the climate all year round. Although the government has taken steps to improve adaptation to changes in climate, there is still a dire need for more improvement within the smaller individual communities and villages in the country. (“Agriculture and Food Security”). Within individual communities, water management is in need of change.

All water resources are very important to help sustain the economy of Mali. Different changes in the climate have made it difficult for the people of Mali to receive an adequate amount of water for their daily lives. Droughts and erratic rainfall within Mali have had a drastic effect on the surface water in Mali. Different water resources help support and maintain the Malian economy, helping withstand agriculture, fishing, tourism, and livestock herding. When changes occur, communities suffer from a lack of water (“Agriculture and Food Security”). Mali has been experiencing more frequent droughts, and less rain. Since 1998, the annual rainfall has dropped thirty percent leaving 1.8 million people in need of food aid. (“Agriculture and Food Security”). Not only is water important for Mali, but agriculture sustains 80% of the labor force. According to the USAID, there will be a decrease in production of crops due to less rain, an increase in the dry season. By 2025, it is projected that Mali will lose 2,500 tons of millet and sorghum production compared to a 150 ton loss in 2005 (“Agriculture and Food Security”). Changes in weather and climate conditions are projected to fluctuate more in the upcoming years, leading to food and crop resources being unstable and a greater impact on income. Changes in the climate are negatively affecting the health of the people in Mali.

Malians are suffering from heat extremes, and rapid changes in weather conditions such as droughts, floods, and storms (“Agriculture and Food Security”). Since the people are continuously living in these conditions, their health is being put in jeopardy. The changes in climate have led to people having illnesses related to changing temperatures. These illnesses along with cardiovascular and respiratory diseases can lead to an increase in poverty, and an increase in child and infant mortality (“Agriculture and Food Security”). The population of Mali may be more prone to infectious diseases, water-borne diseases, and compound hunger if climate volatility continues to occur (*Potential Impacts of Climate Change*). Not only is climate change affecting the health of Malians but is also feeding the food security problem. 4.1 million Malians are food insecure, and about 750,000 children are struggling from acute malnutrition (“Mali.” *Food and Agricultural Organization*). After the military crisis in 2012, seventy five percent of the people in three northern cities were suffering from food insecurity. Since so many people were going hungry, fifty percent of the families had to sell or mortgage their most important items. Nutritional problems are responsible for almost fifty percent of the child deaths in Mali and although the issue has not gotten worse, there has been no measurable improvement (“Agriculture and Food Security”). Although progress has not been made, sustainable enhancements can make adapting to climate volatility much easier.

Drip irrigation systems have been spreading throughout different cities and countries. This is helping to decrease the amount of water used, and adjust to climate change. This system starts with a tub of water that stores water for the crops. The water moves through tubes that will run from the tub to the rows of crops with individual spouts that deliver water to the base of each individual crop. This drip irrigation system helps reduce evaporation, produce more economically sustainable crops, and decrease the amount

of fertilizer that is lost (Bucknall). Drip irrigation also helps reduce the amount of energy needed for growing crops, and controls the amount of water and fertilizer entering the plant (“Drip Irrigating”). Having a way to water and grow crops in a more sustainable way would allow for farmers to produce more food to sell, conserve the amount of water used, provide better nutrients for their families, and grow better selling crops in the dry season that will increase crop production by twenty to ninety percent (“Cheap Drip Irrigation”). Having drip irrigation tubing that is evaporation friendly allows for less water to be lost into the atmosphere due to hotter temperatures and droughts. Using tubing made from polycarbonate or thermoplastic are just a few examples of material that can be used to help reduce evaporation. Another way to reduce evaporation is to water the crops at night. If set on a timer, time spent watering the crops would be significantly decreased, and the sun and heat would not cause the water in the tubes to evaporate. Watering plants at night would allow farmers to purchase less expensive tubing because they would not need tubing that is so evaporation resistant.

In order for an irrigation system to be effective, farmers need to be able to understand and be aware of the technology that they are using. If tubing and the drip irrigation system is not set-up correctly, the system can be damaged and may have a shorter life-span; needing to be replaced more often. For example, Hamado lives in Burkina Faso and is training others how to use the drip-irrigation system that he was once trained on how to use (“Drip Irrigating”). When using drip irrigation, the cost is able to be repaid within six months through increased crop production and usage savings (“Cheap Drip Irrigation”). In Burkina Faso and Ghana, USAID has provided funding for the equipment needed. Before USAID can do anything, farmers must have adequate land and enough money(US\$200) to build a reservoir tank (“Drip Irrigating”). It is important to remember to not only implant an irrigation system in the country of Mali, but to teach the people how to use it, how to benefit from it, and how to keep the system working (Bucknall). Without further instruction, the people of Mali will not be able to benefit from drip irrigation systems.

As seen in Thailand, the people use the rooftop to allow water to run-off into jars for water use in the country. This is an inexpensive way to collect the rainfall that is unstable. Having jars to catch the water allows for water to be available in times when water is scarce or plentiful. “The jars come in various capacities, from 100 to 3,000 litres and are equipped with a lid, faucet, and drain. The most popular size is 2,000 litres, which costs 750 Baht (US \$24.04), and holds sufficient rainwater for a six-person household during the dry season, lasting up to six months” (“Rainwater Harvesting”). Using rainwater collection systems allows the people of the country to work together to produce and maintain sustainable water collection. These rainwater jars are environmentally friendly, and can be built by the people. It is important to make sure that the villagers are educated on proper care and use of rainwater catchment systems so that they will benefit (“Rainwater Harvesting”). They need to be trained on how to use the rainwater jars most efficiently and make sure that the water they are using and collecting is safe.

Drip irrigation and rainwater catchment systems would need to be properly installed on farms all across the country. Rainwater catchment systems can be used by the whole population of Mali, whereas only farmers would benefit from drip irrigation systems. It starts with the rainwater catchment system where rainfall either runs off a clean surface into the tub, or the rain directly falls into the system. In urban areas, rainwater running off roofs into the tubs is more practical for the people. On farms, the people can let the rain fall directly into the tub, or let it run off a roof. The tubs of rainwater would need to be covered to keep all bugs, trash, disease, and waste out of the container. The people of Mali would need to be properly trained on how to clean and maintain the rainwater catchment systems. For farmers, the water stored in the rainwater catchment systems would be connected to the drip irrigation tubes, so that farmers can use the water in their drip irrigation systems. Instead of using multiple systems, this project would connect both the rainwater catchment system and the drip irrigation so that farmer would adapt to the climate and benefit the most. The drip irrigation tubes would need to be placed properly along their rows of crops, and the timing of water would need to be timed correctly. Rainwater catchment systems and drip irrigation are

both sustainable ways to adapt climate change in Mali because of their lasting impact on the country. With cheaper equipment being used, and being able to easily put it together, the Malian people will be more inclined to use the equipment long term.

Although non-profit organizations have already started working on rainwater catchment and drip irrigation, funding, support, more in-depth research and studies are still needed. Without the support of other countries, the people of United States, the people of Mali, the Malian government, and other organizations (The World Bank, United Nations, etc.) nothing will be done to adjust to climate volatility in Mali. People need to raise awareness and be active in implementing and promoting sustainable changes. When people have no knowledge of the problems in other countries, they see no reason or have any desire to help make a difference. If others can see that there is a need for climate adaptation in Mali, they can contribute to the cause. People all around America are engaged and devoted to raising awareness about climate change and food scarcity. Climate adaptation can occur when the civilizations in Mali are connected with the people who are advocating for feeding the world population, with the people who are consistently affected by the climate change. These people in Mali are suffering from terrible climate conditions, but with no way to learn how to stop or adapt to climate change, no improvements will be made.

When rapid changes in the climate occur, growth in a country can be hindered. With the help of hydromet and early warning systems, Mali can reduce the risk of economic setbacks and damage from weather and climate change (“Improving Weather Forecasts”). Hydromet is combining hydrology and meteorology to predict water, weather, and climate changes. Hydromet helps to correctly understand, forecast, and communicate upcoming changes and weather conditions (Ijjasz-Vasquez). Hydromet helps to predict storms, floods, and droughts that are responsible for over 50 percent of disaster-related deaths (*Hydromet Services*). With the use of hydromet services, Mali can boost economic growth, avoid losses in crops and fertilizer runoff, and people can be warned before traveling when bad weather is predicted (*Hydromet Services*). Although there is a dire need for meteorological services, only 10 out of the fifty four countries in Africa offer quality hydromet services (“Modernizing Meteorological Services”). In Japan, using meteorological services has improved their climate change awareness. Japan has found that having a strong and involved government is important to improve hydromet services in other countries. After each disaster, Japan is able to learn new things so that they can make changes and adapt to the new information gathered (*Hydromet*). In certain areas of Africa, rainfall is unsteady and unpredictable. In these areas when weather systems are present, data and information are sparse; rarely getting information to the people of the country (*Hydromet*). Hydromet allows for communities to receive weather data, as they previously were receiving little to no data.

In order to proceed in hydromet and weather services, it is important to get the help and encouragement from the villages, people, and government to see the desired outcome of weather prediction (Modernizing Meteorological Services). Different organizations like the Global Facility for Disaster Reduction and Recovery works around the world to help prevent climate and weather dangers. “The GFDRR helps countries plan and prepare for extreme weather, cooperating closely with national hydrological and meteorological (hydromet) services, disaster risk management agencies, and the World Meteorological Organization” (*Hydromet*). Hydromet services would provide a way for villages, the people, and specifically farmers to be warned of upcoming climate disasters or problems. When they are warned ahead of time, they are able to prepare and get ready so that the least amount of damage is done to the country. TVs and electronic devices are not something of high occurrence in the poor country of Mali. This is where the country needs technology all around the country in order to plan and be ready for disasters and climate occurrences. Advances in the United States have allowed for certain electronic devices and resources to be available without internet access. If hydromet warnings can be internet free, the system would be more cost effective. Although people want to see solutions that cost no money, funding is needed for early warning systems. Poor countries like Mali rarely have time or the money for

electronic devices. If funding provided a device specifically for disaster and weather condition warning, the people would be more prepared for disastrous events (Hydromet).

Community level education about climate volatility would educate the people on a smaller basis with more of a connection and meaning to the people; especially children. Kids are apt to big new ideas and improvements. Many times, reading a pamphlet or booklet is not going to lure someone into making a change that requires effort. They need to be able to see and witness the outcome of what the improvements will produce. The people need to see the outcome of what changes and improvements will do. Without seeing what the climate adaption will produce, people have no desire to invest in something they know so little about. In Mali, there have already been many cases of entrepreneurs making progress and having success with small businesses. Introducing and adding entrepreneurs who are hunger fighters and are focused on fighting climate volatility, will allow for small change which adds up to a larger impact on the country. If people around the world encourage and help these people start their business right, their new businesses could be solely focused on decreasing food and water scarcity.

Climate volatility in Mali ranges from erratic rainfall, to drought, rising temperatures, and flooding near the Niger River. Without help, the people of Mali will continue to struggle to provide for their growing population. Adaptation to climate change is needed so that they will no longer suffer, but prosper because of climate volatility awareness and preparedness. With the help of hydromet services, and a rainwater catchment system working with a drip irrigation system, Malians will be more prepared and effective in their daily lives. A growing population only attributes to the need of more consistent food production. The people must not rely on the finding of another planet for human life, but let the people of Mali grow food effectively and thrive within their adverse climate so that the next generation with not suffer from food insecurity.

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