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Madagascar, Sustainable Agriculture  
**Madagascar: Changing Farming to Reflect a Changing World**

As countries rise and fall, as leaders come and go, and new individuals rise to power, one basic necessity remains: everyone must eat. Third world nations continue to struggle through political and social issues, and those at the bottom; the everyday civilians, are the individuals going to sleep and waking up the next day with an empty stomach that will remain empty. Madagascar is one of the many nations facing extreme food insecurity fed by issues such as: a lack of infrastructure to properly utilize the natural resources at their disposal, low practice of sustainable agricultural tactics that account for terrain restraints, and frequent natural disasters. This island sits off the coast of Africa in the Indian Ocean where, alongside its 25 million inhabitants, there is a wonderful array of plants and wildlife that can be found nowhere else. Although this slice of paradise offers a wealth of biodiversity, over 70% of its people live below the poverty line and many of their small children end up well behind normal growth patterns (CIA World Factbook, 2018). Madagascar receives aid from developed nations, such as the United States, to support the small nation following its frequent natural disasters; and yet, its people remain hungry. By reorganizing their system of agricultural production to account for their volatile weather conditions, Madagascar can effectively implement tactics that will provide lasting benefits and keep Malagasies fed.

Madagascar is home to millions, the majority of which live in a rural setting. A large amount of the abodes of Malagasies are “made from mud with thatched roofs” although there are more modern cement and wood houses (Perry, 2012). Because of the volatility of natural disasters for the African island, houses on the coast often have stilts in case of water emergencies. The high percent of impoverished civilians in Madagascar also leaves many individuals without homes and in many cases leaves them to live in slum-like areas, causing their state of living to be even more dire. The mountainous terrain that constitutes much of the island is a driving force for individuals to live along the coast, but people are also found living in the central plateau portion of the country. Often, an individual’s residence determines the climate and natural events one will experience. Along the coast, an individual will experience a tropical climate rather than a temperate climate felt by those inland, or the arid climate in the southern portion of the nation. Those on the coast are likely to experience water related emergencies such as cyclones while the central plateau of the island oftentimes sees drought. As these natural atrocities strike Malagasy families, the government is tested. The form of government in Madagascar is a semi-presidential republic where executive powers are shared by the president and prime minister. Political instability has remained a pervasive issue in the country as the already struggling nation has an even harder time attempting to support its citizens in the wake of natural disasters.

The average family in Madagascar is made up of a mother, father, and at least “four children” along with other relatives in the house, such as grandparents (CIA World Factbook, 2018). Poverty does not just affect how much food a person eats; it also affects how a person carries out their day-to-day life. The country itself has a relatively high literacy rate; however, they lack in the means of basic technology, which continues to cause even more problems such as sanitation issues prolonged by the use of outhouses and the fact that healthcare remains available mostly to those who reside in urban areas, leaving the majority of the population underserved. Madagascar’s agricultural industry makes up 24% of its GDP; however, this is only being achieved by cultivating 5% of the land; which could be drastically increased (CIA World Factbook, 2018). Malagasy farmers often have plots of about 25 acres with the majority of the bounty being fed straight into the farmer’s family through subsistence agriculture; a common practice

on the island. That being said, a family's diet normally consists of a main dish of meat, poultry, or fish with a side of vegetables and ro, a mix of rice, herbs, and leaves, along with spices. Rice plays a major role in their diet and some Malagasies even say they cannot sleep if they have not had rice that day. There are particular fruits and vegetables that are available around the year such as bananas and zucchini, but isolated regions hardly get some of these items and even when these food commodities make it to the regions, the people cannot afford them (Southall, 2017). They often retrieve their food from their own land, by fishing and hunting, and bartering with one another for specialized goods. They cook their food using kitchens separated from the main living space to prevent damage in case of a fire. The reason why agriculture remains such a prevalent issue is the fact that over 80% of Malagasies are involved in the agricultural sector to make ends meet on about \$1.90 a day (World Food Programme, 2018). Almost "half of all children below the age of five" experience the "fourth highest rate" of chronic malnutrition (World Food Programme, 2018). As many families depend on agriculture, their livelihoods depend on the yield of their farms, and being prone to natural disasters means nothing is certain.

Madagascar is responsible for exporting commodities to nations such as France, Germany, China, United States, and Japan, but without extraordinary initiatives, these practices could come to a halt (CIA World Factbook, 2018). The African island is facing several issues; many that can be alleviated by altering agricultural practices. With "25% of people [living] in areas prone to natural disasters," civilians often lose their homes when events such as cyclones and typhoons hit the coast. Along with the extremely high risk families have of losing their homes to natural events, there are scores of impacts coastal living has to a nation. As families often practice subsistence agriculture; the issue with a coastal disaster is not just the loss of one's home, but also of one's livelihood. The combination of an inadequate environment combined with the high probability of experiencing violent climate attacks, causes Malagasies to often lose their home, their farms, and their way of life. The clear issue is the need to alter the location and process by which Malagasies grow and maintain crops. The loss of crop yields is also, in part, due to using outdated techniques. By utilizing sustainable agriculture, many of these issues can be solved. Only 5% of Madagascar is currently cultivated; this is mostly due to its mountainous terrain. Because so little land is easily available to Malagasies, this small portion of land is being overgrazed and overused. Additionally, to support themselves, to keep their families warm, and to keep their food cooked, many have turned to using timber as a means of living. As a result of excessive logging, oftentimes, this deforested land is not properly utilized, turning previously nutrient rich soil into dry soil with no arable qualities. Wood and coal are used as major sources of energy, but looking towards the future, Malagasies need more eco-conscious energy methods. Madagascar has waterfalls with untapped potential that has the possibility to replacing wood and coal as primary energy resources. After all, the necessity is not in improving finite energy tactics, but transforming the entire agricultural production chain to implement renewable energy practices to support a sustainably-sourced future.

To provide the basis for a food secure future, Madagascar needs sustainable agriculture and they need as much of it as they can get. As of now, the World Food Programme is currently "[pre-positioning] food in remote and disaster-prone areas", "[encouraging] local food purchase", and "[providing] school meals with the support of the Ministry of National Education, and is helping to develop a national school meals policy and a home-grown school meals programme linked to smallholder farmer production" (World Food Programme, 2018). Although effective, this aid cannot be the backbone for a broken system, or else the system will become fully dependent. The way to truly solve the problem is to both move agricultural production inland, away from the coast and the chaotic disasters it endures as well as implementing tactics such as terracing of the mountain landscapes; a feat which is practically unheard of in Madagascar. By taking land that was previously thought to not be arable and making it into successful plots, the country is increasing cultivated land while in a location that provides many more safeguarding mechanisms compared to the coast. Rice patties need a lot of water, but they can easily be drowned. Their

placement on the coast is a problem and by moving production into terraced plots in the mountainous terrain similar to in Asia, Madagascar can sleep knowing one of its most treasured staples is away from the threat of flooding and drought. The issues with this plan arise with water supply. Providing steady irrigation to the terraced land would be difficult, but if the government and World Bank can work collaboratively to create hydroelectric energy systems for Madagascar's waterfalls, aqueducts can also be used to pump clean water into the land and provide a source of water for the people moving to the mountainous terrain. Implementing hydroelectric energy into the country's systems would greatly relieve the stress on forests that are seeing more and more deforestation. Another applicable sustainable practice could be crop rotation similar to the Norwich Region in England that has been using the practice for over 400 years. Crop rotation would allow for a variety of crops to be produced increasing variability in commodities and making the most of arable land without using an exorbitant amount of land. Nigeria is in a very similar situation to that of Madagascar. Nigeria has millions of smallholder farmers like the African island. Their government has promised to insure their farmers through droughts and floods. The fear with implementing the same practice in Madagascar is that these promises have the potential to be empty and the failed attempt to insure farmers could possibly cause more political and social instability than already exists. Just as Norman Borlaug was able to provide extremely beneficial agronomical changes to Latin America and Asia, by using GMOs, higher yield strains of crops, and adapted climate-resistant crops can provide the support for Malagasy farmers that cannot come merely from moving inland. With an already large population that will only continue to grow, it is important to not only maintain the amount of food needed to supply the current population, but to also plan for a changing climate, a larger population, the potential for increasing exports, and the necessity to not just keep stomachs at the bare minimum, but full.

The state of a country, the amount of foreign aid, nor the access to water determines a country's success. A single factor or even a group of factors cannot accurately account for the quality of a country. Success is not based on the actions of a single individual, but rather the will of the majority to collectively benefit from an evolutionary twist on living and surviving in our current world. Madagascar needs to be substantially more food secure and without help, both internally and externally, its civilians will remain hungry. Food insecurity does not merely mean an incessant ache in one's stomach, but a driving force in one's life. Sustainable agriculture is the path to a food secure future, and Malagasies, along with foreign aid, need to adapt with the changing world to satiate its citizens. Moving its agricultural production from the coast cannot solely reverse food insecurity. But changing to more sustainable practices including terracing, crop rotation, agronomy, and renewable energy, the world will finally be able to see a picture of Madagascar and not think of all the natural disasters of the past, but the awe inspiring agricultural tactics leading the country to a healthy, prosperous, and sustainable future.

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