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Madagascar, Sustainable Agriculture

Madagascar: Small Island, Big Problem

Containing only 0.5% of the global landmass and 5% of all species, Madagascar isn't the first country that always comes to mind when dealing with the modern-day problems of the world. However, it should be. It contains 80% of species found nowhere else on Earth and over 99,000 hectares of forest are lost each year (U.S. Agency for International Development, 2019). With a 40% projected population growth by 2030, Madagascar is faced with consequencing threats due to the current unsustainable land management and food growth practices. The first step to finding the problems and their solutions is to learn more about the people they apply to.

Although Madagascar lies closer to Africa, the Malagasy people do not consider themselves to be Africans. Their population is more closely related to that of Indonesia as well as France because of the former colonial rule exhibited there. Most of the Malagasy people live in the eastern part of the country, in the countryside, where life remains traditional in terms of politics and lifestyles. 70% of their population lives in rural areas, whereas 30% live in urban areas. Its capital is Antananarivo, with a population of around 900,000. The Malagasy population can be divided into about 20 ethnic groups. The Merina, Betsimisaraka, and Betsileo peoples are the most numerous ethnic groups. (Maureen Ann Covell, 2021). Written with the Latin alphabet, the national language within Madagascar is Malagasy. Depending on the area within the country, there are local variations in the language, comparable to accents and language ticks within the United States. French is commonly used to interact with visitors, as it is widely spoken and officially recognized. The use of the English language has increased but is not the most common. The people of Madagascar, especially those in rural areas, stick to traditional practices. This includes practicing traditional religions- such as ancestor worship. It is not uncommon for local areas to believe in area-specific spirits as well as taboos. Around half of the Madagascar population in terms of religion is Christian, with varying amounts of Protestantism and Catholicism- although these people still participate in the traditional religious activities. One of these traditions is the way they bury their dead, who are believed to reward or punish the living. The country is divided into systems of provinces, regions, and then communes with provincial and regional administrations. The country faces many health problems due to the geographical lay of the island, such as malaria and many parasitic diseases. The rice fields and streams commonly seen throughout Madagascar create perfect habitats for parasitic species. However, most hospitals are located in cities, making it very difficult for those large amounts of people who live in extremely rural areas to receive medical attention when needed. In terms of living conditions for those in the rural areas, most of their houses are made of woven matting or mud.

In the east, bamboo is the most common tool for housing; in the south using wooden planks that overlap each other. Those who live on the plateau use earth blocks and thatched roofing. The government is consistently looking to inexpensive housing methods, which is proving to become more difficult with the problem of overcrowding expecting to increase. These housing situations make sense based on the fact that Madagascar can be divided into the east coast, the Tsaratanana Massif, the central highlands, the west coast, and the southwest (Geography of Madagascar). Speaking of the plateau, school attendance levels are higher for those who live on there, due to more stable urban areas being easier to reach. Education is required in the country between the ages of six and thirteen. It starts with primary education at age six. Primary education is free and includes five years of schooling. Secondary schooling has a four-year and then three-year cycle of study. There are a few universities in Madagascar: the University of Antananarivo, the University of Mahajanga, and the University of Fianarantsoa. These are of course only

for those able to afford such schooling. In larger families, it is typical to send the males on to higher education. Family sizes vary greatly based on the family's wants and needs. It is more common for those in urban areas to have larger families so there are more people to help with the farm work. The average household is made up of about four to five people (Institut National de la Statistique, 2003-2004). This could increase along with the expected population growth in Madagascar. These people are expected to live off the land that they are surrounded by, using any resourcing they possibly can.

Madagascar has one of the highest poverty rates in the world. Their human capital ranks among the lowest globally. Even more, they have the fourth-highest rate of chronic malnutrition. 97% of Malagasy children at the age of ten can't understand or read a short message, and four out of ten children drop out of primary school before the last grade (Overview, World Bank). The most struggle occurs in rural areas with problems with child mortality, transportation, malnutrition, potable water, and literacy rates. This is all because Madagascar is one of the countries affected the greatest by the ongoing climate crisis that is being witnessed. The food situation is so desperate, that the Malagasy people have resorted to hunting endangered species and partaking in deforestation practices to have access to food and water. This is clearly a problem for several reasons. Those who live close to the forests will hunt anything that crosses their path. When you are starving, it doesn't matter what type of animal. Due to the location of the island and its isolation, things like rising water levels and cyclones lead to drought and food insecurity issues. One-half of the children in Madagascar are expected to experience stunted due to undernutrition, and one in sixteen children die before the age of five (The Borgen Project, 2019). Despite these statistics, there has been an increasing trend in birth rates and population in Madagascar. However, we see this trend not only in Madagascar but across the world. The population is increasing, and the concern is this: will there be enough food? Now, this question is even more of a terrifying thought for the already poverty-stricken country of Madagascar. If nothing is done about the malnutrition and unsustainable practices being done, the farmland will no longer be usable and it will not be possible to feed the multiply mouths in the country. Slash-and-burn agriculture used to tear down forests to make room for farmland so that the farmers can feed their starving families. The name quite literally describes it: the forests are cut down as much as possible, and anything left is burned. The remaining ashes provide a nutrient-rich layer to fertilize the crops, although it only lasts a few years before the nutrients are used up. This then causes the farmers to then have to move to another area, and continue the same vicious cycle. In other countries, this method has been used for generations and will continue to be. However, it is important to consider the geographic situation in Madagascar when speaking on this topic. Eventually, there will be no more forests to burn down, no more soil left to use for farming. The slash-and-burn, also called tavy, the method works temporarily, but in the long term, it continues to add to the problems. Not only this, but it kills off wildlife, leaving behind a destitute land not suited for anything to live in, even people. Tavy is the primary way for the Malagasy culture to convert forests to rice fields. The rice fields only last a few cycles of four to six years before the nutrients run out. New plants are inserted into the ecosystem in an attempt to restore the forest, but the alien vegetation cannot sufficiently root into the soil, which makes erosion and landslides a major problem. Moving more toward eastern Madagascar, logging for timber becomes a common practice. There is high value and demand for some of the Malagasy woods for thousands of dollars (i.e. rosewood can fetch \$2,000 a ton on an international market). Due to these high prices offered to those in poverty-stricken land, illegal logging can be seen in protected areas. According to Wild Madagascar, "... forests of Madagascar are being cut at an alarming rate for charcoal production." This deforestation leads to major erosion problems, and for a country that relies so heavily on agriculture for its economic successes, the loss of soil in their rivers is costly. Back to the hunting, species of Madagascar are dying off to keep families alive- even those species that are illegal to hunt, such as lemurs. Various other species are collected for use in the pet trade in hopes of money. The rivers that run through Madagascar are overfished, leading marine species to be harvested at increasingly unsustainable rates. Not to mention the bringing of alien species into the ecosystems negatively impacts all the current species living there. If these practices are to continue, there will be nothing but more negative effects on Madagascar's environment, economy, ecosystems, and people.

Although it sounds like there is little chance for a revival of Madagascar agriculture, I do believe there are possible solutions. I believe one of the best solutions to this problem would be insect farming.

Entomophagy is the technical term for eating insects. According to the University of California Riverside Campus Center for Invasive Species Research, humans have harvested the eggs, larvae, pupae, and adults of certain insect species from forests or other suitable habitats to eat for thousands of years. For Americans, eating insects is not most of the time not considered normal behavior. However, it is a very common practice amongst many other cultures as it is cheap, environmentally friendly, has lots of protein, and tastes good. Actually, around 3,000 ethnic groups practice entomophagy, and 80% of the world's nations eat insects of 1,000 to 2,000 species.

To begin, insects can be raised at way faster rates than your typical farm animals. The actual food conversion efficiency of insects can be up to twenty times that of cattle. Not to mention, there are as many as ten quintillion individual insects alive at any moment, meaning a lot of potential food. Due to their fast growth rates, insects would be a great food to keep up with the growing population of the Malagasy. It would still be necessary to raise and eat other forms of food, but not to the point where it would be necessary to hunt endangered species or cut down forests. Eating insects also reduces the environmental impact of farming. As seen in Madagascar, slash-and-burn farming will not be a viable option with the population growing and the amount of usable land decreasing. Insect farming requires less space than the farming of animals. It creates less pollution. All it would take is a small building in your backyard, or even in your house. You would need to find the proper food for the insects you have chosen to raise. I would consider putting together a group of people, perhaps from the government, who can learn the best methods to rear insects, what insects to raise, and how to get started. Then this group can go and put on training for free, to show others how to do it. This way, everyone can work together to try and overcome the crisis. When insects have been eaten in other cultures, they are typically collected from the wild and require little care, but if insects are to be raised on a basis like raising other animals, more work will be required. It will take a decent amount of money to get started, but if people are willing to commit, it will pay off and become a cheaper process as it goes on. I think it would be best if Madagascar's government would commit some money to it, and take it on as a project to see what would happen. If it works, it could become more common and a bigger deal. Cultures within Madagascar don't view eating insects as a weird behavior, and so I believe they would be open to trying this if they became aware of all the benefits. Even more, the process of this insect rearing would open up lots of job opportunities to people in the surrounding areas. People would be needed to help capture, process, transport, and market these edible insects. If more people get jobs, poverty levels would hopefully decrease. Not only is it efficient, but it is also nutritious. According to the Food and Agriculture Organization of the United Nations, many insect species contain just as much, if not more, protein as meat and fish. Some are rich in fat depending on what stage of life they are in, and most insects have large percentages of amino acids, vitamins, and minerals. Leafhoppers have a protein percentage of 56.22%, house fly pupae with 61.54%, and red-legged locusts with 75.30% (Protein Content of Common Insects on a Dry Weight Basis, Ramos-Elorduy, 1998). Carbohydrates, fats, proteins, and vitamins can all be found in insects as well. Insects might not sound like they taste good, but many species of insects have been proven to taste just like any of your other foods. Once again, this is not an uncommon practice for lots of other cultures. It would just take the beginning steps to get the idea introduced. Although insects collected from forests are typically free of chemicals, if the eating of insects was to become a more common practice, standards and regulations would need to be put in place just like that of any other food production. DeFoliart (1997) suggested five approaches to protecting forest biodiversity while focusing on insect populations: enhance forest management by taking into consideration the wishes and needs of local people, allow sustainable exploitation by local people of edible insects within otherwise protected areas to reduce illegal poaching pressures, reduce the use of pesticides in agriculture by developing efficient methods of harvesting pest species that are also traditional foods (grasshoppers), increase overall productivity by developing dual product systems, and reduce organic pollution by recycling agriculture and forestry wastes into food or

feed. This way, farming would be benefiting the environment through sustainable practices and feeding the people.

In conclusion, there is a lot of work that needs to be done. Fixing a problem that has been going on for decades is not something that can be fixed overnight- but it can be fixed. The people of Madagascar are struggling, even though everyone might not be aware of it. Despite all the resources the country has, they are slowly fading. Madagascar is one of the most diverse countries, and it deserves to be protected. Through sustainable agriculture, even if it's in a way you might not have considered to be agriculture, the land can be brought back to life. It is important to keep our minds open to options we might not have considered before- such as raising and eating insects- because you never know what the answer will be to problems as vast as the ones we see in Madagascar. It might not be the first country you think of when you think about the need for sustainable agriculture- but it is now.

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