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## **Biofuels, Food Security, and the Country of Mali**

One thing most people would like to have is security. The feeling that when they go to sleep one night they know that the next day will start off well. Some families have that feeling. Their children will wake up and wonder what outfit they are going to wear for the day, what kind of cereal they are going to eat, and how they are going to do on their geometry test. Other families do not have this luxury. Their kids will go to bed and wake up not knowing if they will get sufficient food for the day, or if they will have sufficient clothing. Some will not even go to school, because for them that is an opportunity beyond their reach.

Living with the constant fear of not having enough food, or being malnourished is what people faced with food insecurity must deal with. Food insecurity is a problem that affects over 800 million every day, and over two billion people live in fear of it. It is a problem with no one beginning and with no one end. People may live with food insecurity due to war, to poverty, to harsh weather, to government restrictions, to any number of causes. To get out of the insecurity and into security takes effort on everybody's part. No one person or organization can do it alone, but working together they can make a change.

Mali is a landlocked West African country with ninety percent of its population living in the south half. The Malian Government identifies food insecurity as a problem mainly in the northern half of the country due to geography and climate, and a not very friendly farming territory. Mali is a country with 10 million people, and slightly over eighty percent of them live in rural areas. This country is home to many ethnic groups; the largest of these, the Mande, make up half the population.

Mali is heavily dependent on foreign aid. In 2003 alone, the United States Agency for International Development supported over ninety percent of the US's total assistance (roughly 44 million) More money was donated for a couple of different reasons: education, democracy, military, and a peace corps. The United States benefited from these relations with Mali because the two countries had similar goals: averting suffering and strengthening democracy. Also, Mali became a small center of trade with the US. The Malians also received numerous forms of aid from China, leading to the Chinese participating in industries centered in Mali. However, even with the foreign aid from the United States, China, and other places/organizations, Mali is still one of the ten poorest counties in the world.

Most Malian families are agriculturally based; over seventy percent of the economy deals with some form of agriculture. Most of these rural agricultural families consist of the father, his wife(s), and sons for labor, their wives/children and unmarried daughters. Women in this country are able to help the men in the collective fields until they reach menopause, when they either work in their own fields or participate in limited trading in the markets, compared to the freedom the man have (majority of a woman's trade goods would consist of food, while the men trade in manufactured goods).

One major crop that is traded from the rural to the urban families of Mali is rice. Forty percent of the daily intake of food in the urban cities is rice. The rest of their diet is cereals such as sorghum, and millet, and peanuts, sugar, and oil. The rural families live mostly off the two aforementioned cereals and a third cereal known as fonio. Small villages that reside along the Niger River also look to fish for food (with some excess fish being used for an export), although the fishing industry has continually faced hardships from agricultural irrigation needs and droughts.

Malian children often work on the family farms, although if it is possible they may attend school. Formal education for the children is required and free for the first 9 years, although (according to a 1980's survey) only 50% of the children who began school would complete six years, or go onto the next level of schooling. Duties dealing with the farm and with other economical activities were basically learned through sight and taught through observations. One major problem with children continuing education through the system is there are scant opportunities for employment in the "business district" of Mali. The families that work in that area average only \$1300 a year.

Mali is a country with nearly ten million people (nine-tenths in the south half), but under fifty percent of the total population is actively employed, and over eighty percent of these people are involved in the agriculture business. An average farm size in Mali is about 3 ha, or around 7 acres. On these acres the Malian farmers grow cotton (country's major export (fifty percent), rice grown in rice patties along the Niger River, pearl millet, maize, vegetables, tobacco, and tree crops. Livestock, mostly cattle, is another part of the Malian trade and agriculture industry.

One threat involving food security is small farmers and their access to markets due to costs and risk. Without this access the farmer cannot sell his products and make enough income to support his family. Vice versa, the market will be hurt without the farmer's crop.

There are several problems associated with farmers accessing markets. One of these is the infrastructure of Mali. Poorly constructed roads, or lacking roads, sometimes prohibit farmers from delivering their goods to markets. Other times the cost of transportation becomes greater than what the farmer will receive for his crops at the market. According to one source, only one quarter to one third of the agricultural products reach the markets.

With a country so heavily dependent on agriculture for a majority of their income/trade, barriers and difficulties in this field would hit them hard. With Mali being situated halfway within the Sahara Desert, two of the main barriers in agricultural development are drought and desertification (encroaching desert). Drought has been a continuing problem since the great droughts of 1972-74, and 83-85, which decimated 40% of the livestock during those years. The number of cattle isn't expected to regain the numbers that were before the drought, and what is left of the livestock population is slowly moving southward due to the droughts

Desertification is also forcing many herders to turn away from herding and become farmers. However, the problem with this is that cotton is one crop which seems to be aggravating the desertification. Cotton farmers often lack important knowledge about the best farming practices and under-fertilize, cultivate too often, and don't follow overall practice standards that would help stop further erosion and degradation of the land. Soon the land becomes too infertile to farm, and will eventually surrender to the desert. If the farmers can't use their land to their full potential, they aren't going to be able to make maximum profits off of it. In addition to this, if the size of their farm shrinks over time due to being incorrectly farmed, then they are being hit harder.

I believe that one of the key factors affecting Malian farmers from maximizing their outputs and incomes is the natural resource degradation and the quality and scarcity of their water. The natural resource degradation focuses on what is being done to the land when the cotton has sucked the nutrients out of the ground and it turns into desert. The scarcity of water is an issue due primarily to Mali's climate and the lack of rain the country receives (from a half of an inch to a foot is all). According to a 2000 survey, only 58% of the country has access to safe drinking water. If a farmer drinks the contaminated water and falls ill, then he will not be able to work. His inability to work will affect the family finances in

two ways; he isn't working to get the food ready to sell, and if he requires medical attention, then they will have to pay the bills for that.

Out of several major diseases associated with the water quality in Mali, cholera is one of the worst. It was the cause of a twelve percent death rate in the Mopti region in 1996. Another disease is diarrhea (caused by poor nutritional hygiene and poor water quality), and is the second leading cause of death among children in Mali. In addition to these two, nearly half the population is put in risk of blindness due to another water related disease.

The country doesn't have many connections to outside water sources to obtain safe drinking water. The only outside water source is an 1107 mile stretch of the Niger River that runs through the bottom half of the country. The northern part of the country in the Sahara Desert, receives even less rain than the southern half, and has no access to the Niger River which is being overdrawn upon for irrigation, fishing, and rice patties. The overdrawn on the Niger River for agricultural needs and the rice patties has resulted in a steady decline of the fish population.

The state of the desertification and the water issues has remained in a steady pattern of descent for a growing number of years. A majority of the farmers continue to remain uneducated about the best methods of farming, and therefore have not done anything to alleviate the problem of erosion, or desertification. The situation and state of Malian families cannot get better until the problems surrounding them are fully understood, analyzed, and worked out.

By solving the aforementioned problems, Mali would be set on a course to become more agriculturally stable and more self-sufficient. With Malian farmers practicing the best methods, they would be able to increase agricultural production, thereby increasing annual income, and prevent some of the erosion of the land. The farmers would also be able to make an effort to stop the desertification of the northernmost farms.

Dealing with desertification is where biofuels would probably help the Malian economy the most. By growing products that countries use to make alternative fuel sources, a steady source of income would be established. The United States is looking to reduce the amount of petroleum used for commercial transportation, and are already growing home sources for alternatives fuels. Countries trying to do the same, but unable to support the growth of products for alternative fuels, would be in the market to establish imports.

There are two main substances that are being looked at to improve gasoline. One of these is biodiesel, which can be mixed with generic diesel (20% biodiesel to 80% normal diesel being the lowest blend) to create cleaner burning fuel. Biodiesel is one of the safest fuels to handle, due to its high flashpoint of two-hundred degrees.

The other main substance is bioethanol (lowest blend being 10% ethanol to 90% regular gasoline). Biodiesel and bioethanol are being made and distributed in the United States in the hope of cleaning up the environment and becoming less dependent of foreign countries for the known-renewable source of petroleum for fuel. Many other common household items and commercial products are made from petroleum. Using alternative fuels for transportation will ensure that the petroleum reservoirs will last the world for a longer period of time.

However, biodiesel would be the focus for biofuel production for farmers in Mali. The current crop of choice and main export is cotton, and that is destroying, eroding, and desertifying the farm land. With biodiesel production established in Mali, the country and its farmers would be able to make an effort to turn that around.

One source that is used to produce biofuel is the plant known as Jatropha Curcus. Jatropha is a plant that grows in desert-like conditions that lay siege to the country of Mali, this includes the heat and the poor state of the soil. Jatropha can be grown in just about any state of land from moderately efficient to rock soils. Jatropha can survive long periods with limited water, which would make it go well with Mali's climate, limited precipitation and strained irrigation patterns.

Jatropha is not only used for biodiesel. Many other parts of the plant can be used for various purposes. The oil of the Jatropha plant can be used to make soap, and the bark will produce blue dies for clothing and the like. The plant has a part that is a key ingredient in an organic fertilizer for crops. Jatropha has also been effective in reducing desertification and soil erosion. This would be a benefit to the country.

The Jatropha plant also has many medicinal qualities. It contains something known as the jatrophine alkaloid that is said to have an effect on cancer. It has many other uses such as a treatment for skin diseases, a tooth cleaner, and the roots are said to be effective against snakebite.

About two years after the Jatropha plant has been planted it will start to produce seeds. These seeds will continue to grow for about fifty years. One hectare will produce anywhere from three to ten tons of seeds per growing season. That is one way to provide an efficient and steady income in a family.

The seeds of the Jatropha plant are the part of the plant that is used to make biodiesel. Countries that want to produce biodiesel, but are unable to effectively grow or domestically locate material for biofuels would look to buy from outside sources. Jatropha could help Mali become a crucial exporter in the field of biofuels. There was a project already established in Mali dealing with the Jatropha plant (I was unable to locate sufficient information on the project or its status, only that it was to conclude in 1997).

Several key institutions that would be able to help Mali in an effort to start farmers on Jatropha include The World Bank that could provide financial support to get the farmers up and running until they can effectively create a steady supply of the seeds, and locate specific buyers. The World Bank might also be able to help with some national projects centered around improving the infrastructure throughout the county of Mali, lowering the cost of transportation.

Another organization that can help Malian farmers is the Food and Agriculture Organization. One of the main goals of the FAO is putting information within reach. FAO would be able to help this country by educating farmers about the benefits of cultivating Jatropha on their farms. They would also be able to dispense information about correct farming practices, thereby helping farmers to prevent some of the soil erosion, and desertification. This along with the Jatropha plants qualities for doing the same would help set families in this country on a course to attaining a steady income.

While it is true that Mali is a country with many problems agriculturally and economically, it is also true that there exists the possibility of this country one day becoming food secure, and having families live with a steady source of income.

Many ominous obstacles threaten this course of action such as infrastructure and costs, risks, and access to markets. All of these barriers are able to be overcome with time, patience, and help from outside sources. The World Bank and FAO are just two examples of organizations that would be able to help the farmers become stable.

The Jatropha Curcus plant would also be able to alleviate some of the problems surrounding the agricultural industry of Mali. However, this will not succeed if the farmers do not become educated about its qualities. Another thing that must take place is that the outside countries must strive even more towards running on alternative fuel sources. Petroleum is a nonrenewable resource that won't last forever. The more countries that strive towards alternative fuel sources the more market there will be for biofuels.

Mali can be a part of this market by using the Jatropha Curcus plant. They will be able to find a steady source of income from the biodiesel produced from the seeds of this plant. However this cannot happen without the countries involvement.

Part of the future of Malian economy hangs in the balance of biofuel production and this plant. This answer will not work unless the countries become involved in biofuels and open markets for them. The door to the solution hinges upon the involvement of many individuals and organizations working together. No one person can solve this on his/her own. It will take many people and much help from outside organizations to turn this vision into reality.

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