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Alternative Crop Production Methods to Help Improve Yields in Mali

On the news there is always a new story about how the stock market might drop or the price of food or gas is slowly rising. People in developed countries might not think anything of it, paying a few cents more every week is not a big deal. For them, life goes on as it always has. Their pockets might have a few less dollars but otherwise their future is secure. Unfortunately, in other countries where not having enough food is a regular occurrence, if the price of food goes up it can have a detrimental impact on poverty stricken families. It could mean their families will not get the food they could previously afford, causing serious malnutrition or even starvation.

Today, there are an estimated one billion or more people in the world who go hungry. Although it is difficult to know exactly how many people go undernourished or are malnourished, any amount is something to work towards eliminating. According to a recent study, there has been a significant increase in undernourished people in the past few years. This is due to current economic instability, food prices increasing, and people who are living in poverty not having access to adequate agricultural help they need (World hunger and poverty facts and statistics 2010).

In some developing countries families might dedicate their whole lives to farming to provide for their family. But if they do not have the proper equipment or a way to get their food to a market to be sold, all their hard work and toils are for nothing. Dramatically changing climate, with droughts and desertification, can destroy crops before harvest which can have a negative impact on rural families even before it becomes time to harvest the crops. While many people in developed countries might look at farming as a career that helps an already well-off country, in poverty abundant areas of the world, farming is a way of life where a crop can mean the difference between food for their families or an empty table with starving children.

Typical Malian farmers can have trouble with crop production because of the extended dry season with many droughts and erratic climate change. Since most of northern Mali is a hot and dry desert that covers more than 60% of the country (Mali), farmers in central Mali have trouble with desertification and not having enough water and rainfall for their crops. Even in the more urban southern part of Mali the threat of the Niger River rising and flooding the land around it can erode soil and ruin crops too close to the riverbank. Around 80% of the labor in Mali is in agriculture and most of the crops harvested are used to sustain the farming family (Africa: mali), if there is even enough of a crop for the family to be fed.

In a typical Malian family, a man might have more than one wife. It is legal to have multiple wives in Mali, but there are only a few men who have more than the two wives their Islamic beliefs allow. If a man has multiple wives, they are allowed their own house and share any family responsibilities (Malians). The average number of children a woman has is six to seven. But the mortality rate for newborn babies is almost one in nine births. From those that live, the total population life expectancy is fifty-two which is ranked 209th in the world for lowest life expectancy. An unemployment rate of over 30% contributes to 36% of Malians living in poverty. Because they are unable to afford food, poverty and hunger make significant contributions to the low life expectancy (Africa: mali).

The GDP per capita in Mali is only $1,200 per person, which is 205th in the world. If rural farmers could produce more crops additionally resulting in surplus to sell and even export, the GDP would increase drastically. Also if farmers could produce more crops, the percentage of the population below the poverty

line and the number of children and families going malnourished would greatly decrease. Regrettably, there are major barriers and problems to increasing crop production. One of the barriers is the drastic climate changes. With lasting droughts and desertification in the northern regions and unexpected flooding and erosion in the southern part of Mali, it is hard for farmers to grow crops and regulate irrigation and temperature exposure (Africa: mali).

One part of the solution to the low crop productivity in Mali is to create hardened sand barriers. Researchers at the University of California at Davis have found that a certain bacteria, *Bacillus pasteurii*, along with a calcium-alkaline combination, can harden sand in a few weeks. In this short time frame, the hardened sand dunes become strong enough to withstand earthquakes and provide protection from desertification in the northern regions. Sand would not be able to blow around the hardened sand mounds, thereby slowing the progress of desertification. In the southern regions, the hardened mounds would be a barrier for the flooding when the Niger River overflows (B. 48).

As important as these barriers would be, it is what would be inside the mound that is the key to sustainable and highly productive crops. The inside of the mound would be hollowed out providing an ideal place for growing crops without the threat of them being flooded or the soil being eroded away by dry and dusty wind (B. 48). Each farmer would have his own little plot underground large enough to grow all the crops needed to fully sustain his family and even more for selling.

Another piece of the puzzle to sustaining crops in the bacterially hardened sand mounds is being able to provide the crops with enough water to maintain them. To solve this problem soil beneath the crops would be filled with hydrogels. Hydrogels are super absorbent polymers that are designed to absorb up to 500% of their weight in water. Hydrogels are commonly used and found in diapers which gave way to the idea of use in agriculture. But hydrogels in diapers are toxic for plant and human consumption so agricultural hydrogels have been designed to be safe for plants and human consumption (Grierson 49).

Hydrogels used for non-agricultural purposes, such as those found in diapers and used to help clean up oil spills, are designed specifically to just absorb any liquid they come in contact with. Agricultural hydrogels are different because as they are designed to absorb water, they also have the capability to release water when the plant needs it. In agricultural hydrogels, nutrients and specialized compounds let the hydrogels release water when it becomes too hot or dry in the soil. These specialized hydrogels, along with a nutrient mix the plant needs, would be placed in the soil below where the plant roots would reach. Then as the plant grows the roots can tap into the water and nutrient filled hydrogels and use that to help the plant successfully grow, improving the current crop production by Mali farmers (Grierson 49).

Since the plants will be in hardened sand mounds, they will not have access to direct sunlight. A solution to this problem is to have an open top on the hardened mounds. With it being open at the top, plants can get the sunlight they need. To help protect the crops from insects, transparent coverings would be made to stop them from having access to the plants. The plants also are less prone to disease in the "sand sculptures" as described in *Popular Science Magazine*. By having crops separated in their own defined space, there is less chance of plant diseases being spread by airborne viruses or plant related diseases. These sand sculptures could significantly impact the way plants are grown and how they are protected from flooding and harsh climate changes (B. 48).

The idea of having sand sculptures may still be in the experimental stages, but the application of creating such a work of art could forever change the agricultural life of many farmers. Not only are the sand sculptures just used for growing crops, they are barriers against hot desert winds and flooding rivers. They could help slow the effects of desertification and slow the expansion of the Sahara Desert. They provide a safer and more effective way to grow sustainable crops for the poverty stricken families in the arid land in Mali (B. 48).

Currently malnutrition is a major problem in Mali. Malnutrition affects many people all over the world but it especially takes a toll on children. Malnourished children can cause problems later on in life such as different degrees of brain damage and stunted growth. Just in sub-Sahara Africa more than four million children under the age of five are malnourished. That is more than one third of the total number of children under five who suffer from being malnourished (Africa: mali). Malnourishment is a serious problem that needs to be addressed in Mali and in the world.

One of the major factors contributing to malnutrition is poverty. Because farmers and people are poor, they do not have enough money to purchase food. Recent statistics indicate that there are millions of poor and rural farmers in Mali. Over seventy-five percent of the rural population of Mali is living in poverty. That is increased from the estimated thirty-six percent of the total population being under the poverty line. Poverty and malnutrition go hand-in-hand contributing to many problems in Mali (Mali statistics).

One of the major diseases affecting many people in Mali is HIV/AIDS. The estimated number of people living with HIV/AIDS is one hundred thousand people. The number of deaths annually caused by HIV/AIDS is estimated at five thousand eight hundred. The risk for contracting a major infectious disease is very high. Bacterial and protozoal diarrhea, typhoid fever, and hepatitis A are common food and waterborne diseases. A major disease from water contact is schistosomiasis, which is a type of parasitic worm passed from snails to water. Anyone who comes into contact with contaminated water can contract the parasite where it gets into the bloodstream and travels through the body to the bladder and intestines. It can cause internal scarring, inflammation, and in some cases, paralysis (Africa: mali). With better agricultural adaptations, disease and malnutrition can be greatly reduced.

One of the major components to make the new farming techniques successful is to implement education in schools. Many children only attend school for a few years because they are needed to work in the house or fields. Males are estimated to only go to school for eight years while females only go an average of five years. The total population is estimated at being forty-six percent literate because of the little schooling many children receive. It is common for education to come second for children when there is work to be done in the house and field for poor, rural farmers in Mali (Africa: mali).

With proper education and support in research and implementing the idea of sand sculpture farms (B. 48), the food insecurity problem in Mali could be resolved. If the project is successful in Mali it could be expanded to other countries with malnutrition and food insecurity problems. Fixing problems in one country is just the start to see if those same solutions could be implemented in other places around the world.

One of the major issues surrounding world hunger and malnutrition is the involvement of people to help those less fortunate and in need. Government involvement is crucial to making sure that the citizens are kept safe and have what they need, but with a third world country sometimes a government is not able to do so because of the lack of funds, resources, and availability of technology that they can get to the people. That is why it is so important for other governments to notice and take action by helping send food, disaster relief, and even political advice to them.

What the World Food Prize and other organizations do is extremely significant because they bring awareness to problems like malnutrition and world hunger. Many people do not realize just how bad it is in third world countries. Children are lucky if they even get a few grains of rice for dinner or if they live to be 40. Awareness of these problems is a big step into recruiting people to become involved in helping others in need. The next step is actually recruiting people willing to invest their time, money, food, or resources to make a difference.

What we do today can make a difference. Even if one essay is read to make someone aware of problems around the world or a few dollars donated to help feed hungry children, every little bit counts. We can go and help those in other countries learn more modern techniques of farming. Or we can help by finding solutions in the U.S. that we can share with other countries. We do not need to do this just for the advancement of countries and people in need, but also of the advancement of the human race. If one society is affected, then others around the world will feel the resounding effects. We can learn a lot from each other and our different lives but if part of that dies, we may never know just how much of an impact we could have made for our world.

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