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Biofuels: The Beginning of a Comprehensive Approach to Ethiopia's Primary Problems

"You can't build a peaceful world on empty stomachs and human misery," ("A quote by Norman Borlaug"). This quote by Dr. Norman Borlaug is linked to Ethiopia because one of the main problems is hunger and malnutrition ("Major Problems in Ethiopia"). Ethiopia is a developing country that is landlocked and lies within the horn of Africa ("Soils"). Ethiopia is one of the oldest countries in Africa; however, it has not progressed as fast as one might think, even though it is such an old country. The agricultural methods used in Ethiopia are far behind those used in the United States ("What We Do"). The use of advanced agricultural methods and renewable resources, such as ethanol, could greatly impact Ethiopians' day-to-day lives. If corn could be used for food, and instead other nonedible plants or byproducts of corn could be substituted in the production of ethanol, this could lead to even less hunger. In addition, if Ethiopia is able to make their own biofuel, they can limit the amount of gasoline that currently needs to be imported. This would lead to economic growth and less poverty. The key to understanding the impact of Ethiopia's challenges is through understanding the people, the problems, and the solutions to the problems.

In Ethiopia as with all countries, it is hard to understand how a country works without first understanding the families within that country. A household usually contains multiple generations, the average being three generations, which typically include grandparents, their male children and spouses, and the grandchildren from their married sons (Pier). The average couple has at least four children. The government is trying to encourage the use of birth control among women to decrease births because of the lack of resources within the country (Pier). In general, in this country, the men have more power than the women. The men are supposed to be brave and make all of the decisions; whereas, the women are expected to be constantly proper and pretty (Pier). The Ethiopian culture would not be the same without traditions and the kinds of foods they eat.

The food in this country is quite diverse. According to Jenny Miller, the national dish of Ethiopia is wot. Wot is a spicy stew that can be made with a variety of meats and some vegetables such as chickpeas or lentils. This is eaten with injera, which is similar to sourdough bread. The injera is used to scoop up the stew so that silverware is not necessary. In sweet dishes, honey is used instead of sweeteners like sugar. For example, a typical sweet dish would be a piece of honeycomb wrapped in injera. Some mealtime customs for Ethiopians include washing their hands and saying a prayer (Miller). At the start of the supper, injera is put in a circular basket called a mesob. Then, the stew or soup is placed on top of the injera. In some cultures, the meal does not start until the patriarch breaks off a piece of the injera. Traditionally, the injera is picked up with the right hand as a sign of respect, and typically, tej (honey wine) and tella (beer) are the main beverages during the meal. Coffee is enjoyed at the end of the meal (Miller). Since coffee is the main export of the country, Ethiopians take much pride in making it. While Ethiopia has a rich and diverse culture, it also has many problems.

The main problems in Ethiopia are undernourishment and poverty, poor general and agricultural educational opportunities, poor land use and infrastructure, and lack of government programs and policies to confront these problems ("Major Problems in Ethiopia"). Today 37 million people in Ethiopia are considered by The World Food Bank to be in poverty ("Major Problems in Ethiopia"). This is partially due to wars and droughts during the 1970's and 1980's ("1980s Ethiopia Famine: Facts, FAQs, and How to Help"). The average annual household income is \$783 USD (Overview). Obviously, this is quite a low wage considering the hourly minimum wage is \$7.25 in the state of Iowa. An Iowa worker would take a

little over 100 hours to earn the average annual Ethiopian income. The rate of poverty in 2011 was 30%, and in 2016, the rate was down to 24% (“Overview”). This is a great improvement; however, many people in this country still live in poverty and do not have access to proper sanitation or clean water. In addition, prices of food have increased over the last years, and this leads to people not being able to afford necessities. Poverty should be a thing decreased at a steady rate in the coming years because new technology can help to make more and better food as well as create jobs and develop companies to be more efficient. Poor wages are part of the problem but also the inefficiency of the land they do have leads to lower yields and more harsh conditions.

Land use should be controlled more in Ethiopia. It should be monitored and excavated because currently only 15.1% of the land is farmable (“Major Problems Facing Ethiopia Today”). One of the downfalls about the stability of the Ethiopian economy is that between 45% and 50% of the annual products produced in the country are agriculturally based (“Major Problems Facing Ethiopia Today”). This leaves the economy susceptible to natural disasters such as flooding and drought. The presence of coffee farming specifically has a positive effect on the economy because the amount of coffee that is exported is worth 400 million US dollars (USD) (“Major Problems Facing Ethiopia Today”). Some of the other crops produced in Ethiopia besides coffee are oilseeds, sugar cane, vegetables, and more. Since agriculture is such a big part of Ethiopia economically, it needs to be as efficient as possible. Also, due to the abuse of land through deforestation and overgrazing, periodic droughts occur (“Major Problems Facing Ethiopia Today”). The government has not put a lot of money into infrastructure in Ethiopia. That causes extreme difficulty in transporting the food to marketplaces resulting in losses of income. Even though farming is one of the biggest boosters of the Ethiopian economy, poor infrastructure still hinders progress in solving the problems of poverty and malnourishment.

A major reason that the people of Ethiopia live in poverty is due to the fact that nearly half of the population is not literate (“Major Problems Facing Ethiopia Today”). Hunger and bad circumstances prevent many children from going to school (“Major Problems Facing Ethiopia Today”). Many of these children are put into child labor, trafficked, or forced into child marriage (“Major Problems Facing Ethiopia Today”). Even though a good education is an important part of a person’s success, the government of Ethiopia does not promote school. Not only do children need education, but also this agricultural population needs to be educated in the most advanced agricultural methods in order to help raise their income and feed their nation. This could have a great positive impact since nearly 85% of the workforce works in the agriculture industry (“Ethiopia - Agriculture”). Having more educated people can solve many issues for these people and is an important aspect of the overall problem. The economic problem is that the imports in this country are costing Ethiopia a lot of money.

The importation of petroleum is a major problem in Ethiopia. The cost of refined petroleum that is imported is worth 157 million USD (“Ethiopia.”). If the money used on refined petroleum products could be used where most needed, this could positively impact many of these challenges that Ethiopia faces. This challenge is tied to food because some biofuels like ethanol are made from corn that could be used for feeding livestock or families. Ethanol can be mixed into gas to make it cheaper, and make it burn cleaner than traditional fossil fuels such as gasoline. This problem is also tied into the environment because, depending on what fuel is used, it could greatly reduce carbon emissions. It is said that carbon dioxide is a greenhouse gas (GHG) and makes the earth warmer (“Greenhouse Gases/Effect”). This is not a good thing for Ethiopia because it is already prone to droughts. The use of fossil fuels sometimes affects rural populations; however, it is much more likely that it would affect people in urban areas. This is due to the higher concentration of cars, which leads to more carbon dioxide being present. This problem affects people no matter their social or economic status; however, the next the issue of racism and marginalization affects some people in this country.

Marginalization is a major problem in Ethiopia due to poor government policies (“Major Problems Facing Ethiopia Today”). The protests by the Oromo people, the biggest ethnic group in Ethiopia, help to highlight this problem (“Major Problems Facing Ethiopia Today”). Marginalization can be decreased if the government has more resources, and the marginalized people have more economical and educational power, this issue can be improved. As Noel Claraso once said, “Every problem has its solution; the only problem is where to find it” (“Noel Clarasó Quotes”). This problem, fortunately, like all problems, has a solution that will affect all facets of the lives of the Ethiopian people.

Solutions come in many forms; the solution to this issue not only solves hunger but also covers many other problematic areas in Ethiopian society. In order to find a solution a person has to evaluate all options. Some modern agriculture practices could also solve the problems of hunger or energy in Ethiopia; however, the use of fertilizers and insecticides could harm other natural resources even though they increase yield which seems to do more harm (“How Fertilizers Harm Earth More Than Help Your Lawn”). Another option is using renewable resources such as solar power or wind energy but Ethiopia does not have enough infrastructure to be able to transport this energy effectively. Ethiopia needs to become more reliant on renewable resources such as ethanol to be able to save the money and the resources they do have. The thought behind this solution is that the 157 million USD used to import fossil fuel into the country could be used elsewhere. By blending a 10% ethanol fuel over the next five years, the government would save 46.9 million USD (“Ethiopia Saves \$46.9 Million in Gasoline Imports over 5 Years Thanks to E10.”). The use of biofuel is a good solution because if it is more accessible, it cuts spending on importing fuel, is better for the environment, and can let the government spend money elsewhere. Biofuels are made from sugar-based crops like corn, sugarcane, and sugar beets (“Economics of Biofuels”). Biofuels are made by fermenting the sugar in these crops, and converting it into a form of bio-alcohol such as ethanol, butanol, or propanol. In addition, biodiesel can be made from vegetable oil and animal fats as well as 3rd generation biofuel from algae (“Economics of Biofuels”). There is currently research being done to make ethanol out of cornstalks and algae on a commercial level so that corn may be used for food (Rapiet). This solution is a long-term plan; biofuels are used simply to allow room for funding the issues of poor land use and outdated farming practices so that yields can be increased, resulting in more food and money for the people of Ethiopia.

The United States’ model might be useful to Ethiopia. As more and more cars become able to use these biofuels, the demand will increase. At this point all vehicles can run on 10% ethanol while flex fuel cars can use E85, which consists of 85 percent ethanol and 15 percent gas (“Ethanol and Engines (E10)”). Due to this technology, the United States (US) has tried to become more dependent on biofuels. The US decided to become more dependent on biofuels because it would lessen their dependence on other countries for fuel (“Economics of Biofuels”). Another reason is that the US would be less exposed to the threat of disruptions from other countries, like tariffs. They also decided that this could lead to less demand for fossil fuels leading to lower prices for the people of the US. The way the US made this idea more mainstream was by providing tax incentives in return for people to be involved. According to Economics of Biofuels, based on a 2007 act, The US is trying to increase biofuel production to 36 billion gallons by 2022. The article goes on to say, “To limit GHG emissions, the Act states that conventional renewable fuels (corn starch ethanol) are required to reduce life-cycle GHG emissions relative to life-cycle emissions from fossil fuels by at least 20 percent, biodiesel and advanced biofuels must reduce GHG emissions by 50 percent, and cellulosic biofuels must reduce emissions by 60 percent” (“Economics of Biofuels”). These benchmarks ensure that the biofuels are as good for the atmosphere as possible. This is important because the US can use this and export the biofuels as well as import less fuel; therefore, it makes the US more money and costs them less. The 16 billion gallons of biofuel the US made in 2015 was worth around \$17.5 billion USD (“Bioenergy Frequently Asked Questions”). The US also does a lot of research to determine the best way to minimize water and fertilizer usage while also getting the best yield. This allows the environment and resources to be preserved. The US exported 1.2 billion gallons of ethanol in 2017. The average price of ethanol in 2017 was \$1.52 meaning the US exported \$1.824 billion

in ethanol (“U.S. Energy Information Administration - EIA - Independent Statistics and Analysis”). Even though the US and Ethiopia are extremely different countries the same principles of biofuels and using them as a way to help the people can be applied.

The US model of biofuel production can be used on a smaller scale for a country like Ethiopia. The people who could manage this project are from the Project Ethiopia organization. One reason that Project Ethiopia is successful is that they have volunteers that are active in Ethiopian villages. Another reason is that they hire local people for projects as well as buying goods and materials locally (“What We Do”). Project Ethiopia is also guided by the United Nations Sustainable Millennium Development Goals for 2030. These goals are a set of 16 goals. The top five goals are no poverty, no hunger, good healthy lifestyles, better education, and gender equality (“About the Sustainable Development Goals - United Nations Sustainable Development”). Goals like these are a great model for attacking the problems of Ethiopia because some of the problems are lack of education, gender inequality, hunger, and poverty. Not only does Project Ethiopia help solve problems, but they could also lead because they understand the trade of farming and the economic impact of agriculture on Ethiopia. This would also be a good organization because they believe in education, and they construct schools to improve the education conditions in Ethiopia (“What We Do”). Project Ethiopia also helps to teach farmers how to increase yields to improve their lives economically as well as teach basic education. The people that would fund this project would be non-profits and the Ethiopian government because, in the end, it is for the people of Ethiopia. Project Ethiopia would lead this plan; however, there are multiple steps to ensure that the plan works.

For this plan to work, it would rely heavily on the community members of Ethiopia. They need to become more efficient at farming. The education that would need to be addressed would be about the use of fertilizer and how to make cheap irrigation. This would lead to better yields of all products used for human consumption and the production of biofuels. The community members would need to be behind this because 85% of the workforce in Ethiopia has something to do with agriculture (“Ethiopia - Agriculture”). The government would play a role in this because they have the ability to fund research and projects for their people. Some barriers the government would experience when trying to achieve these goals are balancing the economy while still helping the people, the relatively high input cost of installing bio refineries, and having to spend money on education programs. These problems over the long-term would eventually be solved because Ethiopia would have a smarter population to innovate and start new businesses; the profit from the ethanol production would eventually outweigh the input costs; and the economy would be more stable because it would be less dependent on agriculture due to having more businesses. The Ethiopian government would need to be able to fund projects for their people as well as create new policies.

Some policies that would need to be put in place for this plan to work would be a policy that would fund research and production of biofuels (“Economics of Biofuels”). Another policy that would need to be put in place would be a policy that monitors the effects of farming on the environment so that drought or soil erosion would not be as frequent. These policies as a whole would ensure that the people of Ethiopia are getting higher yields due to having more modern technology. Soil erosion would need to be monitored because erosion could lead to soil pollution in their lakes and rivers. The discrimination of cultures in the Ethiopia would need to be assessed, and policies would need to be developed to decrease the frequency of discrimination. This project could be sustainable by being closely monitored by the government or other environmental research institutions. This would ensure that Ethiopia is using the newest and best methods to reduce negative effects of farming, while still getting higher yields.

The biggest problems that Ethiopia has are poverty and malnourishment. Fortunately, these problems can be addressed by utilizing government programs and policies that support biofuels and support general and agricultural education. Biofuels such as ethanol positively impact the food security and use of food in

Ethiopia. Producing higher yields, using biofuel production to reduce dependency on fuel imports, and eventually exporting biofuels to make money will aid the struggling people of Ethiopia. These savings and income could fund environmental and farming research to continue to optimize yields, further decrease poverty and hunger, improve the lives of those marginalized and experiencing discrimination, increase the infrastructure in Ethiopia, and improve the overall quality of life. The use of biofuels is not only better for air quality and the environment, but also better for the government and people of Ethiopia.

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