

Kayla Miller
Webster City High School
Webster City, Iowa
Ethiopia, Factor 1: Plant Science

Plant Science in Ethiopia

Ethiopia is a country with a population of 94.1 million people, and that number continues to rise day by day. In one Ethiopian family there usually is a male, a female, and an average of 7-8 children. Divorce rates are very high here so many families have multiple heads of the family with different extensions of relations. When the children of the family are ready to marry, they are set up in arranged marriages by their parents. Most of the 94.1 million people in Ethiopia live under poverty and don't have enough to live a stable life. ("Ethiopian Cultural")

The people in Ethiopia rely greatly on the food they grow themselves. There are a few main dishes that the Ethiopian culture feeds on mostly. A very popular national dish to the Ethiopian culture is called wat. It is a hot, spicy stew that is served with injera, a large, spongy pancake made from teff flour (grown in Ethiopian highlands) and water. Ethiopians consume wat in many different varieties including chicken, beef, lamb, vegetable, lentils, and peas. Another dish that is common is berbere which is made from hot peppers, herbs and spices, and onions. Even in Ethiopia, there are people that don't eat meat. Vegetarian meals consist of mainly lentils, split peas, grains, fruit, and vegetable stews. Beverages include the most popular bunna, similar to american coffee. Other beverages include tella and tej, which are mainly served at religious festivals, weddings, or special occasions. Along with religious practices, certain religions aren't allowed to eat meat and dairy products on Wednesdays and Fridays. Because of the high poverty rates in Ethiopia, citizens cannot afford to own silverware; most food is eaten by using fingers. ("Ethiopian Treasures")

Education is a very important aspect to the Ethiopian culture, as the people believe. Kids are started in the school systems at the age of five and are expected to have 12 years of schooling. It is expected that they are in elementary for six years, junior elementary for two years, and have four years of senior secondary school. Minimal school supplies are available for the classrooms. The average size of the classes are 65 students for every one teacher. Educators are to believe in punishing the children for their bad habits so they are able to learn good lessons for their life after school. ("Education")

Ethiopia has the least developed health care system in Sub-Saharan Africa. They are unable to take care of the current health problems in most of the country. The Ethiopian government has made attempts to take action and improve the health of its citizens by strengthening primary health care as an approach to address a major gap in the healthcare problems- the lack of physical access to basic health care facilities. As of right now, the average life expectancy at birth is 54 years old. If the HIV rates continue to increase, that number will soon drop to 46 years old. 3.5% of people in the age group of 15-24 years old have either HIV/AIDS. Malaria is also a huge problem in Ethiopia. It has caused an extreme number of deaths and is responsible for 8-10 million outpatients. 80% of the country's health problems are due to many different preventable and nutritional diseases. Most of the problems are associated with the low socio-economic development of Ethiopia. ("Center")

A majority of the families in Ethiopia own their own farms. Their farms and land may not be large, but they find a way to make it work. 87.4% of the rural households operate on less than two hectares of land, 64.5% of cultivate farms have less than one hectare of land, and 40.6% of farmers operate on less than half a hectare. Small farmers are fragmented with about 2.3 plots of land. The average farm size can generate 50% of the total minimum income that is required for an average household of eight people to live in poverty. The households that maintain a small farm are usually very poor with a small cash

income. Most farmers have little to no surplus for investments and the input purchases. The probability of adopting fertilizer and improved seeds decreases with the declining of farm size. ("Future")

Ethiopia grows a variety of crops including the following: cereals, pulses, oilseeds, coffee, cotton, and khat. Coffee is an important cash crop. It is grown in many wild parts of the country. 98% of the total coffee grown in Ethiopia is produced by peasants on small farms on less than one hectare while the other two percent of coffee is grown in state farms. Pulses and oilseeds are the second highest crops grown in Ethiopia. The importance of the pulse and oilseed has dropped because of the reoccurring droughts that have devastated parts of Ethiopia. The peasants that grow them have face food shortages, giving a priority to cereal staples to live, and the government has controlled the prices of the pulses and oilseeds. Khat is a drug of abuse that has been proven that may lead to psychological dependence. Cotton is a crop that relies greatly on an adequate amount rainfall for irrigation. Cotton is usually grown at levels below 1400 meters elevation. There are many types of grains that are grown, some of which include teff, wheat, barley, corn, sorghum, and millet. Most of the grains are cultivated in warm areas at a low altitude. Sorghum and millet are drought resistant while corn requires large amounts of water for a good harvest. Pulses are the second most important element in a diet because they are a high protein source for most Ethiopians. These pulses are exported to go all over the world for others to enjoy and use as protein. Most of the time they are either boiled, roasted, or used in a stew dish. Vegetable oil and oilseeds are usually raised by farmers on the small scale, and sesame seed, a type of oilseed produced, is grown by the large scale commercial farmers. One last crop that is grown in Ethiopia is called the ensete, which resembles a banana but is an inedible fruit. They are produced in large amounts for their amount of starch. Ensete is also ground up to be produced into flour; ensete flour is the staple food for people in the area. ("Agriculture in Ethiopia.")

In Ethiopia and other African countries, a majority of the land is used for both livestock and crops, otherwise known as mixed farming. Most of the midlands and the highlands are mainly for mixed farming. The low lands are used for grazing and pastoral systems. ("Ethiopia - Project")

Animals are a very important aspect to the agriculture in Ethiopia. There are a total of over 150 million farm animals that are used for a variety of tasks and practices including food, cash, draft power, transportation, fuel, and social prestige. The number of livestock in the pastoral areas is the basis of the economy. In Ethiopia, there is about 47.5 million cattle, 39.6 million poultry, 26.1 million sheep, 21.7 million goats, 5.6 million donkeys, 2.1 million horses and mules, and 1 million camels. With these numbers, Ethiopia has the largest population of animals in all of Africa. The cattle are usually killed from the numerous diseases or malnutrition/starvation. The malnutrition and starvation usually occur during the times when drought occurs. When there is plenty of rainfall, the cattle are usually nourished and able to resist the diseases. They are a poor meat and milk source. The 48 million goats and sheep are raised by small farmers who usually use them for a source of meat and sell them for a cash income. The 7.7 million equine animals are mainly used for transportation. The poultry animals are produced for consumption by the Ethiopians and sold for cash. ("Agriculture in") Most of the times, the women in the family are expected to be in charge of the livestock management on the small farms, while the men are out on the farm taking care of the crops. ("Ethiopia - Project")

The variety of agricultural practices in Ethiopia is very slim. They have intensive cultivation that comprises the use of high-yielding seeds. This practice has been very popular in terms of raising the crops for food and grain. Ethiopian farmers have used a chemical based cultivation, and it has been fairly successful but it requires technology that is not always available in Ethiopia. The parts of Africa that prevail in the arid and semi-arid conditions, are less conducive to the water technologies. ("Document") Another agricultural practice is the plants that the farmers plant. Most farmers only plant single crops but more and more, farmers are practicing planting a double crop. Double crops are usually found along the

rivers. ("Ethiopia - Project") Currently farmers collect the rain and flood water and divert it to their farmland fields via a simple furrow system that has been previously installed. This simple system works great for this topography, but things can always be better and there is always room for improvement.

There are a few barriers to improving the agricultural productivity in Ethiopia. A very important problem that the Ethiopian farmers face is that of the extremely dry land conditions from the droughts. Because of the droughts, the crops are not capable of growing to their full potential and the yields for the crops are very low. There have been a few actions that have been taken place by the Alliance of the Green Revolution in Africa (AGRA) to try and improve the following agricultural problems:

- Improve the seeds for local grown food crops
- Managing water resources
- Strengthening the agricultural markets
- Scaling up the agricultural education, research, and extension services
- Creating a better policy environment for the farmers

There are also a few barriers to the employment at living wages in Ethiopia. There are a very few jobs available. Most of which are farming related, whether it be growing or selling the crops. There aren't many business related jobs in Ethiopia. Another barrier that Ethiopians have is the access to food markets and the adequate nutrition. Ethiopians do not have the proper food to maintain a well-balanced nutrition. They could possibly grow some food to meet some of their dietary needs, but they still cannot produce everything that is important to a well-balanced diet. The surplus food that the Ethiopians grow is able to be sold at the markets but a lot of times the average farmer does not produce enough to support its own family, let alone have enough to sell to others. ("Agriculture and")

What if it was possible to improve the genetics of the plants that are grown in Ethiopia to increase the yields? Right now there is very low crop yields. It affects the family's income because they do not produce enough crops to make a profit. The families are not able to produce enough food because one, they only own a few hectares of land and it cannot quite possibly produce enough crops to maintain an above poverty life, and two, the crops that they do have are not producing a high enough yield. If they cannot produce enough crops, they won't be able to have an income to purchase other food that they are not currently growing themselves. Ethiopians won't have an adequate nutrition because they cannot afford the food that allows them the things that they need to live a healthy life.

As of right now, the only thing that is being done to improve the yield of crops is the five things that the AGRA is doing that were previously listed. This situation is important to improving the lives of the Ethiopians and many other countries in Africa. The AGRA is currently running trials, trying to improve the environment to see if anything will help increase the yields and genetics of the crops being grown. Nobody is really at a disadvantage to these problems. It more or less affects all people in the families of Ethiopia. ("Agriculture and") Some individuals are currently trying to better their own personal farms by dipping into their drinking water well for water for their crops. By taking these few steps on their own to improve their crops, not only will the yields increase, but they will produce crops with more nutritious value to hopefully help with the malnutrition problems in areas like this.

Tests have shown very slow improvements. With the trials that are being run by the AGRA and the records that have been taken, slowly but surely the yields have been increasing and the average Ethiopian family has increased its income. The technology has steadily improved, giving them ways to improve even more. Many people have found out that by using even the simplest of irrigation systems to start giving their crops some nutrients, the crops have produced to be healthier, and have a higher yield.

If improving the genetics of the plants and crops could increase the yields, it will improve some of the hunger problems that most of the African countries are facing, not just Ethiopia. The foods will become more nutritious to all of the people in Ethiopia, allowing them to maybe end the starvation. Right now, the Ethiopian economy is struggling so improving the crops could possibly get some cash flow going and could maybe spark something to get the economy going again. By improving the crops, it would be able to help the environment by putting better chemicals back into the ground for the farming in the years to come. It will benefit small farmers, maybe not so much the women, unless it produces better crops for better food for the women to prepare. By working towards producing a higher yield of crops, it could possibly have a domino effect by spreading the knowledge and the better yielding crops to other countries so they become self-sufficient instead of relying on others. If more crops are being produced, more manual labor could possibly be required, thus leaving openings for some jobs for the citizens looking for a few extra dollars to be able to bring food home to their families.

There are a few major issues that can conflict with increasing yields. One of them is that with increasing the yields, it will require some major technology that Ethiopia may not have to advance the plant genetics. It would be very easy to take the technology to Ethiopia and other African countries and teach them how to continue to improve their agricultural practices. Another issue is that there is not a sufficient amount of rainfall in Ethiopia; their ground is very dry. Very rarely do they get a period of time where there is enough rainfall to irrigate all of the crops that are being grown. Even though it is impossible to control mother nature, droughts occur every 4-5 years, therefore affecting crop and livestock production, thus influencing the food prices. It would be very easy to install an irrigation system that hooks up to a local well or another source of water. Of the more than 4.3 million hectares of total irrigable land in all of the country, less than 10% is actually irrigated for farming purposes. ("Ethiopia - Project") This problem could easily be fixed with even a little bit of attention put forth towards the land.

I think what AGRA is doing to improve things is a good start in the right direction. The program needs to continue to expand and reach out to everyone in Africa, not just Ethiopians. It's important to teach the Ethiopians how to change and improve their farming ways so they can continue it in the future. We can always give and give to the Ethiopians, or any of the people in Africa for that matter, but until they are taught how to do some of the things by themselves, they will never have the feeling that they accomplished something and they won't be able to carry it over and use the skills in their everyday life. The same idea goes for technology. The use of technology is also important on figuring out how else the expansion of genetics to increase yields can continue. Technology is a great tool, but it is even better when it is used to its fullest potential. The internet accessibility is slowly growing over the country, but unfortunately most of it is all within the government and the wealthy communities. The people that are living under poverty in Ethiopia still do not have the luxury of the internet and some of the other technology. If they were able to have the technology and the knowledge of how to use the technology given, the Ethiopians could figure out ways to better their crops and to have a healthier life style. The AGRA is going to need more than just a small group of people working at a time to change. There needs to be multiple groups working together because using different practices, like the research done in America, will help to improve the science that goes into the seeds that are being used. Right now the AGRA is working on five main topics to improve things. It would be easier, in my opinion, to "divide and conquer" the items that need attention. I had previously just mentioned a little bit about the irrigation systems and how they are an issue in Ethiopia. In other, more wealthier, countries, they have a variety of different irrigation mechanisms that they use to help water their crops and livestock. Some of the irrigation is run and managed by the government, which limits what and how much is irrigated with the proper nutrients and water. Ideal farming land is not often found in parts of Africa, especially Ethiopia, but depending on the topography, dams are used to trap what little water they have. With these dams comes a main problem. The dams are not built to withstand heavy currents so often times siltation, seepage, and or water logging occurs. Many farms in Africa have shallow, hand dug wells that they use

for drinking water and little irrigation. A few of the more wealthier farmers that are privileged with the access will use motorized pumps to pump water from the wells, producing horticultural crops for market. These farmers are not always guaranteed with the best of water, as water quality is a major concern in a majority of parts in Africa, thus causing a constraint with prices fluctuating and never knowing how good of a crop they are going to produce. With more focus on certain things, I think more things can be done to improve the living, especially the farming in Ethiopia.

Something that I suggest trying is, as I said before, installing irrigation systems. A way to conserve the water when it rains is an irrigation system called Spate Irrigation. Spate irrigation is a process where the rain water and the flood water is collected and divided from upstream to irrigate the land downstream. This process is mainly practiced in the lowlands of other African countries but I believe that it wouldn't be too extremely difficult to incorporate it into the farm lands in Ethiopia. As of right now, drip irrigation, treadle pumps, rope-and-wash, and wind mills are currently being adopted in some parts of Ethiopia.

("Ethiopia - Project") I think if we could help instal more of these different systems into many small farming communities, it would really help out the local Ethiopians a lot. I believe that rather than just giving Ethiopia the resources they need to survive, it's more important to teach them how to get the supplies they need for themselves. This way, Ethiopians know how to fend for themselves on the things they need rather than expect it to always be given to them. The continuation of improving the crops is vital. Things can never be perfect, and there is always room for improvement.

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