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### **Ethiopia: Educating farmers to help their fields and yields**

Ethiopia has one of the most diverse landscapes in Africa due to its large mountains and deep valleys that cover most of the country. Ethiopia is a land locked country located on the Horn of Africa. By means of population Ethiopia is the third most populous country in Africa, currently hovering around 74 million people and growing. Because of the large population growth, agriculture became the country's number one sector in their industry. It accounts for 40% of their GDP, and employs 85% of their workers (Mengistu). And in the last 30 years Ethiopia has experienced a government change three times going from an Imperial government to a now Democratic government (Diao).

Subsistence farming families make up approximately 90% of the Ethiopian population. Farming families are usually made up of 6-8 people. The husband is the head of household and is superior to women (Getahun). The man is supposed to take care of all farming and grazing chores. The women are supposed to make meals, take care of the children, and take care of the house. The other 4-6 people in the family are kids; half of which are usually under the age of 10. The family eats unleavened bread, Injera, with every meal. Injera is typically made of Teff or other cereal grains. They use this bread as their silverware to help consume the other foods they eat, typically stews made of vegetables like carrots, cabbage, and lentils ("Countries and Their Cultures"). The access to education and the amount of education that kids are receiving in Ethiopia is continuing to grow. In 2010 almost all children in Ethiopia received primary school education. But only 39% of males and 32% of females received secondary school education. And in 2007 39% of adults and 55% of children were literate (Education (all Levels) Profile – Ethiopia). The overall health in Ethiopia however is in need of help. With famine and malnourishment on the rise, people are becoming sicker with various diseases at an increasing rate. Currently, the Ministry of Health's priority health problem is Malaria. Government spending on health care has increased substantially but is still under the average compared to other Sub-Saharan countries. The physician to population ratio is about 1:38,365 and a majority of the hospitals lie within bigger cities where only 5% of the population lives ("Countries and Their Cultures").

With 85% of Ethiopia's population working as a farmer, a growing population, and a limited amount of land; the average farm size per family is small. In low and mid altitude regions, the farm size average is 2HA, and a variety of plants are grown including teff, wheat, maize, sorghum, faba beans, chickpeas, and field peas. And in the high altitude areas of Ethiopia, the average farm size is 3.3 HA with about 1 HA kept fallow because of mountainous terrain and poor farming practices. High terrain farmers usually plant barley, wheat, oats, faba beans, field peas, lentils, and linseed (Seyoum Taffesse). Current farming practices in Ethiopia are currently poor and outdated. Because of infertile land due to soil erosion, fertilizer is needed in excessive amounts. Because farm families have very little money, they can't afford the fertilizer and therefore don't use any. This results in low crop yields and soil becoming even more eroded because there aren't enough plants covering it. It is a revolving cycle, as it gets worse and worse every year (GEBRE-SELASSIE).

There are many barriers to improving the agricultural productivity of Ethiopia. The government currently controls all of the land and lets farmers rent it on a long term lease because of the fear that hierarchies will form based on land-owners selling their land. And because of the growing population and limited land, the farms are extremely small and infertile because of exploitation of the land. The soil infertility is causing decreasing yields of crops. Other barriers include outdated technologies because of a lack of education and severe droughts due to climate change (GEBRE-SELASSIE). Because the majority of farmers are subsistence farmers, there is very little room for crops to be sold for profit. Currently farmers

are selling 4-20% of their crops; but 30-50% of their livestock is sold instead of consuming it. The annual income for a farming family is between 376 to 415 Birr (depending on where they live); which is equivalent to about 20 U.S. dollars a year (Seyoum Taffesse). Because of a small amount of land per family farm, a dependence on rain and high post-harvest losses results in people not wanting to invest much into the farm land they are using. The farmers see no need to invest money into the land, since they will be reassigned new land years down the road. This is hindering their goods from accessing the food markets. There are however, unions coming to existence that help farmers sell their crops to bigger markets (“Purchase for Progress”).

Malnutrition in the world is extremely prominent in children. It accounts for half of the child deaths in the world, approximately 5 million. Malnourishment also magnifies other diseases which is usually the death of other ill people. Of the known malaria cases 57% are because of malnourishment, 52% of pneumonia cases are because of malnourishment, and 45% of measles cases are because of malnourishment. In developing countries, approximately 32.5% of the children are malnourished (“2012 World Hunger and Poverty Facts and Statistics by World Hunger Education Service”), and 6 million children in Ethiopia are at risk for malnourishment because of a lack of food (Rice). And Ethiopia’s Ministry of Health is focusing on Malaria as the number one health problem (“Countries and Their Cultures”). People are malnourished because they can’t get enough nutrients from food. With the reasons described below, factor 15-Education will be my focus for this paper to reduce the amount of malnourished people in Ethiopia.

Currently 70% of Ethiopian land that is cultivated for agriculture is used to grow cereal crops. Of that, 30% of the land is used to grow teff, which gives an output about 22%. And 18% of the land cultivated is used to grow sorghum. Over 11 million farmers are currently “small farmers” who are raising cereal crops (Diao).

Ethiopia has two growing seasons, which are based on the time of year when the crops are harvested. The first growing season is the “belg” rains which spans from March-August of every year. The other growing season is the “mehr” rains which spans from September-February of every year. The belg rains account for all crops that are grown in the highland regions including one of the country’s most important crops-teff. Because of climate change, belg rains have been sparse in regions. And when the rains are present the crops have already died from no water. Mehr rains though, provide water for the growing season for the lowlands of Ethiopia where sorghum is grown. Climate change has not yet affected the mehr rains; and interviews with farmers throughout the country show that the rains have still been sufficient (“Crop Production Zones in Ethiopia”).

Because of soil infertility due to excessive erosion and exploitation over time, excessive amounts of fertilizer is necessary for crops to be successfully grown. The fertilizer supply is readily available to the farmers (studied in Arsi and Bale region), but because of transportation costs, fertilizer proves to be too expensive year after year. This leads to farmers wanting to buy fertilizer, not having the money, and only buying a small fraction of what they actually need. Though this small fraction is better than having no fertilizer, it isn’t enough to successfully yield the amount of crops the fields are able to produce. In the Arsi and Bala regions, crop yield is expected to fall 10-20% because of a lack of fertilizer (“Crop Production Zones in Ethiopia”).

Sorghum, a cereal grain, is a very well-rounded grain. Based on a 2000 Calorie a day diet, 1 cup of sorghum contains 6g of fat, 143g of carbohydrates (48% of daily value), and contains 22g of protein. Sorghum also provides in that one serving 47% daily Iron needs and many other minerals. (“Nutrition Facts-Sorghum”). Teff is very similar in nutrition to sorghum (“Nutrition Facts-Teff”). Sorghum has drought resistant properties because it thrives in semi-arid environments. When considering Ethiopia’s terrain, you can conclude that the majority of the country would be able to support sorghum crop. Sorghum is an extremely reliable crop, when proper farming techniques are used, because of the drought resistant and nutrition properties of the crop. The mehr rains which are still consistent, provides the rain

that grows 90-95% of the crop for the country. And since sorghum is drought resistant, even if the rains were to become sporadic the crops would still be able to pull through. Teff still makes up a larger percentage of crop output in Ethiopia compared to sorghum not because of more nutritional benefits but because of a cultural bias to it (Countries and Their Cultures). Everything that teff is currently used for can easily be replaced with sorghum (Clemson University). Plus sorghum is mold resistant when storing for long periods of time ("Crop Production Zones in Ethiopia").

Farmers are not educated on ways that they can better utilize their land and resources to grow more drought resistant crops and use composting instead of chemical fertilizers (fertilizer from composting being natural and not harmful to the environment compared to chemical fertilizers which can damage the environment) to help their fields. Because farmers aren't educated they are continuously planting their crops using old technologies which erode the soil even more. With no education it is a never ending cycle of soil erosion and crop failures. The lack of education affects the country as a whole because of the lack of food made for the country to consume, and the amount that they are then able to export.

The amount of education of Ethiopian farmers seems to be increasing slowly. There is no true indicator to whether or not this is actually taking place, because there is no true way of finding out how much education is currently being given to the people as there are many separate organizations that aren't compiling their data with one another. However, when looking at specific studies we can see that when education is given, people do put it into practice. A study shows farmers were very hesitant to put in place practices that they had not tried before. Once they were convinced, implemented the new farming ideas, and harvested the new crops, they realized that they needed to permanently change their farming practices. These included putting seeds into rows; and using composting instead of no fertilizer or chemical fertilizers (Edwards). This indicates that with education subsistence farm families will be able to better support themselves through the crops that they grow; which will help stop malnourishment.

Making sure adequate education reached all farmers would greatly help a subsistence farm family along with the nation as a whole. It would double the amount of crops that a farmer is able to produce (Edwards) and be more sustainable to the long term use of the land as new practices are introduced. Planting seeds in rows instead of scattering them would help allow that the land was being used to its full capacity without further erosion. Using compost would help ensure that the soil is replenished with the nutrients that the plant took away from it. And planting more sorghum, another cereal plant similar to teff as previously mentioned, would help ensure that more crops were yielded even when long terms droughts occurred. This means that a higher yield of crops would most definitely yield, the farm land would be in better shape in the long run, and most likely make the country's GDP increase since 40% of it depends on their agriculture ("Countries and Their Cultures"). This would most definitely increase the livelihoods' of all people living in Ethiopia.

There are several other factors when considering the shortage of food, and how they will affect how successful education actually is. No matter how much education you have, if there is absolutely no water to grow crops; then you can't grow any crops. Due to climate change, water scarcity throughout Africa seems to be a huge problem. If education about how to sustain healthy fields (including water conservation) isn't implemented, than Ethiopia's population with its dramatic increase could result in famine. That's why it's crucial that education is put in place immediately.

There are a few different practices that I think could be put into place on a small community scale to help meet the Millennium Development Goals of eradicating extreme poverty and hunger along with ensuring environmental sustainability. First, education is key. It is important that all communities and all farmers receive adequate education in order to farm sustainably. Without the use of new farming techniques, people will continue to die from malnourishment. Education for many aspects of farming is important, especially teaching farmers how to use compost instead of chemical fertilizers. Compost can be easily made from the left over husks and shells of many crops, and it is a natural way of nourishing the soil. It

takes out the harmful chemicals that are put into the environment by the chemical fertilizers, and is proven to produce more crops. Educating farmers about switching the crops they plant to sorghum (if they aren't already planting it) would also greatly be beneficial to helping farmers. As described earlier sorghum is more drought resistant than teff, is as nutritionally beneficial as teff, and can be grown in more parts of the country when compared to teff. Once one person in the community knows how to farm better, the word of mouth will spread quickly and others will catch on too. A project that each community could have would be a local compost pile. Because composting requires both nitrogen and carbon based substances, a community pile would be beneficial. It would make sure there are enough of all necessary elements, it would break down faster into a usable product because of the heat produced from the pile, and it would be easier to manage with many people available to routinely turn the pile. Having a community compost pile would ensure that all farmers have enough fertilizer for their fields every year. This would also save money since it would save the farmers from having to buy chemical fertilizers.

I feel that the knowledge that the Ethiopian farmers lack is information that is common in and known by most "gardeners" in the Western world. With that, I think that the Ethiopian national government, the United Nations, and other organizations could provide a great deal of knowledge to the farmers. The Ethiopian national government should set aside money for providing internal education to its farmers; along with encouraging their farmers to grow more sorghum. Currently a large majority of the government's funds are being spent on health care. And a large part of that is treatment for malaria. As you can conclude from the information provided above, when people aren't malnourished the likelihood of them getting malaria plummets. Therefore, some of the money currently spent on healthcare should be spent on education focusing on better farming techniques; because once better farming practices are put into place, there will be more food, and people will no longer be malnourished (or substantially less amount of people). And if the government encourages more sorghum to be raised, more tonnage of crops with equal nutrition is likely to yield. So between increasing spending for education and the encouragement of growing a better drought resistant food Ethiopia should experience a greater amount of food available for its families; and a greater GDP due to more exports because of more crops, helping bring the country out of poverty.

I feel the United Nations along with other independent organizations throughout the world could also help Ethiopia by just providing simple education to the farmers. This funding should be spent on employing people to go and teach farmers through a growing season period on how to implement better farming practices including composting and the transition into growing more sorghum; and on creating and distributing informational pamphlets throughout the country (since over 30% of adults are literate and 55% of children are literate, with numbers growing with newer generations). Pamphlets would allow information to reach areas where humanitarian workers aren't able to immediately teach; and educated people through the UN and other organizations would help show people how to properly put the practices into place. Rural families can then use the information that organizations and their government have provided them to then teach their neighbors and new generations to come. Along with continuing to implement the new practices that they were taught. The money used from these organizations to fund education wouldn't be "new money." But instead reallocating money from health relief efforts (associated with malnourishment and supplying nutrition shakes) to an education program. Therefore, no money that isn't already set aside for Ethiopia relief would be used.

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