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### **Crop Yield Improvement in Ethiopia**

Today there are more than eight hundred million people on this planet living without proper food security (Prakash). Food security, life without hunger or starvation, is an aspect of life that everyone needs and desires, but that some will never achieve. Living in terrible conditions without enough food causes about forty thousand deaths each day. One of the poorest countries in the world, Ethiopia, is home to approximately fifteen million people living with the threat of starvation (Prakash). Malnutrition haunts the lives of many small children including the thirty four percent under the age of five that are severely underweight and starving. With agriculture as its main source of livelihood and with few advances in technology throughout the years, Ethiopians rely heavily on erratic rainfall to grow their crops. Good seasons of harvest are rare and drought is very common in the poverty ridden country (Prakash). Without enough food to feed their families, many go without food on a daily basis. However, this type of starvation and famine can be reduced. By increasing research and breeding of improved plant varieties, crop yields could greatly increase and lives could be saved.

Though farming and agriculture are incredibly dominant industries in Ethiopia, the geography of this African country is not conducive to such practices. Ethiopia is on the northeastern part of the Horn of Africa just west of Somalia (Von Braun). The country is landlocked and consists of a high plateau with a central mountain range ("The World Factbook; Ethiopia"). Ethiopia has a tropical monsoon climate, meaning that each year has a wet and a dry season. However there are also wide topographic-induced variations and rainfall is highly erratic. Because of this unpredictable weather, there is a very high risk for droughts year-round. Intraseasonal dry spells are common and often harm the land that farmers cultivate, eventually damaging the crops that will be harvested (Joachim). The primary agricultural products grown in Ethiopia are cereals, coffee, potatoes, and sugarcane. The five main cereals are teff, wheat, maize, sorghum, and barley. These cereals take up about three fourths of the total area cultivated each year (Von Braun). However, with the high risk of drought and limited irrigation opportunities, successful harvest of these crops is rare. Irrigation is very limited in Ethiopia because farmers do not have good access to a tributary of the Nile River that flows through the country. Egyptian farmers have been dominating the river for decades and allow few opportunities for Ethiopians to use the river for irrigation networks (Thurow). Because of this, keeping crops healthy is even more of a challenge. Despite of the fact that 10% of the land in Ethiopia is considered to be arable, only 0.65% of the crops planted and harvested are permanent and reliable ("The World Factbook; Ethiopia"). Frequent droughts, soil erosion, and numerous water shortages cause huge challenges for Ethiopian farmers. The harvesting of the crops is a very difficult task and many do not survive through the entire season because of the massive lack of water. Because agriculture acts as the main source of livelihood in Ethiopia, farmers are almost forced to continue planting, cultivating, and harvesting, despite the fact that the harvests are rarely substantial and many still are unable to feed their families.

Due to the harsh climate and lack of reliable water in Ethiopia, famine, as a result of drought and loss of food, is very common. This country is the second most populous in all of Sub-Saharan Africa and is also one of the poorest (Joachim). Home to more than seventy-five million people, fifteen million Ethiopians are threatened by starvation daily (Von Braun). Many families eat only one meal each day and some even go days without any food at all. Homes consist mostly of huts made from mud and sticks. With agriculture as the main source of livelihood for most Ethiopian people, the economy is dominated by small farmers. Approximately eighty five percent of the population of Ethiopia is farmers. These farmers rely on traditional techniques for cultivation and produce primarily for consumption by the farmers'

families (Joachim). However, “yields are very low by international standards and overall production is highly susceptible to weather shocks, particularly droughts” (Taffesse). Low yields make it challenging for farmers to provide for their families and very few have extra crops to sell for a profit. Therefore, income in the farming household is low and many are in constant debt. With families made up of five to seven children, debt and low yields are even more tragic. There is only a forty three percent literacy rate in this country and few children attend school after the age of eight. Few occupations exist outside of agriculture, however life as a small farm owner is not rewarding because of the many droughts. Furthermore, the population of Ethiopia has increased in the past two decades, but the food production per capita has continued to decline (Von Braun). This means that with the amount of food that is currently being grown, it is impossible to feed the increasing population. Because of this, “famine vulnerability is high in Ethiopia,” and food insecurity is constantly growing (Joachim). Nearly thirty percent of the population is living below the poverty line. This means that thirty percent of the people in Ethiopia live on less than one dollar each day. Days often go by without any food, and any shelter that is attained is not adequate for safe living. The life expectancy for a person currently living in Ethiopia is only sixty-five years old (“The World Factbook; Ethiopia”). This low life expectancy can be traced directly back to the immense lack of food in the country. Because of droughts and a poor climate, crops often fail and entire families are left with nothing to eat. Unlike affluent countries like the United States, Ethiopia cannot afford to make up for the many crop failures. “In the United States, a crop fails and the government writes a check. In Africa, a crop fails and people die” (Thurow). There have been thousands of personal stories told about starving families in Ethiopia. As explained in Enough; Why the World’s Poorest Starve in an Age of Plenty:

Laa Lakamo, a father of ten, patiently waited his turn on his little plot of land... “I don’t have enough to feed any of them,” he said of his children, some of whom stood at his side, holding tight to his legs. The drought had wiped out his corn and beans the year before. The area inside his one-room hut where he would normally store food was barren. He actually had less than nothing, he said, for he was in debt to creditors for two years’ worth of fertilizer and seed. His clothes were in tatters. He balanced a square piece of black and green carpet on his head to ward off the blazing sun (Thurow).

Many great famines have occurred in Ethiopia throughout its history. Two of the harshest were in 1983 and 2002. The famine from 1983 to 1985 was the worst famine in the world in current history. It came as a result of a lack of rain and an extensive drought. Families completely lost all sources of food and had little access to any water. Over eight million lives were affected and nearly one million died from starvation. Some of the lasting impacts of the famine were malnutrition and illness. Another devastating famine struck in 2002. As a result, chronic food insecurity affected the majority of poor households. The number of people in dire need of food doubled as a result of the disaster (Von Braun). Famines similar to these will continue in Ethiopia if changes to living situations are not made. Many farmers rely solely on rainfall for irrigation; however, rainfall is so erratic that successful harvests are rare. Droughts are incredibly prominent in Ethiopia and often leave families without food and water. If the current situation in this populous country does not change soon, droughts and famines will continue, killing more innocent men, women, and children.

Agricultural Biotechnology could help to provide a solution to the devastation in Ethiopia. This field of science has become increasingly more sophisticated in the twentieth century. It can easily be defined as the use of modern science and tools to create improved products; usually through genetic engineering of plants. Researchers have said that, “biotechnology enables improvements that are not possible with traditional crossing of related species alone” (“Agricultural Biotechnology”). For many Ethiopian families that rely on their farms, the loss of crucial crops to disease and weather can be a life or death situation. Agricultural Biotechnology can increase production, crop yields, and decrease crop damage caused by weather and disease (Prakash). Population in the African country continues to rise, but because

there is no increase in food production to go along with it, many are threatened by starvation. Researchers in this field are working to create variations of crops that will be more durable and resistant to drought and erratic weather conditions. These crops would be able to survive during the long droughts of Ethiopia and would not need nearly as much water as current crops. Therefore, rather than farmers losing entire harvests during droughts, good and reliable products could still be grown and cultivated. Experts have often stated that “investment in drought-resistant and high yielding crops can boost production” (Von Braun).

In addition to the production of crops that are more pest, disease, and drought resistant, products with a greater nutritional value are also being explored (Borlaug). Because malnutrition plays a large role in the amount of deaths each year, crops with a greater nutritional value would have a huge impact on Ethiopian people. For example, nearly one hundred million children worldwide suffer from vitamin A deficiency (Prakash). Low levels of vitamin A make children more susceptible to slow bone development and respiratory infections (“Agricultural Biotechnology”). Many scientists are working to incorporate beta carotene, a precursor of vitamin A, into certain crops (Prakash). With increased levels of beta carotene in crops, the amount of vitamin A deficiency in young children could greatly decrease. Research is also taking place to find ways to increase the amount of protein in maize (“Agricultural Biotechnology”). Because maize is one of the main cereals grown in Ethiopia, this advancement could have a large effect on the overall health of Ethiopian people. Advancements such as these could help to save the lives of the many starving in Ethiopia and improve the standard of living as well.

Scientists also believe that biotechnology can “sustain the land’s ability to support continued farming” (Prakash). As many farmers are noticing today, the land in Ethiopia is becoming increasingly damaged as a result of too much harvesting and cultivation. Farmer’s crop production would be at risk if this trend continues. By increasing the ability of the land to support continued farming, biotechnology could save farms and allow for more crops to be produced on the same land. Certain products are being developed that can more efficiently absorb nutrients from the soil. This could greatly increase the amount of food harvested each year and would also positively impact the arable land. Furthermore, each year farmers spend a great deal of money on fertilizers and other products to help their crops grow (Thurow). However, with the common droughts and complete loss of harvests, this money is often spent and never earned back; leaving farmers in debt. Another area to be explored could include improved techniques used by the farmers. Crop rotations, soil erosion control, and use of natural fertilizers could improve the crop yields. The issue of teaching farmers these improved techniques is another topic that would need consideration. The use of Peace Corps volunteers is one example of a way to solve this issue. Internships could also be offered to students interested in assisting struggling countries and these students could help educate farmers in new techniques. As a result of these new techniques and biotechnology, production on land already under cultivation could increase and the need for costly fertilizers and non-renewable resources could be greatly reduced (Borlaug). As a result, genetically improved crops and farming techniques could benefit the land in Ethiopia as well as assist farmers in their cultivation.

To summarize, because of modern technology and advancements in biotechnology, genetically advanced improvements in the crop yields in Ethiopia are very possible, as early as the year 2015. Drought, pest, and disease resistant products would have a far greater chance of living through the many weather changes in this African country. Crops with a greater nutritional value would also improve the lives of many that are starving and malnourished. Certain crops could also positively impact the environment and save the land in Ethiopia that has been deteriorating over the past decades from excessive farming. For this process to be successful for the farmers of Ethiopia, increased communication needs to occur between the United States and Ethiopia.

The United States has been sending food aid to African countries, such as Ethiopia, since the mid-1800s (Thurow). Thousands of packages of food are shipped to Ethiopia throughout the year and families are

given food and other materials that they need to survive. The original goal of this aid was to act as a solution to world hunger and many thought it would not only save lives but also end starvation completely. While the food aid program has had a significant influence on many lives, the effect is not always a positive one. During long droughts in Ethiopia, when many crops fail and farmers are left with little for their families to eat, many line up to receive aid sent to them by the United States and other prosperous countries. People are offered food without having to pay for it and many willingly accept. In times of poor harvest and when few farmers have enough to feed their families, programs such as food aid are very beneficial to Ethiopian people and many lives are positively impacted. However, there are times throughout the year when farmers are able to harvest enough food to not only feed their families, but to also sell to the community. Good cultivations have occurred in Ethiopia at times when there is no drought and the weather is conducive to growing crops. Farmers can feed their families and even have enough food left over to sell and make a profit. However, when families are receiving free food from other countries, such as the United States, through food aid programs, few people chose the option to buy food from local farmers. Because of this, farmers that are able to harvest good, sellable crops are left with their extra food and no one to buy it. The food spoils in warehouses as families continue to receive food aid from America. All of the money that farmers spend on fertilizers to grow healthy crops is wasted because no one buys the food. If there was less aid during good harvests, farmers could sell their crops and make money rather than losing it all to the food aid program. As explained in Enough; Why the World's Poorest Starve in an Age of Plenty:

The trucks came in waves, carrying in all more than 1 million tons of wheat, corn, beans, peas, and lentils from the United States....Jerman shook with anger whenever he saw those trucks, for inside his warehouse, a vast concrete cavern, was an astonishing sight in a country suffering from epic hunger: bag upon bag of *Ethiopian* wheat, corn, beans, peas, and lentils stacked in towering columns stretching toward the ceiling...It was the bounty from the two seasons before, the bumper crop from Jerman's farm and the fields of his neighbors (Thurow).

There needs to be increased honest communication between the United States and African countries in order for this issue to be resolved. While aid programs set up by organizations in the United States do have major benefits in countries like Ethiopia, there are still some obvious flaws. Despite the fact that food aid programs have been in action for many, many years in Ethiopia, the country is still one of the poorest, and food aid is not the only thing that Ethiopia needs. Hunger and death by starvation are still dominant and thirty percent of people still live below the poverty line. Food aid alone will not solve hunger or gain food security; a more permanent solution needs to be found. Increased research in genetic engineering of certain crops as well as the teaching of improved farming techniques could give Ethiopian people more control over their farms and their wellbeing. Rather than sending packages of food to the country in the form of food aid, United State organizations could send genetically advance seeds for farmers to use. Markets could be established in Ethiopia for the buying and selling of these seeds. This could also have a positive impact on the economy of this struggling country by giving more people jobs. People would not have to rely on other countries to provide food for them because drought and disease resistant crops grown from the genetically modified seeds could survive the Ethiopian climate and be harvested and sold. Farmers could pay off their debt because they would be making money by selling their extra crops. Families would not have to go days without food and overall nutrition would improve. However, these things can only be accomplished if the United States and Ethiopia work closely together and improve communication.

The Ethiopian government also needs to take more responsibility for its starving population. It is important for the government of a country to recognize the needs of its people and to put every effort forward to meet the country's needs. Currently, Ethiopian people need food and more reliable farming practices. However, the government in this starving country is not doing much to save the dying families. Often, money sent as aid programs to Ethiopia is misused by the government for "political mobilization

and rewards for voting for the ruling party” (Mariam). Furthermore, “business attached to the ruling party have a near-total monopoly and chokehold on the economy making fair competition for non-ruling party affiliated entities in the market an exercise in futility” (Mariam). If practices like these continue in Ethiopia, the country will not be able to combat the food insecurity that so many families face every day. If the government of this poverty ridden country does not start committing itself to its people, conditions will not improve. By using the money and aid from other countries in the way it is intended, the Ethiopian government could greatly help its people in their fight to end hunger and starvation. The country would have a greater chance of reducing starvation and famine if the government was more prevalent in the fight against hunger.

A more stable Ethiopian government and assistance from the United States and other developed countries could have many beneficial impacts on Ethiopia. Not only could the amount of people living in starvation decrease, but the use of the environment could improve, the Ethiopian economy could be stimulated, malnutrition could decrease, and Ethiopian farmers’ harvests could be more reliable. With a more reliable food source within the country, Ethiopian people would no longer have to rely on other countries for support during droughts. However, until a more stable farming system is set up within this populous country, developed countries, such as the United States, need to be present and willing to provide assistance to struggling farmers. Because the United States has already vowed to help poorer countries, it is important to see this promise through. Once a stable system is set up within Ethiopia, assistance from more developed countries will not be needed nearly as much. However, for now, Ethiopia cannot fight hunger alone.

Modern technology and advances in science give the United States the opportunity to assist struggling countries with devastating issues, such as hunger and starvation. As Ronald Cantrell says: “To still have hunger in our world of abundance is not only unacceptable, it is unforgivable.” Biotechnology allows and could provide a solution to the thousands of crop failures that have occurred throughout the history of Ethiopian farming. Leaving a populous country to rely only on erratic and unpredictable weather to determine their survival is not acceptable or forgivable. It is the duty of affluent and knowledgeable countries, like the United States, to provide help and support to these countries. Prakash, as well as many other scientists, believe that, “the use of high-yielding, disease-resistant and pest-resistant crops would have a direct bearing on improved food security, poverty alleviation and environmental conservation in Africa” (“Agricultural Biotechnology”). With increased communication and cooperation from both the United States and Ethiopia, food insecurity could decrease and farmers could have fewer inadequate harvests. Increased research in breeding improved crops, and more effective farming techniques could not only have an enormous influence on Ethiopian people, but the technology could also be used in other countries that suffer the same conflicts.

#### Works Cited

"Agricultural Biotechnology." Agricultural Biotechnology and Genetically Engineered Crops - Policy Briefs. US Agency for International Development, 2004. 3 Aug 2012. <[http://www.absp2.cornell.edu/resources/briefs/documents/warp\\_briefs\\_eng\\_scr.pdf](http://www.absp2.cornell.edu/resources/briefs/documents/warp_briefs_eng_scr.pdf)>.

Borlaug, Norman E. "Drought Tolerance." Sixty-two years of fighting hunger: personal recollections. Euphytica: 2007. 3 Aug 2012. <<http://www.plantbreeding.org/publications/borlauglife.pdf>>.

Borlaug, Norman E. "Increasing genetic yield potential." Sixty-two years of fighting hunger: personal recollections. Euphytica: 2007. 3Aug 2012. <<http://www.plantbreeding.org/publications/borlauglife.pdf>>.

Joachim von Braun, Tolulope Olofinbiyi (2007). Case Study #7-4, "Famine and Food Insecurity in Ethiopia". "Food Policy for Developing Countries: Case Studies."  
<<http://cip.cornell.edu/dns.gfs/1200428184>>.

Mariam, Al. "Why is Ethiopia Poor?." *The Universal Declaration of Human Rights*. N.p., 28 Nov 2011. Web. 20 Sep 2012.

Prakash, C.S. *Benefits of Biotechnology for Developing Countries*. Tuskegee University, AL. 3 Aug. 2011. <<http://www.agbioworld.org/biotech-info/topics/dev-world/benefits.html>>.

Taffesse, Alematehu Seyoum, Paul Dorosh, and Sinafikeh Asrat. "Crop Production in Ethiopia: Regional Patterns and Trends." International Food Policy Research Institute, 2011. 14 Aug 2012.  
<<http://www.ifpri.org/publication/crop-production-ethiopia>>.

"The World Factbook; Ethiopia." Central Intelligence Agency. N.p., July 31, 2012. 4 Aug 2012.  
<<https://www.cia.gov/library/publications/the-world-factbook/geos/et.html>>.

Thurow, Roger, and Scott Kilman. *Enough: Why the World's Poorest Starve in an Age of Plenty*. 1st. Philadelphia: PublicAffairs, 2009. Print.

Von Braun, Joachim, and Tolulope Olofinbiyi . "Famine and Food Insecurity in Ethiopia." Food Policy for Developing Countries: The Role of the Government in the Global Food System. Ithaca, NY: Cornell University, 4 Aug 2012.  
<[http://cip.cornell.edu/DPubS/Repository/1.0/Disseminate?view=body&id=pdf\\_1&handle=dns.gfs/1200428184](http://cip.cornell.edu/DPubS/Repository/1.0/Disseminate?view=body&id=pdf_1&handle=dns.gfs/1200428184)>.