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Somalia, Plants

Genetically Modified Crops: A Potential Solution to Somalia's Food Issues

Somalia, home to around 11 million people, is currently experiencing food insecurity that can be attributed to droughts, poor rainfall, armed conflict, and a lack of infrastructure (Central Intelligence Agency, 2018). The complexity of Somalia's situation varies from region to region but could be remedied by improving the quality or even the characteristics of the crops that they grow to better suit the circumstances. An effective solution to Somalia's food insecurity as well as its problems with the amount of usable water it has is through the use of genetically modified cereal crops, more specifically crops modified to use less water to cultivate. This paired with an increase in foreign aid - focused towards providing modified crops and educating farmers along with the public - can solve food insecurity in Somalia.

Residing in East Africa, bordering the Gulf of Aden and the Indian Ocean, Somalia boasts a total area of 246,201 square miles (Lewis & Janzen, 2018). The climate is mild, dry, and hot with four seasons. The country is mostly flat with the exception of a mountainous coastal region and multiple river valleys. This flat geography allows the nomadic peoples of Somalia to easily traverse the country along with their livestock. The river valleys are a main source of water which supports agriculture in Somalia and is essential in cultivating several different types of crops. Some of which include: sorghum, maize, rice, bananas, and cowpeas (International Bank for Reconstruction & The Food and Agriculture Organization, 2018). Although Somalia has grown a multitude of different crops, recent droughts and poor rainfall have led to significant declines in crop production. These droughts and lack of rainfall have also dried up the river valleys that Somali agriculture heavily relies on resulting in a widespread famine.

Somalia's population is Sunni Muslim as Islam is the national religion of the country itself (Central Intelligence Agency, 2018). About half the population lives in rural areas and the other in urban with roughly 40.5% in urban and 59.9% in rural (Lewis & Janzen, 2018). There have been high levels of unemployment in the rural areas following the inadequate conditions for farming. Somalia's government has been a mixture of civil law, Islamic law, and customary law (Central Intelligence Agency, 2018). This is in part due to the many Muslim clans and sub-clans that reside in the country, three-fifths being nomadic. The northern part of Somalia has an organized government that consists of two houses while the southern part is in a disorganized state controlled by the many clans and rebel groups, such as the Al Shabab (Lewis & Janzen, 2018). The disorganization in the government leads to a lack of a strong centralized government outside the capital, Mogadishu. According to Conor Seyle (2015), Deputy Director of Research and Development at the One Earth Future Foundation, this is due to "regional governments in Somalia operate[ing] with varying degrees of independence and effectiveness, ranging from the almost fully autonomous Somaliland region (which has sought recognition as [an] independent state), areas dominated by the militant organization Al Shabab, and other states and regions that still struggle to establish political control." The lack of political control in some areas may make it difficult for certain organizations like the United Nations to come and provide aid to the populations; it also makes assessing the food insecurity situation difficult as the Al Shabab's control over certain territories makes it challenging for help to be brought to those in need. A typical family in Somalia consists of around six people, 66% of which are headed by females (Population, composition and demographic characteristics, 2016). A large amount of Somalia's population relies on agriculture to provide for families. With the current conditions preventing crop production many families find themselves in need of aid. According to

the World Food Programme, “Another 2.7 million Somalis need livelihood support to keep from sliding into crisis” (World Food Programme, n.d.).

One of the most significant factors contributing to Somalia’s food insecurity is the inability to grow and cultivate crops. The lack of a secure supply of crops is attributed to the war and droughts that have been plaguing the country (International Bank for Reconstruction & The Food and Agriculture Organization, 2018). According to the FAO, “as a result of the drought, by early 2017, more than 1.6 million people had exhausted their cereal stocks and become heavily dependent on markets (with cash purchases funded with remittances) and international aid for food.” Recently there has been a consistent lack of adequate rainfall that has led to infertile land. The poor rains paired with continuous attempts to plant crops has exhausted the soil’s nutrients. Not only have the droughts brought infertile soils but have also dried up the river valleys located throughout the country. The river valleys are important supplies for both consumption for the population and irrigation for agriculture.

The population that is most impacted by the droughts and lack of food is rural populations. In November 2016 to mid-2017 it was recorded that around 444,000 people in rural areas were displaced as a result of people searching for new sources of food and water (International Bank for Reconstruction & The Food and Agriculture Organization, 2018). Along with being displaced and lacking a proper food supply, farmers affected by the infertile lands now have to find new sources for employment in urban areas. One of the main reasons for rural populations to move to urban areas is for new opportunities and better access to aid.

Although not much information can be found about the use of GMOs in Somalia, genetic modification could have potential to solve much of Somalia’s problems with food. According to the FAO, “The food supply is based on milk and cereals. The dietary energy supply is insufficient to meet the population's energy requirements. The country depends heavily on imports of cereals, vegetable oil, and sweeteners. The supply of fruit and vegetables, as well as that of meat, is low” (Food and Agriculture Organization, 2010). Based on this information the most suitable crops to modify would be cereal crops like maize, wheat, sorghum, and rice due to its already familiar presence in Somali agriculture, their nutritious value, and the fact that scientists have already been working on modifying crops like these.

The numerous problems Somalia is facing such as lack of water, lack of nutrition, and lack of fertile land can be remedied by carefully choosing characteristics for the crops being cultivated. For example, the Massachusetts Institute of Technology describes that “genetic modification can decrease the water requirement of the staple cereal crops mentioned above by selection for traits that increase the rate of photosynthesis and depth of root structure, as well as decrease the rate at which water is lost through transpiration” (Massachusetts Institute of Technology, n.d.). Specifically, crops can be modified so that the rate of photosynthesis is increased, the depth of the roots increases, and less water is lost from the plant during transpiration. By genetically modifying cereal crops in this fashion, farmers are able to decrease the amount of water needed to manage their crops. This allows for two things: more water for other agriculture and more water for consumption by livestock and the populations in need. Another possibility of modifying crops is improving the soil. Other efforts to make crops drought-resistant include making them able to withstand higher temperatures than they normally would not be able to survive in. One treatment for this characteristic, created by Dr. Rusty Rodriguez and his team is called BioEnsure and employs the use of fungal endophytes, microorganisms that live between the cells of plants, to grow symbiotically with the crop that is being modified (Rodriguez, 2016). Although this treatment is not genetic modification, it is, however, effective and a notable procedure that is being tested for use in Somalia by the Somalia Agriculture Technical Group. Dr. Rodriguez claims that by treating crops with BioEnsure, the crops can adapt to the stress droughts bear on them. When tested in the U.S the treated crops had an 85% increase in yields as compared to the untreated crops. Similarly, Dr. Rodriguez states that there has been a 29% increase in the yields of five different crops tested in India and according to him

the reason for this increase is the fact that the crops are using less water to survive. The usual method of monocropping, or only cultivating one type of crop as opposed to several, in Somalia, has led to phosphorus deficiencies in the soil (Agriculture, 2019). Farmers would see an increase in crop yields through the use of fertilizers or modifying crops to use less phosphorus so that the nutrient can be replenished in the soil. The efforts already made towards genetically modified crops in Somalia consists of isolating varieties of crops that have done well in Somali agriculture and testing them for yield and agronomic performance (Agriculture, 2019). Compared to the locally-grown varieties planted by farmers, the new crops have proven to be superior.

Efforts to implement GMOs into Somali agriculture should be headed by a well-funded organization that already has a presence in Somalia. The Food and Agriculture Organization of the United Nations or similar organizations would be adequate to provide a program where farmers can receive these genetically modified crops. This organization would be a perfect fit due to its ongoing efforts to end hunger and poverty in developing countries. The FAO already does work in Somalia, providing support, aid, and supplies to those in need. Buying and distributing the genetically modified seeds would be as easy as giving them out along with the aid that they already provide to the population. Checkups with the farmers who received the seeds much like the comparisons made with the isolated varieties of crops could assure this programs' sustainability. Providing farmers with a source to learn new and better farming techniques could also increase the longevity of this program. Just giving farmers seeds alone would not make this solution as sustainable as it could be. Educating the farmers of Somalia on ways to better farm crops or take care of livestock can pose as a good way to supplement the addition of GMOs into their agriculture. For example, teaching new farming techniques such as the use of cover crops to ensure the health of the soil used for farming can secure the success of the efforts towards solving food insecurity in Somalia. Another suggested organization that could be viable in efforts to provide Somali farmers with these seeds and the proper education to cultivate them is the Somalia Agriculture Technical Group. This organization works to expand sustainable agriculture throughout Somalia with one of their goals being to network with others across the globe to find solutions and innovations for problems such as water conservation, soil health, and storage practices (Board of Directors, n.d.). One project the Somalia Agriculture Technical Group has been working on is identifying the best varieties of crops for farmers to use and distributing the seeds to farmers. Based on the work they already do the research and distribution of GM crops modified for water conservation could be added to their efforts to providing farmers with reliable seeds for farming (Agriculture, 2019). Additionally, in the process of providing this aid through seeds and education, hopefully, new opportunities for employment can open up for the people of Somalia. Whether it be labor to help transport seeds or even translators to help educate farmers, the people of Somalia will be needed to make this solution a reality.

Although this solution has many possibilities and encouraging outcomes, it does not come without any limitations. The genetically modified crops that are to be distributed to the farmers of Somalia need to be researched, developed, tested, shipped, and then implemented. This means the initial cost of this project will be high, especially due to the research and development phase of making a genetically modified crop, but should be sustainable once the crops start producing more seeds for the farmers to use in future seasons. Additionally, extra care would be needed when farmers cultivate these GMO crops as they can cross-contaminate and out-compete with the already established plants and crops. Along with the problems GMOs pose environmentally and economically, there still might be a need for convincing the people of Somalia to use the modified crops. Countries have their own ways of farming and conducting agriculture, so the introduction of the seeds should be supplemented with educating the public about the benefits and the safeness of cultivating and consuming modified crops. One other problem that modifying crops would not solve is the food insecurity of the nomadic peoples of Somalia. The distribution of the modified seeds would not be viable for this population as they live off of mostly livestock and do not stay in areas long enough to see the long term benefits of farming the new and improved seeds. As for the areas of modification like the fungal endophyte treatment organization would have to still distribute and

educate people about the seeds, but may have the option of treating the seeds at a local level, such as treating them at the farms that they will be planted at. This is a possibility as Dr. Rodriguez says that the treatment consists of spraying the crops with a formula before having them planted (Rodriguez, 2016). What can also be done is educating the farmers in Somalia how to spray their existing seeds as well as providing the formulas for them. Furthermore, another limitation to this solution is the current political situation Somalia is in. Due to the Al Shabab communication and the distribution of aid to certain communities will be very difficult if not impossible. Organizations will have to find ways into these communities or find ways to negotiate with the Al Shabab in order for aid to be brought in properly and without any conflict that could result in more lives lost. This could also hinder the education aspect of this solution. If organizations cannot properly relay information and procedures to the farmers and public regarding the care of their crops then the efforts to provide these seeds will be futile. Since the situation is so delicate extra time, planning, and even money must be appropriated by the organizations who hope to undertake a project of this liking as not to further disturb Somalia's current political climate.

Often it takes quite a lot of convincing to get countries on board for providing foreign aid to countries in need. Almost always, the concept of providing aid solely based on altruism is brought up. This, however, is usually not enough to convince people to help out others. What people are looking for is something that benefits them. In a video promoting foreign aid, Mark Rober, a former NASA engineer, in collaboration with Bill Gates, a technology mogul, and philanthropist, present several ways for countries to benefit off of helping out developing countries (Rober, 2019). One concept they presented was that the country providing the aid can benefit off of certain products, technologies, and knowledge that the country receiving the aid can provide. In the case of Somalia, there are untapped reserves of oil, uranium, tin, copper, and other minerals as well as other exports like bananas (Lewis & Janzen, 2018). These resources can be used as a factor for countries to consider when determining whether or not they should help out developing countries. By establishing a good relationship with countries like Somalia through foreign aid, developed countries can hope to also establish good trade links. Another interesting point Rober and Gates pointed out was the untapped human potential that developing countries have. Due to the conditions people in developing countries have to endure, they do not have the time nor the energy to think or create. To be more specific, people in developing countries are spending their time and energy towards surviving as opposed to learning, thinking, exercising their minds, or creating things. Rober and Gates are trying to convey that by providing foreign aid developed countries can improve the quality of life for the developing countries, which can hopefully lead to a whole new population of thinkers and creators. This whole new population could be the ones that solve the existing problems we have in the world today.

Ultimately, Somalia's food crisis is a continuously worsening problem that could be addressed through the use of genetically modified crops. This is due to the numerous possibilities and implementations genetically modified crops have pertaining to Somalia's circumstances. With the support of a well-funded and credible organization, like the Food and Agriculture Organization of the United Nations or the Somalia Agriculture Technical Group, a program implementing genetically modified crops into Somali agriculture could be effective in combating the food insecurity that the country is currently facing. Modified crops, like those that use less water to cultivate or those that can withstand higher temperatures, are a promising solution not just for Somalia, but for many other developing countries. The successful implementation of modified crops in Somali agriculture can be a model for other countries to follow in their efforts to solving food insecurity.

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