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Kenya: The Need for GM Crops and Strategies to Implement for the Repeal of their Ban

Kenya is a country full of potential, potential that is lying abeyant under miles and miles of hard, dry, and cracked farmland. This barren farmland has the ability to produce enough food to feed the forty million Kenyans who depend on its fruits to fill their stomachs and their wallets. Yet, severe droughts, disease and pests, soil degradation, lack of arable land, and outdated farming techniques force the country to fall short in food production every year. The use of genetically modified organisms (GMOs) could drastically change the Kenyan agriculture industry but Kenya's government has banned all imports, distribution, and cultivation of GMOs from the country. The Kenyan government defines GMOs as "the use of cell and tissue culture, cell fusion, molecular biology, and in particular recombinant deoxyribonucleic acid (DNA) technology to generate unique organisms with new traits or organisms that have the potential to produce specific products (J. Masinde and Ngari)." It is important to keep in mind that although not all effects of GMOs are known, there is no proof that there are harmful effects on the environment or consumers. What we do know about the crops from scientific research, field tests, and commercial use is that they have the power to greatly increase yields and help solve the ever present battle of world hunger. In poor, agriculture-based countries like Kenya, utilizing the maximum capability of land, water, time, and seeds is the key to feeding the masses, which in turn will generate revenue and stimulate the economy. In an effort to do this, the GMO ban must be lifted. The Kenyan government needs to organize a detailed plan of funding, restrictions and regulations, distribution and planting, and education in conjunction with the ban's repeal. Mitigation strategies including modern farming techniques, conventional breeding techniques, an extension and outreach program, and appropriate staff and equipment to oversee the distribution and handling of the products will make Kenya a successful pro-GMO country. The GMO ban inhibits Kenya's true potential of being the prosperous and rich country it can be.

The people whose lives the GM crops could change the most are the smallholder subsistence farmers, who make up most of the seventy-five percent of Kenyans who depend on agriculture for income (Rural Poverty Portal). A typical Kenyan farm family is made up of parents, sometimes more than one wife, and many children due to the farm's large work load. It is common for the extended family such as grandparents, aunts, uncles, and cousins to live in nearby huts or even under the same roof. They value large families and see themselves as a "single unit." Traditionally, Kenyans survive on a diet based mainly on maize which they incorporate into a wide variety of dishes; meat is rarely eaten because it is expensive. Seven to fourteen year olds attend primary schools for free but only about one-half of all children complete their early education because their help is needed on the farm. One-seventh of the children that finish primary school move onto high school which is far too expensive for the average Kenyan family. At school, girls and boys are taught skills that adhere to traditional gender roles, girls caring for children and boys working the fields. A rural community where such families reside depends heavily on herbal medicines and traditional healing rituals for health care because government funded clinics with modern equipment and doctors are scarce. The average Kenyan farm is no more than five acres, with two to three being more common. They grow enough corn, millet, sweet potatoes, and a variety of fruits to feed their families. They take any extra to the market where they receive, in many cases, their only income. Ancient, labor- intensive farming practices such as crop rotation and hand weeding are used because machinery and herbicides are not affordable (Stanford).

In November 2012, the decision to ban all imports and use of GMOs was announced by Kenyan Public Health Minister Beth Mugo. The decision, which was made by the Kenyan President Mwai Kibaki and

his cabinet, took Kenya's National Biosafety Authority by complete surprise (Occupy Monsanto). The President failed to consult his own leading experts on the subject before making such an impactful decision. Insufficient research and evidence presenting major health concerns are the main reasons the government banned the GM crops. The government reported that, "The ban will remain in effect until there is sufficient information, data and knowledge demonstrating that GMO foods are not a danger to public health (gmeducation.org)."

Supporters of the ban argue that GM crops could create a loss of genetic biodiversity, an increase in the use of pesticides and herbicides, antibiotic resistance, and other threats to the small subsistence farmer. The Kenya Biodiversity Network, a Kenyan-based regional research network, is an organization that ultimately supports the new laws. They joined an appeal to the African Union to examine the ban of planting GM crops at the January 2013 African Union Summit. Perhaps the most important supporting argument to consider is that of those who signed the African Civil Society Statement, a petition expressing the concern of the African population of GM crops being planted in their country. Over four-hundred African organizations including small-scale farmers, faith-based organizations, social movements, organic producers, consumers, and ordinary citizens signed the document (gmeducation.org). In order to get the ban lifted, it is important to consider the reason why these groups signed the Statement. Are they truly concerned about the effects that GM crops might have? Are they educated enough on the modern technology to fully understand what GM crops are and their capability? Or do they think that because their government does not trust the new crops shown by the ban, then they should not either?

A study done by Gilles-Eric Seralini, a molecular biologist at the University of Caen in France, was a major factor in deciding to issue the ban. The Seralini study found that rats fed for two years with Monsanto's glyphosate resident NK603 maize died earlier of newly developed tumors than the control group did. The Glyphosate is an herbicide that is used with Monsanto's GM maize. The study sparked an uproar in Europe which caused many people, including scientists and politicians, to argue for more restrictions or bans on GM crops. These arguments found their way to Kenya where the government decided to issue a ban of their own. In a case for the pro-GMO world, the European Food Safety Authority (EFSA) found the paper to be inconclusive due to a poor design and inadequate results. Two of the largest faults found were that the number of tested rats was not as high as considered regulatory and the variety of rat used, the Sprague-Dawley rat, are known for developing spontaneous tumors causing early death. They determined that the paper needs to be subject to further assessment (Butler).

The opposition of the ban poses a lot of valid points backed with multitudes of supporters. Many powerful and influential organizations are trying to negate the Presidential decision. Some of these groups are the Africa Biotechnology Stakeholders Forum, International Service for the Acquisition of Agri-biotech Applications, Program for Biosafety Systems, African Agricultural Technology Foundation, Africa Harvest Biotech Foundation International, Biotechnology Trust Africa, Seed Trade Association of Kenya, and the East African Grains Council. They argue that the ban contradicts Kenya's legal system as defined by its National Biosafety Act of 2009. The NBA established the regulations for the supervision, transfer, and handling of GMOs. The United States thought of Kenya as a partner and advocate for GMOs in East Africa, for they have one of the region's richest economies (gmeducation.org). An AgProfessional in Washington said the ban will cause leaders to "question Kenya's commitment to making regulatory decisions based on sound science (gmeducation.org)." Scientists say that the ban may severely hinder the biotechnology research and development in Kenya. Although the ban does not restrict research, there is a high probability that because GMOs have been determined a threat, funding for the research will be eliminated (Owino). Richard Okath, a biotechnology scientist at Kenyatta University in Nairobi, Kenya, said, "The essence of GMO research is to provide a product that can complement efforts towards food security. This ban will discourage research, as the product for which the research is being conducted has been placed on import ban (Owino)."

The biggest support for the repeal of the ban lays with the three-and-a-half million food insecure Kenyans (Chuma). Having high hunger indices and falling under the category of moderately severe undernourishment leaves Kenya no choice but to do something about its obvious hunger problem. Kenya has the potential to meet its own food security requirements and rebuild its fragile economy but needs the right tools to do it. GM crops have the power to help Kenya just as they have helped other countries in Africa. South Africa is ranked eighth in the world for the total area of GM crops grown, mainly *Bt* cotton and maize. The *Bt* gene, Bacillus thuringensis, is a naturally occurring toxin found in soil which kills common pests like moths, beetles and flies without harming other organisms. Farmers experienced a reduction of pesticide sprays from fifteen times per season with traditional crops to three times with GM crops. They also reported yields increasing from 600 kg/ha to 800 kg/ha. Egypt dedicates about two and a half million hectares to GM *Bt* yellow maize which yields thirty percent higher than conventional maize. Burkina Faso is one of the poorest countries on earth. Their hunger index was 20.4 in 2009 which is very similar to Kenya's hunger index of 20.2 during the same time. Burkina Faso's economy relies heavily on cotton; it represents sixty percent of their export earnings. Farmers reduced the number of pesticide sprays from eighteen to two times a season and an increase in yields of thirty percent. In all of these countries, the GM crops not only supplied more food, but also self sufficiency, a more competitive product for the international markets, and higher profits for the subsistence farmer, all resulting in a better economy and reduction in poverty (J., Masinde and Ngari). Kenya can use these countries as examples to see what their country could look like with a successful GMO initiative.

In a specific case for GM crops in Kenya, drought-tolerant maize, a traditional Kenyan staple, could have a substantial impact on Kenya. Kenyans consumed about 2.8 million metric tons of maize in 2000 and this number is projected to reach 7.5 million metric tons by 2050 (Brasher). With the country slowly recovering from a devastating drought since late 2010 which caused a nation-wide food emergency, a high yielding maize variety is vital to life (AMURT). In its early test stages, Monsanto's Genuity Droughtgard maize, a GM drought-tolerant hybrid, produced encouraging results. Field trials conducted in the Great Plains of the western United States showed that the drought-tolerant maize met or exceeded six to ten bushels more maize per acre (Kasting and Kraus). This maize could produce two million tons of food during drought, which would provide fourteen to twenty-one million people with enough food to live comfortably (Monsanto). This variety of GM crop, along with varieties of other crucial Kenyan crops such as sorghum and millet, has the ability to lessen the harsh effects of natural barriers on Kenyan's yields.

It is a world-wide attitude towards GM crops that they should be thought out before being allowed into consumers' hands. In order for a safe, efficient product, restrictions and regulations are necessary. In conjunction with the repeal of the ban, Kenya needs to set up a clear and concise plan that is easy to implement. The plan needs to include the funding for appropriate infrastructure, the restrictions and regulations on the GM crops, rules to control the distribution and planting of the crops, and an educational outreach program to teach the farmers about the plan and provide help with anything that the farmers may need.

The first step in the plan involves obtaining adequate funding to carry out the projects that are necessary in order for the plan to be successful. Poor infrastructure is perhaps the biggest obstacle that is hindering Kenya's biotechnology future. Infrastructure is necessary for every aspect of agribusiness including on-farm production, shipping, processing, storage, and finally transportation to the consumer. Rural areas with low populations and rain dependent crops dissuade private investors from financing the much needed infrastructure because their investment may or may not result in a profit. A solution to funding the building of new infrastructure is public-private partnerships (PPPs). A PPP is the "participation by the private sector (the for-profit or not-for-profit sectors) in the provision of infrastructure services in cases where, if left to the free market alone, such private participation would not occur because of the low returns on investment or the levels of risk involved, financial or non-financial (Warner, Kahan, and

Lehel)." One such PPP, the Adaptable Program Lending for Infrastructure Finance and Public-Private Partnership Project, is already working on building the appropriate infrastructure. The program started in 2012 and is set to close in 2016 after its four components are carried out, totaling forty million USD. This project's goals are not only to build infrastructure but to also keep interest and ultimately funding in the long-term project (The World Bank). In time, and with the right infrastructure, GM crops can be transported, stored, processed, and tested much more regularly than before, resulting in a much safer and effective product.

The second step in the plan involves setting clear restrictions and regulations on GM crops. Food labels identifying the location the crops were grown and whether or not they contain GMOs may be an option. This would help ease the minds of the people that do not want to consume GM food. Other regulations that would be needed are import and export laws. As of now, there are no imports of GMOs into Kenya because of the ban. For the repeal of the ban, Kenya needs to form partnerships with other successful GMO countries, such as the United States, and import GM crops from these countries. When the GM crops reach Kenya, a regulatory process should be used to get the crops tested and distributed where need be.

After the GM crops reach Kenya and testing has deemed them suitable, they will be sent to the civilians and farmers for consumption and planting. It is important to realize that GM crops alone can increase yields, but other, non-GM factors can be used alongside the GM crops to increase productivity even more. Farmers should be given guidelines to planting and monitoring GM crops, modern farming techniques including conventional breeding, and utilizing what they have to make growing any type of crop easier. The Kenyan government will be able to decide what regulations they need and want to impose. Examples of ones they should consider are regulations that other GMO countries use. Brazil has regulations that require GM crops to be planted one-hundred meters away from conventional crops, with permits reducing that to twenty meters. Since land is scarce in Kenya, a better option would be to plant a trap crop, or ten rows of conventional crop surrounding the genetically altered crop in order to prevent mixing. The farmers should be taught how to monitor and scout their fields to check for pests, disease and fungi, and to check for soil and nutrient levels (J., Masinde and Ngari). Along with GM crops, the farmers should use the conventional breeding methods of selection, picking the best looking and performing plant to use the next season, and hybridization, selecting two plants exhibiting desired traits and cross pollinating them will result in a plant with both traits (BATS). Other simple techniques utilizing what equipment and little water Kenyan farmers have is very important. One Kenyan farmer planted her seeds in small squares instead of plowing the entire field. She then filled the squares with manure and covered them with leaves; this let the seeds be in the ground up to three weeks without rain. Her yields increased from three bags a season to fifty-seven bags (Consortium). These techniques could greatly increase farmers' yields in addition to the already enhanced yield of the GM crops.

The last step in the plan which brings all the other aspects together is education. Educating the rural farmers in Kenya will be perhaps the most important and most difficult step. The farmers are the ones who hold Kenya's economy in their hands and if they do not know what GM crops are and how to use them properly, then Kenya will never be able to grow. Three steps should be taken in order to successfully train farmers. Step one is to train people that are likely to become farmers. In recent years, the shift of agriculture education has moved from being taught in primary schools to colleges and universities because of funding. The problem with this is that the people that can afford to go to college are not going to have to depend on farming for a living. The children who drop out of primary school at ten years old to help at the farm are the ones who need the agricultural education. The solution is to teach young children, especially in rural communities, the tools they will need to become successful farmers and to not teach agriculture at higher educational levels. This new system would need less funding and resources and ultimately result in more productivity at the small subsistence level. The second step is to emphasize practical skills instead of *knowledge*. Rural farmers need to be taught simple and effective

farming techniques through a hands-on approach instead of being told what they should do in a classroom-like setting. Without seeing how a method works and its affects, it will be very unlikely that the farmers will try it on their own farm. The third step is to set up an extension program where trained volunteers or paid staff travel to teach farmers and to monitor their progress to determine what is working at what is not. Many organizations within the country, including the Ministry of Agriculture, and volunteer organizations around the world are already doing this, although it is imperative for the success of the country that a portion of funding be put towards an appropriate education staff (Ngugi, Isinika, and Tenu).

With this plan, the next step is to figure out how to get the ban repealed. Because the government of Kenya is similar to that of the United States, the ban may take years to work its way through their legislature, the National Assembly, before it is repealed. Although the ban could be repealed as quickly as it was implemented, it will more than likely stay in effect until the government can be convinced that the GMO foods are safe. In order to speed up the process, the Kenyan public needs to organize throughout all sixty-nine districts. They need to clearly identify their need for change and their willingness to cooperate to find a solution that works for everyone. After the citizens do their part, the rest is left in the hands of the government. This may seem as an obstacle due to the government's corrupt and violent history but as it is gradually restructuring and modernizing, we can only hope that it will follow through in its duty to do what is best for their people.

The GMO ban has undermined the needs of the Kenyan people by taking away a key resource in the fight for food security and economic stability. The Kenyan government has induced more hardship on their people as they desperately need the food and money that GM crops could provide. They are at more of a disadvantage than most, with drought, disease, pests, and a lack of technology making it hard to produce food when already so little arable land is available. The technology to mitigate many of these barriers which in turn will save thousands of lives and make thousands more better is at our fingertips and Kenya needs to reap its benefits. In order for Kenya to be able to feed its population and become as prosperous as it can be, the government needs to lift the ban. The opposing side cannot argue the facts that GM crops have been proven successful in other countries similar to Kenya and that the crops' harmful effects have not been bolstered by sound science. It is agreed throughout the biotechnology community, however, that any new technology such as the GM crops needs to be adequately tested and regulated to insure safety for the environment and consumer. In conjunction with the repeal of the ban, Kenya needs to implement a concise plan for GM crops consisting of the funding of infrastructure, restrictions and regulations, distribution and planting, and education. Within this plan, programs for the funding of infrastructure, which is imperative for the development of agriculture, will be set up; clear labels and import and export laws will be required; conventional breeding and farming techniques will be implemented; and an improved educational system will be started. Through a combined effort of modern and traditional technology, scientists and farmers, and government and society, Kenya can become a prosperous pro-GMO country.

Works Cited

AMURT. *Horn of Africa Disaster Response*. 21 September 2011. Document. 24 March 2012.

BATS. "2 Methods of Plant Breeding." n.d. *bats.ch.* Document. 29 December 2013.

Brasher, Philip. "Biotech in Africa: 'A Shortage of Maize Means a Shortage of Food' (Part 2)." 9 May 2010. *pulitzercenter.org.* Article. 23 February 2012.

Butler, Declan. "Hyped GM maize study faces growing scrutiny." *Nature* (2012): 158. Document.

Chuma, Aeneas C. "Drought in Kenya; Cuttent Crisis calls for Long-term Solutions." 25 August 2011. *undp.org.* Article. 24 March 2012.

Consortium. "Kenyan Farmers Adopt Simple Techniques to Increase their Yield." 31 August 2011. *cgiar.org.* Online. 29 December 2013.

gmeducation.org. "Kenya GMO ban: the industry fights back." 13 December 2012. *gmeducation.org.* Article. 29 March 2013.

J., Milinga, E. Masinde and M. Ngari. "Commercializing GM Crops in Kenya: Potential Risks and Possible Mitigation Strategies." n.d. *kari.org.* Document. 30 March 2013.

Kasting, Jason and Ric Kraus. "Monsanto's Drought-Tolerant Corn progresses to 4th Stage of R&D." 11 February 2011. *blog.iphandbook.org.* Article. 23 February 2012.

Monsanto. "Water-Efficient Maize for Africa (WEMA)." n.d. *monsanto.com.* Article. 26 February 2012.

Ngugi, David, et al. *Agricultural Education in Kenya and Tanzania (1968-1998)*. Technical. Nairobi: Regional Land Management Unit (RELMA), 2002. Document. 29 December 2013.

Occupy Monsanto. "Kenya Bans Importation of GMO Foods." 2 December 2012. *readersupportednews.org.* Document. 29 March 2013.

Owino, Otieno. "Scientists torn over Kenya's recent GM food ban." 3 December 2012. *SciDev.Net.* Article. 29 March 2013.

Rural Poverty Portal. *Rural Povery in Kenya*. n.d. Article. 23 February 2012.

Stanford, Eleanor. *Kenya*. n.d. Online. 29 December 2013.

The World Bank. *Kenya Infrastructure Finance/PPP project*. 2012. Overview. 30 December 2013.

Warner, Michael, David Kahan and Szilvia Lehel. *Market-oriented Agrigcultural infrastructure: Appraisal of Public-Private Partnerships*. Agricultural Management, Marketing and Finance Occasional Paper. Rome: Food and Agriculture Organization of the United Nations, 2008. Document.