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The Banana Factor in Uganda

The Republic of Uganda is a landlocked country in East Africa, bordered by Kenya to the East, Sudan to the North, the Democratic Republic of the Congo to the west, Rwanda to the Southwest, and Tanzania to the South (Central Intelligence Agency). The Republic of Uganda is located at the heart of Africa, with numerous water bodies and fertile soils that are driving production of a variety of fruits and vegetables for export and the regional market (Uganda Investment Authority, 5). Amongst the variety of fruits and vegetables grown in Uganda is the banana. The banana is one of the most important crops in Uganda with approximately 7 million people, or 26% of the population, depending on the plant as a source of food and income (Kikulwe, Wesseler, & Zepeda, 3). Banana yields in Uganda however, have been severely reduced by several pests and diseases which in turn have resulted in the loss of income and food security for the small-scale farmers in Uganda. With the banana being a staple food crop and source of income for the small-scale farmers of Uganda, resources and man power have been directed towards the sustainability of the banana crop (Kikulwe, Wesseler, & Zepeda, 3).

Uganda ranks second after India in the world banana production with an annual output of 9.84 million tones accounting for 11.18% of the world's total production (UNCST, & PBS, 1).

However, it has the highest per capita consumption of cooking banana in the world (Kikulwe, Wesseler, & Zepeda, 3). Out of the 9.84 million tons of bananas produced by Uganda annually, cooking bananas, or Matooke, account for 80% of the total output, which is equivalent to approximately 440 million U.S dollars at the average farm gate price (Kalyebara et al, 94). Over 90% of the output is mainly consumed locally, with an estimated per capita consumption of between 220 and 460kg per year (Kalyebara et al, 94).

Bananas fall into the fruit and vegetable group (UNCST, & PBS, 1) and are relied upon for their starch and caloric consumption ("Improving Banana Production", 2010). The banana tree can produce fruits all year round putting the banana in a superior position in bridging the "hunger gap" between crop harvests, therefore contributing significantly to food and income security of the people engaged in its production and trade (UNCST, & PBS, 91). Ugandans use the same word "matooke" to describe both banana and food (Oz politics).

Banana yields in Uganda have been on decline due to diseases, pest and poor soil fertility since the 1970s (UNCST, & PBS, 9). In 1970 the average yield in Uganda was 8.5 tons per hectare per annum; the current average is now about 5.7 tons per hectare per annum (UNCST, & PBS, 9). Until the past few decades, banana was considered a highly sustainable crop in Uganda, with long plantation life and stable yields (Abodie et al, 27). During the past 30 years banana production patterns have been changing (Abodie et al, 27). Plantation acreage has increased or remained stable in most of the western region of Africa, while declining in central and eastern regions (Abodie et al, 27). This shift has been attributed to the increasing severity of production constraints. In particular declining soil fertility, pest and diseases have brought about a severe decline in banana yields (Abodie et al, 27). There are many contributing pest and diseases that can be attributed to the decline, however the two major parties are the *Xanthomonas campestris*

also known as the Banana bacterial wilt (BBW) and the *Mycosphaerella fijiensis* or Black Sigatoka (UNCST, & PBS, 11).

The banana bacterial wilt affects all types of bananas and causes the yellowing and complete wilting of the plant. After wilting the leaves tend to droop and the plant eventually stops growing and dies (UNCST, & PBS, 11). BBW disease spreads very fast and results in total yield loss within a year, even in cases of late mild infection of mature branches, the fruit rots and cannot be consumed (Kalyebara et al, 94). It is so far known that BBW is spread plant to plant by stingless bees collecting sap from fresh wounds left when male bracts/flowers fall off, and by infected cutting tools used by traders (Kalyebara et al, 95). If BBW is not controlled, Uganda stands to lose an estimated 295 million dollars worth of banana output valued at farm gate prices. This translates into an annual 200 dollars of food and income per household at stake (Kalyebara et al, 101).

Black Sigatoka is caused by an air borne fungus and causes yield losses of 30–50%; all of the East African highland bananas are susceptible to this disease (UNCST, & PBS, 11). The pathogen is spread by water, wind, and contaminated materials including suckers for planting ("Black Sigatoka, banana," 2009). Black Sigatoka causes destruction of leaf tissue affecting the photosynthetic capabilities of the banana plant ("Black Sigatoka banana," 2009). The reduction of photosynthesis significantly reduces banana yields, and fruit production on diseased plants can ripen prematurely during commercial shipment and cause further losses ("Black Sigatoka, banana" 2009). Disease management generally includes frequent applications of fungicides, but the high costs of these measures make them essentially unavailable to smallholder farmers ("Black Sigatoka banana," 2009). Cultural practices such as removing diseased leaves and

pruning branches to improve air circulation are also helpful in reducing the occurrence of the disease, but these practices are labor intensive (Flynn, 2005).

The susceptibility of the banana tree to disease is due to its edible origins. There are close to 1,000 species of banana today. Most of them are inedible; they carry hard pea-sized seeds, and have only a small amount of bad-tasting flesh. Botanists think that about 10,000 years ago, probably in South-East Asia, a random mutation produced a sterile banana with no seeds and lots of flesh that could be eaten uncooked. The internal dark lines and spots inside today's banana are the vestigial remnant of these seeds (Kruszelnicki, 2005). These edible bananas are seedless, sterile and palatable; however, their sterility prevents natural genetic adaptation to resist disease (Henderson, 2003).

The cultivation of the edible banana crop involves vegetative propagation in which part of the underground stem is removed from an already existing banana tree and transplanted (OzPolitic). The incapability of the edible banana crop to reproduce sexually, results in the cultivation of "clones." "Each is a virtual clone, almost devoid of genetic diversity," according to *New Scientist* magazine, "and that uniformity makes it ripe for disease like no other crop on Earth" (Henderson, 2003).

In The National Banana Research Program of the National Agricultural Research Organization in Uganda has developed a breeding program that employs a range of traditional crop breeding methods and a portfolio of biotechnologies to address the crop's most debilitation problems caused by pest and disease (Kikulwe, Wesseler, & Zepeda,). Genetic engineering projects in Uganda are being employed to develop genetically modified (GM) cultivars that are resistant to local pest and diseases, have improved agronomic attributes, and are acceptable to consumers (Kikulwe, Wesseler, & Zepeda). These projects have led to the implementation of

scientific trials to establish whether genes, which prevent disease organisms from causing problems in rice, can also stop leaf diseases in bananas, specifically Black Sigatoka (Baguma, & Sengooba). An anti-fungal chitinase gene was inserted into a model banana system. The transgenic plants are being tested for efficacy against Black Sigatoka in a confined field at Kawanda. “If the technology proves promising, the genes will be transformed into several important banana varieties,” said Dr. Wilberforce Tushemereirwe, the Kawanda program leader (Baguma, & Sengooba).The genetically modified banana crop is already being implemented in Uganda in hopes that the crop will show resistance to the Black Sigatoka fungus which has become an increasing problem to small-scale farmers of Uganda.

The genetically modified banana is being researched and undergoing scientific trials in hopes of salvaging its sustainability. This introduction can provide the small-scale farmers of Uganda the possibility of increasing their banana yields which in turn will provide more food and income.

The sustainability of the GM banana however is questionable, even if the scientific trials are successful. In East Africa, genetic engineering is a relatively new technology of which there is little public awareness on risks and benefits (“Rationale for Common,” 2010). As a result, recent introduction of Genetically Modified Organisms (GMOs) in food and agriculture has not been received well by certain segments of society. The GMOs debate thus invokes mixed feelings from environment, food safety and human health sector policy makers and the general public (“Rationale for Common,” 2010). A latent class model was used to investigate the heterogeneity in consumers’ preferences for banana attributes and to profile consumers who are more or less likely to accept GM bananas (Kikulwe, Ekin, Wesseler, & Zepeda, 2009). The results revealed that there was significant heterogeneity in consumer preferences across the

sample (Kikulwe, Ekin, Wesseler, & Zepeda, 2009). The GM bananas were valued the most by poorer households located in the rural areas of the Eastern region of Uganda. These food-insecure households would experience the highest benefits (i.e., welfare gains) from the commercial release of GM bananas (Kikulwe, Ekin, Wesseler, & Zepeda, 2009). In contrast, urban consumers were less accepting of GM bananas, and they would experience significant welfare losses if GM banana is released (Kikulwe, Ekin, Wesseler, & Zepeda, 2009). The welfare gains and losses have created a rift in the acceptance of the GM banana between the urban consumers and the poor rural farmers of Uganda.

Europe's resistance to the acceptance of GM crops has also played a major role in the acceptance of GM crop in Africa. The European countries are both a major destination for African agricultural exports and also a major contributor of aid on the continent. "Africa is very reluctant to approve and adopt (biotech crops) because they are afraid some of their specialized exports to the European Union would be jeopardized," said GianCarlo Moschini, a trade economist at Iowa State University (Brasher, 2010). European food retailers don't want biotech ingredients because of resistance from consumers and fear of blacklisting by anti-biotech groups, according to U.S. Agriculture Department reports (Brasher, 2010). This potential loss of income would increase the economical hardship and burden that is already overwhelming the heart of Africa.

If the GM banana crop is approved and widely accepted, the increase in banana yields would definitely improve food security for the small-scale farmers of Uganda, especially since Uganda's population is exploding and is on track to surpass 130 million people by 2050. That will make Uganda the 13th most populated country in the world. The current growth rate is 3.6% per annum. This means over 1.2 million Ugandans are born every year. The country's population,

which stands at over 30.9 million up from seven million at independence in 1962, will have increased four times in 2050 (all Africa.com, 2008). Economically, the increase in banana production due to GM bananas may not necessarily contribute to an increase in income due to poor infrastructure of the roads used for transportation, fuel costs, and travel distances (Kisule, 2008).

Truck drivers in oil-importing, landlocked countries are paying as much as 50% more for fuel than in other countries of the region, even before recent oil price jumps. Delays at the borders, particularly Kenya add to this fuel cost. “Delays increase costs and uncertainty of delivery and that is as big a problem as a lengthy transport process.” In effect, all food items coming from the deep villages are now priced based on both demand and transport costs, these constituents coupled with poor road networks and generally poor road conditions, contribute significantly to the loss of perishable food items like sweet bananas, which in turn results in a low profit return for the producers of the crop (Kisule, 2008).

The acceptance of the GM banana is questionable. However, with the population increasing it is imperative that food production and security increases proportionately with it. It is for this reason that I believe the GM banana will continue to be researched and improved upon regardless of its approval or lack thereof.

The future outlook of the banana crop in Uganda and what role it will play in the future is uncertain. The banana crop and lively hood of the small-scale farmers of Uganda are under siege by disease, pest, and unfertile soil, but with the first steps of sustainability underway and present in mind, all that was once loss may one day rise again in hopes of salvaging not just a staple food

source, but with it a small-scale farming culture who have and hopefully always will be able to call the heart of Africa their home.

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