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Diseases Kill Cattle, and Dead Cattle Kill Profits

At 241,038 square kilometers, the landlocked country of Uganda is only one third the size of Texas. From the shore of Lake Victoria to the mountain ranges, with rolling hills and vast plateaus in between, Uganda has an immense amount of geographical diversity. Another prevailing and prominent characteristic of this small country is its astounding wildlife diversity. The expansive plateaus are full of elephants, lions, birds, and a considerable number of antelope species. Gorillas and chimpanzees are some other animals that can be found in the forests of Uganda. Wildlife is an important asset to the economy of Uganda. A portion of Uganda's income comes from tourism, which is driven by Uganda's unique and plentiful wildlife population. Uganda is a presidential republic, and within the past few years a series of rebellions have risen up. According to the World Bank, 42,862,958 people populate the country of Uganda. 75.5% of these individuals live in a rural setting, while the remaining 24.5% live in the urban centers of the country, like Kampala and Gulu (World Bank 2018). 71.89% of the country's land is cultivated, while the average farm size is 1.33 acres (World Bank 2018). On a typical day in Uganda, you might find 4-5 family members sitting outside of their mud brick and thatched roof houses eating a meal of home-raised plantains and other starchy vegetables. Unfortunately, little to no dairy is consumed within their diets. This leads to adverse effects to their health, especially to the growing children. Children, especially, need calcium in their diet. Dairy products are the best source of calcium for growing children, but dairy products are not readily available. There are educational institutions available, but they are expensive, making them accessible only to the fortunate. Earning a living in Uganda proves to be a difficult task. While there are a few universities in Uganda, an extremely small percentage of the population attends these universities. Uganda is extremely undeveloped when looking at the number of individuals working in a "professional" career. Many argue that this lack of development stems from the frail education system in the younger generations. The majority of the population farms, and if they do not farm they are doing jobs that are mostly manual labor. Arguably, livestock farmers, who make up 26.1% of the population, have one of the most difficult tasks: raising livestock for the ever-growing population.

One may be asking, "Why is raising livestock so difficult?" We, as Americans, have grown accustomed to the advancements in livestock production. Raising livestock in the United States may not always be profitable due to the constantly fluctuating market, but it proves to be much simpler with the advancements in technology, genetics, and medicine. These technologies and advancements that we are privileged to have access to is not available nor affordable to most farmers in Uganda. Specifically, medication for dairy cattle in Uganda is exorbitantly priced. Genetic mapping is not obtainable to farmers at reasonable prices, and few studies have been done on the species of cattle indigenous to the country. The two most common breeds of cattle in Uganda are the Ankole (*Bos taurus indicus*) and the East African Shorthorn Zebu (*Bos indicus*). Furthermore, the government in Uganda does not have many health regulations, leading to even more health complications. A lack of sanitation sets up a perfect environment for diseases and ailments to fester and spread. Hemo-protozoan parasites are one of the most prominent diseases, with East Coast Fever being the most prevalent parasitic disease. 92.9% of all parasitic issues were the East Coast Fever parasite, as studied by Joseph Byaruhanga in 2017. Such diseases prove to be devastating, as veterinarian care costs much more than a struggling farmer can afford.

The definition of a parasite is "an organism that lives in or on an organism of another species (its host) and benefits by deriving nutrients at the other's expense" (Google 2019). Parasitism in dairy cattle can be catastrophic. The parasites within the host, which is the cow in this case, are constantly drawing nutrients from the cow. The stress that lactation puts on a dairy cow is already physically tolling on the body condition, and when a parasite is added into the biological equation,this results in a horrible product. Many other varieties of parasites that plague on cattle also can cause the cow to slip into an anaemic condition, killing the cow even faster. The Uganda dairy industry is vital to the population's overall health, so parasitism does not only devastate the farmer. In a country that already has very limited access to a healthy, fortified diet, if dairy were eliminated the consequences would be astronomical. There would be distinct rise in the already present calcium deficiency and many children would not reach the optimal growth rate.

The government took action in the late 1900s by organizing the purchase of beef cattle from Tanzania to help increase the population after disease ran rampant through the population. The government knew that the beef economy took a hit after the rampant diseases, so by sourcing cattle from a new country they received lineage to add diversity to their stock. This has helped the beef population, but the question still remains, "Will it last and how does it affect the dairy cattle population?" Another solution is to send over cattle lineage from the USA that are known to have stronger immune systems and are more genetically resistant to certain diseases. One problem that this solution poses is that some of the diseases affecting cattle in Uganda are not found in the United States. Furthermore, Holsteins, Jerseys, Guernseys, etc. do not thrive and produce as much milk in Uganda's environment. The government intervened once again, and offers benefits to those that cross these exotic breeds with their indigenous breeds of cattle. Indigenous cattle crossed with the high-producing Holstein still do not produce nearly as much milk as a purebred Holstein. However, these crossbreds still produce more than the low-production indigenous breeds. While the government has attempted to help, these solutions do not work as well as the government had hoped. Further action is needed in order to save the cattle economy of Uganda. That is where genetics come in.

Studies have been done to find a connection to parasitic resistance and the genome of dairy cattle. It has been shown that certain bloodlines of cattle here in the United States have an increased resistance to parasites. When a line of cattle expresses a trait, it is apparent that there must be something connecting this resistance with genetics (Byaruhanga 2017).These cattle could be exported to Uganda. After crossing these cattle with the indigenous breeds, the F1 generation should be more genetically resistant to parasites. This strain of cattle will have increased production of milk, while also being more resistant. This requires less care from a veterinarian, which can maximize the profits of struggling farmers. There are a couple of holes within this solution. The cattle may not be resistant to the parasite strains native to Uganda. One way to narrow down the chance of error and lack of expression would be to use current biotechnology. The use of DNA assay could be implemented in order to determine which genes the cattle express, therefore indicating whether or not they have a likelihood of being resistant. Using polymerase chain reaction (PCR), multiple copies of the genome of a cattle can be multiplied and then placed into the assay for further testing. The genes would then be exposed to their complementary strands for the resistant gene. If pairing occurs, the gene is active and resistant.To increase the exotic cattle's resistance, one could introduce the strains to them before you export them. However, that would take time, as cattle do not have a rapid rate of reproduction. Another possible solution to this could be found in the science of embryo transfer. Eggs could be harvested from the cow and mated with semen from the bull of choice to create a zygote, which later becomes an embryo. The embryo then can be frozen and stored until placement in the uterus of the recipient cow. This poses another problem with the overall cost, but funding for all of these proposed endeavors could be found through research grants here in the United States. This solution provides a tremendous opportunity for cattle reproduction specialists to partner with scientists in order to create a project to improve the dairy industry of Uganda. The early work of the embryo transfer project would be where the reproduction specialist and scientists come in. Grants are available throughout the United States and the world that fit within the parameters of this project. Many various grants could be applied for, especially since the work fits into several different categories.

The question can be raised, “Is this a realistic and appropriate solution to implement in Uganda?” Embryo transfer technology has been around for several years in the United States. Little to no negative effects have been seen in the time that it has been around and in use here in the United States. DNA assay techniques have been around even longer. DNA assay works with specific genes, and those genes are a part of the overall genomes in the cattle. The genome is what is passed down, so it is a guarantee that these genetic resistance genes will at least be partially observed in the next generation. DNA assay has not had other negative drawbacks, so it is entirely appropriate to implement. These technologies have been proven to work, which shows that this is a viable solution. The start-up cost for this program would be expensive, but the maintenance is not nearly as costly. Technology is something that can prove to be one of the greatest assets to humanity, and this technology is no exception to the cattle industry.

Another solution involves the government. In Canada, there have been acts passed against the inflation of medicine prices for humans. Similar inflation can be seen in the animal industry in Uganda. The biggest contributor to this is that most of Uganda’s drugs are imports. Uganda doesn’t have the facilities or economy to produce the drugs that are used in the animal industry, leaving them to rely on other countries around them to get ahold of these drugs. The question has to be asked, “What is stopping the Ugandan government from passing an act against the inflation of medication for livestock?” There is no reason why they couldn’t work with the companies that supply their animal health products and the veterinarians that administer them. It is difficult, however, to regulate the price that the companies and other countries sell them at. Foreign relations will be important as Uganda considers pursuing this path. The government needs to prioritize the minimization of inflation done by the middleman between drug companies and farmers. Passing related legislation would benefit the farmers, which ultimately benefits the economy. The more farmers that struggle to survive and have to shut down their operations results in less food for the growing population. If they didn’t just stop at drug prices, and included legislation that protect farmers and their livestock, Uganda would undoubtedly see an increase in those wanting to farm livestock. Legislation may be hard to pass at the current time, as there has been some political turmoil within the last few years. Passing legislation takes time, so it could be a few years before any real change reaches their economy.

The involvement of citizens is crucial for legislation to be passed. Citizens need to identify and vocalize the needs that should be met in order to positively impact the dairy industry. Legislation will not begin to appear in government until someone takes the initiative to bring it forward. Along with that comes the importance of education. The people of Uganda need educated on why the dairy industry is so vital. A majority of the population has no idea why dairy needs to be a part of their diet. Even fewer have access to dairy products, and that is something that needs to change. The people need to realize why dairy and the calcium and other nutrients it provides are so important. Once education programs are implemented, it will be much easier for legislation to begin coming before the government. The important thing for the passage of the legislation is to show the government that the dairy industry matters. The government must see the vital role it plays, while also see that it matters to the people. From an economical standpoint, the government will not choose to back something or provide funding to it if there is no profit or substantial output. Current dairy farmers need to come together and determine a plan to show how the dairy industry can pay for itself.

American farmers can get involved by considering to donate their time by travelling overseas to Africa. On these trips, they could come alongside dairy farmers and educate them, while also giving them simple practices that can be easily implicated. Specifically, it would be important for United States dairy farmers to help the Uganda dairy farmers identify the needs that should be met to maximize their impact in the economy. American doctors and nutritionists can work with the general population to raise the awareness of the importance of calcium in the human diet. While financial aid may be difficult to come by, the time that people can give would be a great start in beginning to educate the public. A lack of education can be seen, but this lack can also be fixed. It is important to realize that while there are problems here in the United States, other countries still hold value in our economy. The United States has relations with Uganda for trade, so there is reason to believe that the United States should care about Uganda's economy. If the Ugandan people are experiencing health issues and their infrastructure begins to fall apart due to the lack of animal production, the trade programs will deteriorate. This would leave the United States without their 156th largest trade partner.

Uganda is not in a state of absolute devastation at the current moment, but further action needs to be taken to prevent devastation with their growing population. The government could be worked with to begin passing acts to protect drug prices and farmers. As for the introduction of genetically resistant cattle, this solution is also a viable option. If these problems are not addressed, Uganda will suffer in the future. Unless action is taken to help those struggling in the agricultural industry, the people and economy of Uganda will be left with the remains of a dysfunctional economy. Uganda should be a treasure of the world, as it is at the heart of Africa. It borders the shores of Lake Victoria, and this country is full of reservations for endangered animals that are the face of Africa. They are loved by the people, and if the people of Uganda cannot support themselves and their economy, the treasures this country beholds will become despondent and will fade away.

Livestock health and production should be priorities to farmers, but they are problems they cannot solve on their own. Uganda has the right economic pieces to become a stronger country, but it is the small things that keep these pieces from coming together to form something wonderful. The government needs to reach out and help farmers. In return, farmers need to persevere through hard times and work hard to maintain the health of their livestock. If all do their part, with a little help from the outside, Uganda will blossom into an economically beautiful country. When Uganda's economy begins to flourish, so will the people. With the implementation of embryo transfer technology, paired with genetic technologies to identify parasite resistance, Uganda can overcome the health problems in cattle. The key elements to success are education, unity, genetic and reproductive advancements, and the legislation. Uganda needs to unite in order to accomplish this seemingly daunting task. When viewed from the outside, this solution is complex and has multiple tiers. This is no small task, and it certainly won't occur overnight. The road to economic stability is not an easy road to travel, but it can be travelled. The bottom line, however, is clear. Diseases kill cattle, and dead cattle kill profits and deeply affect the population's health. Eliminate dead cattle, and watch the profits, population health, and economy rise.

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