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Uganda, Factor 7: Animal Agriculture

Introduction Intrinsically, everybody understands the importance of food. In infancy, we cry for breast milk. As toddlers, we beg for snacks. Adolescence brings insatiable appetite; the constant need for nutrients as the body grows. Every stage of life bears different forms of hunger. In the United States, we design life around this unquenchable thirst for food; leaving breaks for lunch, gathering family and friends together for a meal, incorporating large, juicy slabs of meat and fresh and vibrantly colored vegetables into our advertising. Just look around. It is hard to find a place in the United States that does not appeal to one's hunger. It is a universal need, but one that often goes unmet, particularly in impoverished countries. Like many countries, Uganda contains a diverse selection of vibrant cultures. Traditional dance and music are staples of Ugandan recreation. Bright colors and well-kempt clothing mark their celebrations as the community comes together to enjoy themselves and honor their existence. Unfortunately, despite their lively upbringing, they are unable to quell the universal problem: hunger. Malnutrition plagues the rural areas, affecting virtually every family. This is not just one problem, it is a multitude of them. From malnutrition stems disease, stunted growth, inability to concentrate, failure in school, and, worst of all, premature death. Each of these issues bring many more onto the family: increased financial burden from medicine, necessity for increased child care, and the immense difficulties which surround child death. These are complex obstacles to overcome for any family, but for those suffering from hunger and poverty, as is the case for so many Ugandans, these become unsurmountable.

Background The typical family unit in rural Uganda is about five people, according to a 2010 study, and consists of the biological mom, dad, and children (a nuclear family) in 82% of the cases studied. Additionally, 16% of the families included other relatives, and generally the entire extended family is united by a tight bond and nearby living quarters (Uganda Bureau..., 2010). Education is important to many families in Uganda, but resources are lacking. The government provides free primary schooling for Ugandan children, but its provisions fail to meet the high demand across the country. Thus, many families are forced to keep their children at home or pay for expensive private schools. Those who successfully attain a spot at the schools are subject to class sizes of around one hundred children, allowing very little of the personalized education that we know in the United States. Secondly, children in the education system frequently repeat grades due to inadequate teaching, inability to attend every day (due to poor infrastructure or familial duties), or stunted development due to malnutrition ("Education in...", 2016).

Not only is the education system in Uganda underdeveloped, its health care system is also very poor. Ranked 186th of 191 countries on healthcare performance, Uganda lacks many of the proper tools to create a thriving network of physicians available to citizens. At present, there is an enormous deficit of medical personnel with only 38% of medical posts filled. Of these, 70% are located in urban areas, only accessible to an astonishing 12% of the population of Uganda. This situation leaves rural families without proper medical care, leaving them susceptible to the effects of treatable diseases such as lymphatic filariasis, a parasitic disease, and leprosy, a skin condition. Two examples of this are as follows: about 1 in 200 Ugandan mothers die while giving birth; and 14% of deaths are due to malaria, although only 10% of children sleep under mosquito nets treated with insecticide. The result is the low life expectancy of 58.65 years which is found in Uganda today, compared to the global average of about 70 years (Kelly, 2009).

Due to the circumstances in Uganda, the majority of rural landowners are subsistence farmers, growing food for consumption, not for sale. Farm families typically grow cheap nuts, simple grains (cereals), and legumes such as plantains, cassava, groundnuts, sorghum, millet, corn, beans, or sweet potato. Most of these farms practice traditional agricultural techniques today, using rainfed, family-worked systems; thus

they generally do not implement any irrigation systems or modernized farming tactics. Additionally, very limited pesticides are used across the nation. Farming tools are handmade and primitive, reducing the effectiveness. Not only is the technology primitive, farmers have limited space, with most farms between one and five hectares or about 2.47-12.36 acres. For perspective, this is a range of less than one football field to a little less than four football fields. Making matters worse, years of cultivation has left soil across the nation depleted of nutrients which further reduces the overall productivity of the farm. Backyard agriculture practices are also common throughout rural Uganda. Many families keep poultry, cattle, sheep, and goats to use as an income supplement and a source of food, hides, and manure for fertilizer. These animals also often serve as backups to crop failure and drought. Other families, particularly those along the shores of Lake Victoria, practice subsistence fish farming. (State of the River Nile Basin, 2012).

The major barriers facing rural citizens in earning a living wage, improving agricultural productivity, and gaining access to adequate nutrition are poorly developed infrastructure, extreme poverty, primitive tools, and limited land. At present, infrastructure in Uganda is virtually nonexistent, with their 2013 paved road density essentially equivalent to that of Britain in the aftermath of the Roman Empire in AD 350, with about 4% of roads paved. For rural Ugandans to maintain a job, the majority of which are located in urban areas, they must have a form of transportation that would allow them to provide for their family at home and arrive on time to work each day. This necessity presents a major issue for the 78% of Ugandans which live at least two hours from a market center. The poor infrastructure, as well as the distance to markets and employment, effectively forms an incentive for impoverished Ugandans to continue to depend on subsistence farming. This is because the production of their own food supply reduces its cost by eliminating the extremely high price of transportation, a hypothesis by Gollin and Rogerson states. This argument is key in understanding the obstacle which is faced in the development of agricultural productivity. In the case of cassava, farmgate prices (the values of commodities without external factors like transportation) are often exceeded by the cost of transportation. Additionally, soil degradation has brought about decreased productivity which causes increases in poverty and the inability to produce surplus crops to augment the family's income. This extreme poverty prevents the development or purchase of more advanced technology which would serve as a simple method of increasing yields, profits, and overall productivity. This creates a loop: reduced yields and limited profit bring increased poverty; the poverty limits the ability to improve production (Gollin and Rogerson, 2012).

Animal Agriculture Animal agriculture in Uganda is typically a small-scale, backyard practice consisting of poultry, cattle, goats, sheep, and pigs. In general, these livestock are raised for milk, eggs, and/or meat as a dietary and income supplement. Unfortunately, traditional methodology remains common practice throughout Uganda, due to lack of education, money, and access to technology (State of the Basin, 2012). Recently, a few programs have been implemented to improve these conditions, as outlined in the 'solutions' section, with varying degrees of success. On the flip side, other factors have enormous potential to harm the productivity of animal agriculture. Water scarcity and pollution cause livestock to be unable to attain the proper nutrients. Population growth has severe consequences as it cuts into what little available space is left for animal grazing. Overall, recent trends in animal agriculture remain stagnant, although the aforementioned programs provide hope of an improved future.

A typical backyard subsistence flock is composed of ten to twenty birds (Tibyangye, n.d.). Currently, the majority of rural Ugandan farmers use local breeds, which produce about 40 eggs annually (three to four eggs per month). Not only is the egg production ineffective, the disease susceptibility and additional costs are suboptimal. These poultry are raised free range; they scavenge for their food (grasses and insects; occasionally owner's food scraps) and have the independence to wander in and out of houses, often using bushes and shrubbery for shelter (Mwebaze, 2006). Although this has its benefits in reduced care necessary, it poses a great problem for the overall welfare of the flock. Entire flocks of chickens are liable to being wiped out by illnesses such as Newcastle disease, characterized by difficulty breathing, paralysis, and diarrhea. Furthermore, these birds rarely receive veterinary care or vaccinations. Altogether, the

system lacks biosecurity, leaving the farmers vulnerable to inconsistencies in yield. This prevents them from relying on their poultry as a source of food or profit. As far as human involvement goes, women and children do 90% of the management of subsistence poultry farming. Thus, improvement of the system has large potential to have significant impact on their livelihood (Mwebaze, 2006; Tibyangye, n.d.).

Many inland freshwater lakes in Uganda play host to diverse marine ecosystems, yet their resources remain largely untapped. Presently, fish are integral to the culture, especially along inland lakes. Beyond their use as a main protein source, they are central to cultural traditions. Unfortunately, fish farmers still use primitive equipment and technique, curtailing the overall haul of fish which determines their income, diet, and livelihood. Other major issues with the current fishing schemes are poor education, environmental harm, and the 10-30% post-harvest loss experienced (State of the River Basin, 12).

Improvement of Ugandan animal agriculture would have a nontrivial effect on the whole country. Higher yields provide each family a choice: more income or more food. Both are constructive in tackling the national goal: reducing the 5.6% net loss of national income due to malnutrition (Doyle, 2013).

Potential Solutions Of course, such a complex problem, as this entrenched poverty is, does not have a simple solution. The goal of this proposal is to reverse the vicious cycle of poverty and failure which feeds upon itself in order to create a more virtuous cycle of enrichment leading to success. To do this, it recommends a variety of systems and tools to make progress on several dimensions of the problem while creating as little a disturbance as possible to the culture and environment and maintaining a low cost.

The first facet of the proposal involves the application of a project which found success in Nicaragua under similar circumstances. This plan involves the implementation of silvopastoralism, the integration of forestry into animal agriculture, which comes with many benefits. The grazing livestock is fed from the nutrient-rich grass and woody fodder; the amount of carbon sequestered is increased; soil quality is benefited by the replenishment of nutrients in the soil; and water is saved by reduced heat stress on cattle and other animals because of increased shade. The Nicaraguan Project focused on the addition of fodder shrubs specific to the tropical climate of South and Central America with layered vegetation above, made up of palms and other trees. This is based on the idea of natural intensification: using natural means to increase biodiversity, efficiency, and boost natural processes, such as photosynthesis. The end result of natural intensification is a much more productive farm, with better, nutrient-rich soil, that is somewhat carbon-efficient, and allows increased yield of cattle and other livestock products. For example, the Nicaraguan study found an approximate boost by 50% in income and milk production when the tree-enhanced farms were compared with those practicing traditional methodology (CGIAR, n.d.).

The application of this success to Uganda is relatively simple, with the only major obstacle being the vegetation used, as the main difference between the two countries is climate. Luckily, there are many grasses and shrubs indigenous to the region which will produce similar benefits to the Nicaraguan trees. These include *Panicum maximum*, *Brachiaria ruziziensis*, *Chloris gayana*, and *Setaria anceps*. Also, the Kawanda Agricultural Research Institute is developing new *Pennisetum purpureum*, the only indigenous fodder grass, as well as other trees and grasses with enhanced traits for silvopastoralism in the region. *Tripsacum laxum* and *Setaria splendida* have been introduced successfully in Kenya and Ethiopia, two of Uganda's neighboring countries (Mwebaze, 2006). Another important element in the Nicaraguan success was the hands-on, lifestyle-targeted education on proper agricultural practices and livestock management. Setting up farm field schools focused on silvopastoralism are important to this proposal across the board, as they allow farmers to play a major role in the testing of the effectiveness of processes, make integral decisions, and oversee the management of the system. The schools brief farmers on previous successes and failures, provide the opportunity to visit other farms to learn new methodology, and give farmers the opportunity to communicate with potential partners. This education was found to renew interest in new technology, engage farmers in discussion, and increase business/farming skills (CGIAR, n.d.).

The second component of the solution involves the improvement of poultry breed. A project, which has already begun work in Uganda is finding moderate success in a replacement for local chickens: the Kuroiler Chicken. The bird was designed by KeggFarms to mimic the appearance, diet, and habits of native breeds but with higher efficiency. The project, which originated to help rural Indian woman, found enormous success, with the poultry producing eggs two to three times faster and gaining weight at an approximately five times faster rate. Another major benefit, given the free range conditions in which the chickens are raised, is increased drought and disease tolerance. Presently, chicks are available through the Ugandan government for about a dollar, but, through subsidies from a private institution, prices could fall to around six cents per chick for a rural Ugandan. As the project grows, not only would this give the world of subsistence farmers with backyard poultry operations an opportunity for extra income and another consistent food source, it would provide a second source of income for rural Ugandans by creating jobs across the country in a grassroots distribution and hatching network. Local hatching shifts the economic gain from a large company to poor rural families and creates an independent system within Uganda (CGIAR, n.d.; Kimanthi, 2015; Harth, 2015).

This surplus improves the Ugandans lives in more ways than extra food and money. It also provides an incentive for poor individuals to use some of their few resources to go to the market in order to sell extra eggs and meat. This traverses the cost barriers which previously rendered markets inaccessible to the majority of Ugandans, allowing them to obtain additional resources to improve their livelihood. This project has found great success in recent years, with millions of birds spread to rural Ugandans, but there is more to be done. To become sustainable long term, it is important for the allocation of resources and the funding sources to change to become centered in Uganda. At present, the germplasm (from which the enhanced Kuroiler chicken is produced) is found in India, preventing the full development of a distribution network strictly within Uganda. Furthermore, the project would need a shift in funding source (from government and research based funding to the private sector) to obtain long term stability, as it currently relies on external funding which will not be able to continue indefinitely (Sharma, 2015).

Improving fish farming productivity along inland lakes, such as Lake Victoria, is possible by addressing each issue (primitive technique, no export market, low yields, etc.) individually, but the third portion of the plan proposes aquaculture as a viable solution to the overall problem. This involves using cage fishing, which is advantageous due to the relative ease of switching (high annual average temperatures and optimal overall aquaculture conditions), high yields, and pre-established export market. The main obstacles are the procurement of feed, careful planning to prevent harmful practices and overfishing, and the education of fish farmers on cage aquaculture (Achia, 2013; State of the River Nile Basin, 2012).

The fourth feature of the proposal is a program similar to the ABC Programme in Brazil. It would be designed to encourage rural Ugandans to implement and maintain energy efficient, sustainable agricultural systems by providing low interest loans to farmers with plans fulfilling these intentions. This would encourage the restoration of degraded pasture, silvopastoralism, and nitrogen fixation. Combined with farm-field education to form climate-smart plans, this would help Ugandans recover from the effects of drought or disease and boost the incentive for climate-smart practices (CGIAR, n.d.).

Each of these solutions contributes their own piece of the complex puzzle, but there is still a major obstacle: resource distribution. As discussed in the background section, Ugandan infrastructure is very poor. This provides a challenge in the spread of goods and techniques without a large cost increase, an almost universal problem in project implementation in the third world. There are many possible solutions, but each has downfalls in range of effectivity and cost. For example, the use of markets to springboard the process of spreading knowledge and resources could work, especially to begin the process, but many of the most in-need regions would not be properly accounted for, as many lack the resources financially or physically to journey to markets. A way to overcome this lack of range would be a higher initial cost to

jumpstart the project by using a more expensive or time intensive method, such as helicopter or atv. To continue the projects after this primary setup, a cheaper, more accessible way is needed: the bicycle. Distribution of the bicycle, the fifth and final step in the plan, would allow rural citizens to access a wider geographic area and add ease to the further exchange of project resources. Not only do bicycles allow for the project to continue to be effective, they also further the goals of the project by reducing difficulty in market accessibility and attendance of farmer field schools. Such bicycle distribution could be done in conjunction with the above projects or through directing funding towards external organizations, such as Bicycles for Humanity, who are currently working on the issue (Bicycles for Humanity, 2013).

Funding & Involvement The implementation of this plan depends on funds from the Ugandan government, grants, the private sector, non-government organizations, and the communities themselves. Funds from organizations such as the World Bank, USAID, and the World Health Organization could also provide jumpstarts to the project. The major role of the government would be to provision farmer field schools to educate rural Ugandans as a part of their ongoing goal to provide education to the citizens. Either the government or private banks would be incorporated into the plan to provide low interest loans in accordance to the previously stated policy. This would be a short-term investment with long-term benefits for the Ugandan government. Presuming the proposal is followed, increased finances for rural families should allow either payback of low interest loans or eventual cash return in the form of reduced economic loss due to malnutrition. The Bill and Melinda Gates Foundation acknowledges poverty around the world and works to fix it by empowering the impoverished individuals. They work with locals to find solutions to agricultural problems that are ecologically friendly, cost effective, and sustainable. The foundation also educates the public on the problems affecting third world countries and their role in fixing them. Foundations such as the Bill and Melinda Gates Foundation and KeggFarms, the Kuroiler chicken developer, have in the past provided funding for projects like these. Assuming proper implementation, it is likely that these and other similar grants would be available (Bill and Melinda Gates Foundation, n.d.).

To fully optimize the plan, rural Ugandans would be partially responsible for the cost, at a price subsidized by the government or private sector. For example, for a farmer to invest in the Kuroiler chicken a six cent price may be offered to farmers at the beginning of the project. After these government subsidies, the ongoing continuation of Kuroiler use becomes simpler, as families will gain trust in the breed, are more willing to invest, and have funds to pay a slightly larger (yet still subsidized) price. Over time, the system becomes more fluid, as the government benefits from improved nationwide economic standing. Not only are Ugandans involved monetarily, the process is very hands on. Each feels needed, understood, and receives a greater benefit by learning with their peers through investigation, comparison, and experimentation of methodology in farmer field schools and on their own farms (Harth, 2015).

Conclusion Education is not only important for the ones directly affected, but for citizens around the world. To truly tackle malnutrition and poverty, not only in Uganda, but across the world, it is important that, from a young age, we understand the many facets of these complex issues and take the time to discuss possible solutions. It is up to everyone to spread the word of these countries' poverty and to spark global change, even if it just starts by a simple conversation. Animal agriculture is just one of many factors in the malnutrition that the citizens of Uganda face, but it is critical to their development. It is key to improving the lives of women and children, reducing hunger, and increasing job availability across Uganda. In a jigsaw puzzle, if just one piece is missing, the image doesn't look quite right. Likewise, if we don't solve each little issue that contributes to hunger, it will be difficult to eradicate the problem. Animal agriculture is the piece with the jagged edges, that has so many different edges to work with, yet when its perfect spot is found, it gives the entire image a new layer of meaning.

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