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Agriculture Education in Zambia: The Key to Overcoming Poverty

In Iowa, a state that takes pride in its large agricultural industry, one only has to drive approximately fifteen minutes out of the largest city to find vast crop fields of corn and beans. Iowa proudly identifies itself as a large agricultural producer along with other states in the Midwest. However, the average Zambian views agriculture quite differently. Zambia, a small country located in Sub-Saharan Africa, has a relatively stable government compared to other African governments, yet the country still lags behind in human development and poverty reduction. Although Sub-Saharan Africa possesses a variety of natural resources and the potential for agricultural growth and development, the economy struggles to harness these resources. Unlike in Iowa, farmers have a low social and economic status in Zambia, mostly due to the lack of success small-scale farmers have experienced in the country's constantly changing climate and poor infrastructure. Furthermore, rural farmers lack adequate training and knowledge pertaining to conservation farming methods. For years, Zambia has relied on the support of charities and Non-governmental organizations (NGOs). Unfortunately, these organizations often struggle with relevance when assisting small-scale rural farmers.

In 2010, 65% of Zambia's population lived in rural areas of which the average household size was 5.3 members. Only 79.2% of children from subsistence farming families, ages 7 to 13, attended primary school in 2010, while only 74.9% of children ages 14-18 attended secondary school. Furthermore, only 29.4% of the small-scale farming population pursued a higher education ("Living"). The low enrollment and attendance rate for higher education consequently leads to a high unemployment and poverty rate which puts stress on large rural households to provide enough food for its members.

Additionally, families living in rural areas have limited access to healthcare services. In rural areas, only about 46% of people live within three miles of a health center. The majority of the health centers in Zambia are publically run, while others are organized by private and mission groups. However, most of the facilities are poorly equipped, understaffed, and do not contain adequate resources to treat certain illnesses and aid patients located far away from the center. A significant portion of the population also suffers from diseases such as malaria, tuberculosis, and HIV/AIDs due to unsanitary living conditions, malnutrition, constant climate change, and a lack of education on health ("Key").

Like many resource-rich countries in Sub-Saharan Africa who base their economies mainly on the mining, oil, or gas industry, Zambia's economy lacks diversity and depends heavily on one sector. This prevents long-term economic development due to fluctuating market prices ("Diversification"). Zambia produces one of the world's largest amounts of copper and cobalt, and the country contains a variety of precious minerals. Because of this, Zambia focuses most of its budget on the mining industry even though 58% of the country's land has medium to high potential for agricultural production. The country also contains 35% of Sub-Saharan Africa's total water in its rivers, lakes and waterfalls ("Natural Resources"). Zambia struggles to use all of its valuable resources to increase diversification and stabilize the economy.

Furthermore, Zambia's large dependency on the copper industry is severely polluted with corruption caused by the monopoly of international businesses. Zambia largely invests in its mining industry but fails to profit from the abundance of copper due to corrupt foreign companies that control the copper industry. Each year, Zambia loses an estimated \$3.02 billion of revenue to large international companies that avoid paying taxes. Zambia loses \$2 billion to corporate tax avoidance, \$264 million to tax evasion, and \$752 million to improvement to tax administration, reduction in tax incentives, and introduction of new taxes on an annual basis. Glencore, an international company based in Switzerland, is notorious for

tax avoidance throughout their global businesses. The company costs Zambia billions of dollars by reporting inaccurate records and violating guidelines for multinational enterprises (Curtis 7-16). Mark Curtis, author of the article, "Extracting Minerals, Extracting Wealth", writes about foreign companies taking advantage of Zambia's mining industry:

Research undertaken in 2013 showed that in previous years up to half of Zambia's copper exports had been destined for Switzerland, according to Zambian customs, but according to Swiss import data, most never arrived...If Zambia had secured the same price for its copper exports as Switzerland in 2008, for example, the value would have been nearly six times higher, adding £11.4 billion (about \$12.27 billion) to Zambia's GDP. (Curtis 9)

These losses prevent Zambia from investing in economic and technological advancements that help decrease poverty. While NGOs cannot control corruption in Zambia's government and other economic sectors, they can help Zambia regain some of its annual revenue lost to corrupt international businesses by putting more emphasis on the agricultural sector rather than the copper industry.

Zambia's volatile climate and poor infrastructure prevents advancements in farming methods and technology. The country struggles to create a consistent and dependable agriculture sector due to its large dependence on rainfall and lack of irrigation technologies and drought-resistant crops. For many years, Zambia has suffered climate change and extreme climate events such as floods and drought. The volatile climate reduces the production of Zambia's staple crops such as maize, millet, sorghum, and rice and creates soil erosion, thus decreasing the amount of cultivatable land (Sichinga). Along with climate struggles, the country's poor infrastructure decreases rural farmers' accessibility to markets due to poor roads (Hoel). Zambia's electricity is also unreliable, thus limiting farmers to the use of simple tools and mostly hoe cultivation ("Zambia"). Without proper tools, crops and supplies for Zambia's environment, farmer's fail to progress in crop production, making profit and surplus nearly impossible.

Zambia also lacks investment in the agricultural research and education needed to assist local subsistence farmers and to address their specific needs. Without proper education, farmers do not know how to properly use the land without causing environmental harm (Pinstrup-Andersen and Pandya-Lorch 2). The CEO and founder of the nonprofit organization, Agrihope, that educates and empowers small-scale farmers mainly in Zambia and Ghana, Mickey Kinzenbaw, explains that the lack of success in the agricultural sector discourages people from becoming farmers; in fact, the average African views farming as equivalent to janitorial work. Often, a family's overall goal is to reach urbanization which fills the already densely populated cities with more poor non-working citizens. This migration creates a decrease in sanitation in urban areas and an increase in crime rates and drug abuse (Kinzenbaw). Without receiving the necessary education, farmers may struggle to become successful and to meet their family's basic needs which creates negative views toward the agricultural sector and discourages growth and improvement.

As a result, the lack of agricultural growth and development creates a vicious cycle of hunger, malnutrition, and poverty. Without successful occupations, families struggle to provide food for their members which is especially crucial for pregnant women and growing children. The average diet in Zambia consists of cereals, maize, starchy roots, and few animal products, fruits, and vegetables; consequently, this poor and unbalanced diet leads to various nutrition deficiencies ("Zambia: Nutrition"). Zambia struggles to meet the Millennium Development Goals, specifically in areas of poverty and maternal and child mortality. In addition, Zambia has the world's ninth highest child malnutrition rate at 45.4%, and 28% of children under the age of five are underweight while 47% are stunting in growth ("Zambia"). As a result, stunted growth and damaged development hinders a child's ability to learn and perform tasks needed for work in adulthood. Without the capability of working, the children will not be able to provide for their future families, which again results in poverty and malnourishment for the next generation ("Food"). Thus, the harmful cycle continues, preventing drastic improvements in Zambia's workforce and economy.

Unfortunately, many NGOs that come to Zambia do not address the country's specific issues well. They come with honest intentions to help but often struggle with the relevance and effectiveness of their solutions in the long-term. NGOs often struggle to understand that most approaches and farming methods used in the developed world are not as effective in extremely poor and undeveloped countries. Modern machinery (such as tractors) introduced by some NGOs is useless to small-scale farmers who still struggle with basic farming skills and lack the education and resources to run and maintain the expensive equipment (Kinzenbaw). Without changing their perspective when aiding people with different cultures and knowledge, NGOs cannot cooperate with Sub-Saharan African farmers to create realistic solutions, and charities only increase Zambia's dependency on foreign nations rather than empowering the locals.

Along with short-term solutions and irrelevant methods of farming, cultural and communication barriers also prevent many NGOs and locals from understanding that NGOs should not simply provide supplies but should instruct the locals. Steve Corbett, author of the book *When Helping Hurts*, says, "Development is not done to people or for people, but with people" (Corbett). Unfortunately, many NGOs focus mainly on providing third world countries with the resources they need. The continuous aid to African countries often results in the locals becoming accustomed to receiving goods out of pity. They often do not see themselves capable of carrying out the same tasks as mission workers who have different experiences and have received various opportunities.

Rather than simply donating supplies to Zambia, NGOs should create research institutions in the region that work to find farming methods suitable for the region's climate. In Zambia, the institutions should experiment with different farming methods to discover techniques best suited for the climate and environment. While doing this, they will simultaneously be training local small-scale farmers to use the land in a more effective manner. Through this, NGOs will provide a place for locals to learn and practice practical farming skills while nearby communities will provide the labor. All of the food produced at the research center should first go to the farmers working at the center, and the surplus may then be distributed by the local farmers to poor communities nearby. Allowing the workers to distribute the food helps empower the local farmers and gives hope to surrounding communities who struggle with agriculture. Also, NGOs should hire locals to work full-time at the institutions in order to better communicate with nearby communities. Local insight is critical for communication because the locals know the most about the land, climate, and various cultures in the region ("Food"). The hired locals would also be responsible for traveling to distant communities to introduce the farming techniques they were taught. The separation from a nearby research institution and limited access to supplies forces the local instructors to problem solve, work with the resources they have, and become more independent. By using the institutions for both research and education, NGOs can better adapt to the culture and environment and train locals to use farming techniques that are not impaired by Zambia's struggling infrastructure and erratic climate.

More efficient and relevant farming methods taught in Zambia can lead to increased success in the agricultural sector. This will encourage the government to invest in another dependable source of income and therefore increase economic diversification. The Committee on Twenty-First Century Systems Agriculture--author of the book, *Toward Sustainable Agricultural Systems in the 21st Century*--cites experts from the World Bank and African Union saying that a permanent improvement in the agricultural sector of Sub-Saharan Africa as a whole requires "a commitment among African governments to reallocate up to ten percent of their national budgets to agriculture, up from an average of five percent over the past decade continent-wide and only four percent in Sub-Saharan Africa" (Committee 497). An increase in agricultural investment and success of small-scale farmers may also help Africans see the value of agriculture and encourage them to remain in rural communities rather than seeking urbanization.

The research institutions will experiment with and teach various farming techniques, such as the use of mulch covers, crop rotation, and no-till farming. Although mulch covers (both plastic and organic) can be expensive and hard to remove, they help regulate soil temperature, moisture, and nutrient levels, and they help control weeds (Shrefler). Additionally, crop rotations allow farmers to grow different crops on the same fields in a controlled manner, allowing farmers to better plan their seasons. Farmers often rotate crops from three different categories: cultivated row crops which affect fertility; sod forming, or rest crops, which help regulate soil erosion; and close-growing grains. Crop rotations make labor, power use, and equipment use more efficient and reduce risks caused by unpredictable weather and market conditions (“Crop”). Lastly, the research institutions will discourage farming techniques such as heavy plowing and tilling because it significantly increases soil loss and erosion. Instead, farmers should practice no-till farming in which they leave the remains of the previous year’s harvest in the fields to cover the soil. Although this does increase weed growth and requires farmers to dig underneath crop remains to plant new crops, it greatly reduces soil loss and erosion (Coombs). These and other simple farming methods can be introduced and taught to small-scale farmers in Zambia, and the most effective methods can be improved and adapted to better fit the environment.

The proposed research institutions in Zambia will also help farmers adapt to climate changes and reduce their dependability on rainfall as a main water source. Institutions can do this by introducing simple irrigation systems such as the easily affordable treadle pump, which is a simple, manual pump used to extract water from the ground. Studies show that treadle pumps have increased farmers’ household incomes by \$100-500 (“Treadle” 2). Simple and easily affordable technologies such as the treadle pump can be immediately introduced to small-scale farmers in Zambia because the locals can easily learn how to use and maintain the technology and equipment, thus ensuring sustainability after foreign aid has left. However, more advanced technology is not yet appropriate for Zambia’s agricultural industry because farmers do not have the resources or education to experience full benefits from the often expensive technology, and it would consequently increase their reliance on foreign countries.

Due to Zambia’s volatile climate and current limited access to irrigation, the country, like most of Africa, is a target for genetically modified organisms (GMOs). GMOs are plants, animals, and other organisms that have been genetically modified using unnatural DNA to create a desired trait. These man-made organisms offer many benefits such as improved crop yields, greater nutritional value in food, longer shelf life, and resistance to pests and severe climates such as droughts (“Genetically”). However, with these benefits come possible risks. Many scientists, farmers, and consumers fear GMOs will harm the environment and the health of both humans and animals. Genetically modified crops and animals create the risk of cross-contamination with other breeds natural to the environment, and the foreign crop has the potential to become an invasive species or harm native animals. The unnatural transfer of DNA to another organism also increases the possibility of mutations, and many people fear that they will be consuming unnecessary DNA that may negatively affect their body. Because of the many fears and possible risks, the countries that do produce and experiment with GMOs work in extremely controlled and regulated environments and labs. They also have established a biosafety policy and numerous regulations to ensure the safety of the product before it is made publicly accessible (Key, Suzie).

Unfortunately, most African nations lack the resources and technology to experiment with and effectively use genetically modified crops. Furthermore, they often lack a biosafety policy to closely regulate the genetically modified crops and reduce the amount of possible risks. Due to their limited knowledge on GMOs, most African countries’ views towards GMOs are heavily influenced by biased sources. Many biotechnology companies unrealistically promote GMO products to produce a profit, while some governments, NGOs, and charities who oppose GMOs elaborate on the possible risks and create false fears and myths (Falk-Zepeda).

Along with environmental and health risks, political and economic risks dissuade the use of GMOs in Africa. Many countries are reluctant to attempt to produce and trade genetically modified crops because they risk harming trade relations with nearby countries with strict bans on GMOs. The use of GMOs could also disrupt trade within a single country because some people remain unwilling to buy genetically modified products (Falk-Zepeda). Without the knowledge and resources to conduct their own research and development of GMOs, African countries will remain divided on the use of GMOs, affecting both farmers and consumers and preventing further advancement in agriculture.

Although some African countries, such as South Africa and Kenya, are slowly beginning to open up to GMOs, Zambia holds fast to its tight ban on genetically modified crops. In the past, Zambia has even turned down crops and food from other countries because they contained GMOs (“GMOs”). Zambia mostly opposes GMOs due to their lack of knowledge and research on the subject. Levy Mwanaswa, former president of Zambia, publicly opposed GMOs. Mwanaswa tightened the country’s ban on GMOs and spread anxiety and fear of the possible dangers of the unknown product: “Simply because my people are hungry, that is no justification to give them poison, to give them food that is intrinsically dangerous to their health” (Cooke). The president’s view towards NGOs demonstrates the extreme and unrealistic fear of GMOs found in Zambia, causing people to starve rather than accept genetically modified food.

Currently, Zambia is not ready to experiment with and implement GMOs. A large portion of Zambia’s farming population is small-scale subsistence farming which does not yet have the resources, money, or success to risk experimenting with an unfamiliar and technologically advanced crop (Cooke). Instead, research institutions should first focus on implementing simple farming techniques and technology which can be used more effectively to retrieve more immediate results. Then, as farmers become more successful and increase their crop yields, they can afford to make small investments in genetically modified crops. In order to create a long-term solution, the research institutions must research and develop GMOs in the region of interest rather than importing them from a different country. The institutions must also develop their own biosafety policies and regulations to ensure the safety of their products. As locals work directly with genetically modified crops and experience personal success, the government will be encouraged to adopt the institutions’ biosafety policies, allowing GMOs to expand and grow in potential.

The Drought Tolerant Maize for Africa (DTMA) project, funded by the Bill and Melinda Gates Foundation is currently successful in creating and introducing drought resistant seed to Sub-Saharan Africa farmers. The project joins farmers, research institutions, extension specialists, seed producers, farmer community organizations, and NGOs to support maize research and training for seed producers. Since 2006, the program has already benefited millions of farmers. From 2007 to 2012, the project created over 60 maize hybrids and 57 pollinated varieties for small-scale farmers, which were more successful and resistant to diseases than commercial seed. The project also produced over 29,000 tons of seed between 2011 and 2012, which benefited 2.9 million households (“Drought”). If small-scale farmers in Zambia experience similar success, they may be encouraged to grow genetically modified crops. By using crops, irrigation, and teaching techniques similar to the DTMA project, institutions in Zambia can improve agricultural production and benefit small-scale farmers through the approach of combining research and local training to solve specific problems the agricultural sector faces.

Many current approaches employed by large NGOs are not always relevant and rely too heavily on foreign aid and investment. However, these institutions emphasize the value of education and hands-on training with locals in order to promote methods of farming with more permanent effects. Although many NGOs mainly seek to end poverty and hunger, the research and training center focuses on the initial steps

to help a family meet their basic needs first. Once a farmer can provide for their family, they can then begin to sell surplus in local markets to increase their personal income and the local economy. By taking small steps, this realistic solution may take longer to accomplish, but can produce more permanent effects. A considerable amount of NGOs are on the right track, but this approach goes one step further by emphasizing the importance of education and research and increasing the relativity of the farming methods used.

In conclusion, Zambia contains a large amount of people who live in poverty and suffer from hunger and malnutrition. The country has potential to increase economic output with its abundance of natural resources and cultivable land, but a lack of education and investment in agriculture prevents such improvements in the economy. Like the majority of countries located in the Sub-Saharan African region, Non-governmental organizations (NGOs) working in Zambia struggle to address the specific needs of rural farmers with relevant farming methods. To solve these problems, NGOs should create research institutions in the region that work to find farming methods suitable for the region's climate. These research institutes will allow NGOs to find the most effective method of farming in their specific region and to educate the locals on relevant farming methods. At the same time, the institutions should provide training and education on sustainable farming techniques for local farmers in order to improve agricultural production. To encourage agricultural investment, research centers must adapt to the region's different cultures and break cultural mindsets. By focusing on small-scale rural farmers and those living in poverty, the training and development will demonstrate that the locals have the potential to not only produce food for their families, but also make a profit by selling their extra food. By educating rather than giving, NGOs can empower the people in need, establish a long-term solution that can eventually continue sustainably and should reduce the high poverty and malnutrition rates in Sub-Saharan Africa. NGOs will be challenged with economic corruption caused by foreign companies and the region's unpredictable and severe climate changes. Once adapting to the climate and culture of their environment, research and training centers in Zambia can empower small-scale farmers and increase diversification in the local economy.

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