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## **Nourish & Flourish: Harvesting Success for Tanzanian Education**

When visiting Arusha, Tanzania this spring break, I found a vast difference between the privately funded and government schools. Specifically, the difference in school lunches that were served as the privately funded schools served nutrient and calorie-dense foods every day with a healthy balance and variety, while the government school served only maize porridge (Ugali) with very little nutritional or calorie value and no variety. This sparked my interest and desire to try and find a better way for students to get the nutrition they deserve, no matter what school they attend. After talking with the students and staff at the government schools and learning more about the problems they face I was empowered to learn and research about Tanzanian childhood nutrition, especially how it can be improved by encouraging schools and agriculture to implement the use of two crops—amaranth and moringa.

Tanzania is a country on the east coast of Africa with a population of 65,642,682 (CIA). 43% of Tanzania's land is used for agriculture as agriculture is the main source of revenue in Tanzania (CIA). The central plateau of Tanzania, which covers much of the country, is hot and dry. The semi-temperate highlands are fertile and cool (WFP). Tanzania has a predominantly rural population with around 70% of the population residing in rural areas (AFS). With a large rural population, agriculture is the primary source of employment. The leading crops grown in Tanzania are Maize, Rice, and Millet (CIA). The average number of children in a Tanzanian family is 5, but the extended family tends to all live together making households in Tanzania quite large. In rural areas, typical dwellings include traditional mud-brick houses. Access to amenities like electricity, clean water, and sanitation can vary significantly based on location or economic status. A typical Tanzanian family includes staples of Ugali, rice, and beans. Meat consumption is less frequent due to economic constraints so often protein consumption is low in most families. Typical families in Tanzania face various barriers, including limited access to education, healthcare, and employment opportunities, especially in rural areas. Economic challenges, inadequate infrastructure, food insecurity, and lack of access to clean water and sanitation are also significant issues. Efforts to address these barriers often involve government interventions, community initiatives, and support from international organizations (AFS).

A major ongoing problem in Tanzania is malnutrition in children as more than 2.7 million Tanzanian children under 5 years of age were estimated to be physically stunted (UNICEF Nutrition). According to WFP, "Malnourished children demonstrate a diminished capacity to learn and higher susceptibility to infection. They earn less than their peers and tend to pass on their health problems to their children, propagating a cycle of hunger and poverty." As the size of households is large, this makes it harder for families to provide for their children, leading to much malnutrition among Tanzania youth. Malnutrition in children is a multifaceted issue because it affects everything in a child's life. Malnutrition affects the brain's ability to absorb information meaning that a student's education depends on their nutrition. In Tanzania, there are standardized national exams after primary school, Form 4, and Form 6. If you do not pass your national exam, your education is most likely over (UNICEF Education). Unfortunately, most students in Tanzania do not make it past primary school as 70 percent of children aged 14–17 years are not enrolled in secondary school (UNICEF Education). A possible cause could be the lack of nutrition, highlighting the importance of nutrition when it comes to education in Tanzania.

There have been many attempts to help better the nutrition of students, with a famous example being the partnership between Global Volunteers and Rise Against Hunger which served students two meals (instead of only one meal) during school. The implementation of two meals had a positive impact displayed by team leader Winnie Mshindo stating, “Most students attend all the class sessions in the day and stay afterward to receive the afternoon meal as well and are more active than they used to be due to the added nutritional boost!” Through Global Volunteers and Rise Against Hungers' proposal of two meals a day, the students are more focused in class and are performing better in the classroom. Thrive Global Project is also trying to decrease malnutrition among students by creating the Lunch Project. The Lunch Project is improving school lunches in Tanzania by using fresh produce from local farmers to make porridge and encourage sustainability. To increase job creation, the Thrive Global project is also hiring parents of students to make porridge promoting economic opportunities in Tanzania. Through the Lunch Project, over 5000 kids receive a hot lunch every day.

Although these organizations have helped more students have access to quality nutrition, malnutrition is still a very prevalent issue in Tanzania. Malnourishment in children is mainly due to the lack of access to food. Helping Tanzanian citizens have better access to food can help stop malnutrition but there are many other ways to reduce malnutrition such as using sustainable agricultural practices, better access to clean water and improved sanitation facilities, immunization to prevent diseases, increased health and nutrition education, and ensuring access to quality post and prenatal care with many other factors relating to malnutrition in children.

Though there are so many factors that cause malnutrition, I want to specifically tackle the problem of the lack of nutrition in school lunches within government schools in Tanzania. Traditional staples such as Ugali, made from Maize, lack the essential nutrients for healthy development in children. I propose to address this issue through the substitution of maize with amaranth- a highly nutritious grain- in Ugali preparation. Additionally, the inclusion of moringa, a locally abundant superfood, in Collard Greens will further enhance the nutrition in school meals.

Amaranth is a nutrient-dense grain, rich in protein, carbohydrates, and nutrients such as Iron and Vitamin B. Amaranth helps build and maintain muscle mass. Compared to Maize, it offers much higher nutritional value, making it an ideal choice for improving school lunches. Amaranth contains approximately 13-14% protein, higher than most grains, and is a good source of essential amino acids, particularly lysine, which is often deficient in maize-based diets (Global Giving). Amaranth cultivation in Tanzania presents a solution to the country's malnutrition problem. The specific variety of amaranth suitable for cultivation in Tanzania is *Amaranthus Cruentus*, which thrives in diverse climates (Africa Rising). While Tanzania experiences a drought season, the relatively short duration is followed by a heavy rain season, leaving ample time for the growth of amaranth. Amaranth is an inexpensive plant, and is resilient to diseases, reducing the need for pesticides and promoting eco-friendly agricultural practices. Local farmers will play a crucial role in supplying amaranth to schools. Through supporting farmers in amaranth cultivation, economic opportunities will be created at the local level. Farmers in Kenya have successfully integrated amaranth into their crop rotation systems, benefiting from its low disease susceptibility (KALRO). By utilizing similar cultivation practices, an upscaled amaranth production in Tanzania can be complemented by training programs and subsidies that encourage farmers to adopt amaranth cultivation thereby enhancing food security and stimulating economic growth in rural areas. The switch from maize to amaranth has many positives, as it will result in nutritional value increases and dietary diversity. This will lead to a more varied and balanced diet. In school kitchens, Ugali production can transition easily from

maize to amaranth, requiring minor adjustments. School cooks can incorporate amaranth flour into the traditional Ugali recipe, maintaining its familiar taste while increasing the nutrients within it.

Similar to the introduction of amaranth in the preparation of Ugali, integrating moringa into school lunches further enhances the nutrition of students. Moringa can be used in the making of Collard Greens to add vitamins and nutrients essential for students' learning. Moringa is a superfood grown throughout Tanzania, which is high in nutrients and antioxidants. Moringa, known as the miracle tree, grows plentifully in Tanzania (Global Communities). Moringa is already sold in powdered forms in Tanzania and can be added to porridge to add a boost of nutrition. Moringa is a unique plant because almost all parts of it -leaves, seeds, flowers/pods, stem, and roots - can be used as a source for nutrition, and supplements. Moringa cultivation offers a sustainable solution as the plant has a high growth rate and is adaptable to diverse climates. Tanzanian farmers already cultivate moringa, but there would need to be an influx of moringa grown to integrate the plant into Tanzanian school lunches. This is possible as moringa is an inexpensive crop making it an ideal plant for farmers to grow. Moringa is a fast-growing tree that is easily cultivated in Tanzania and locally available which means schools could use local farmers to supply the schools with moringa. The addition of moringa into a child's diet will increase the diversity of foods consumed, promoting a more balanced diet.

Integrating moringa into school meals requires partnerships between schools, farmers, and local suppliers. Schools can bring in fresh moringa leaves or powder through local farmers and maintain a consistent supply of this ingredient. Collaborating with community organizations can facilitate educational initiatives to raise awareness about the health benefits of moringa among students and families. School cooks can experiment with moringa infused recipes in Collard Greens to find which students prefer. Incorporating moringa into these dishes will expand the dietary diversity.

A comprehensive approach involving various stakeholders such as the Tanzanian government, non-profit organizations would be ideal for this proposal to make an impact. The plan would include initiatives to improve agricultural productivity, promote dietary diversity, improve food distribution systems, and provide nutrition education to communities. The Tanzanian government would need to make a deliberate effort with support from international organizations like the United Nations would be crucial. This would ensure effective coordination, utilization of resources, and implementation of the project. Funding for the project would come from a combination of sources, including government budgets, international aid, and public private partnerships. Community members could participate in project implementation through activities such as agricultural training, school garden initiatives, and nutrition education campaigns. The government would oversee the program coordination and monitor and evaluate the project. Policies supporting sustainable agriculture, nutrition education, and food safety standards would be essential for the project's success. Moreover, there would need to be policies promoting local food production as well as subsidies for local farmers, could encourage increased production of nutritious crops like amaranth and moringa.

Cultural norms and dietary preferences would be considered when designing the project. Incorporating traditional foods such as Ugali and Collard Greens will help the cooks maintain traditional cooking methods and food preparation. As well as focusing on the sustainability of the project, capacity building efforts focus on empowering local people to continue the project. This could mean training local farmers in sustainable agricultural practices, and promoting community led nutrition education programs.

The proposed intervention to incorporate moringa and amaranth into the Tanzanian school lunches will both decrease malnutrition in students, but it will also help them focus and improve their performance in

the classroom. Providing students with nutrient-rich meals, we not only nourish their bodies but sharpen their minds. This improvement in academic performance has extensive effects on the Tanzanian future. By improving students' performance in school, there will be a higher pass rate in national exams, leading to more students attending secondary school. As more students gain access to secondary school, more individuals will reach higher levels of education. This will allow more people to break out of the cycle of poverty and improve Tanzania as a whole. Investing in the nutritional health and education of students lays a foundation for long term prosperity. While acknowledging that targeting issues such as malnutrition and hunger are multifaceted, proposals like the proposed integration of amaranth and moringa into school lunches represent crucial steps towards progress. Small changes, like improving school lunches, can have a big impact on these students' lives. Though my proposal, to use amaranth in the making of Ugali and add moringa into the making of Collard Greens, will not end malnutrition or solve the problem of hunger in Tanzania, it has the potential to improve many students' nutrition and education in Tanzania.

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