

Maggie Norland
Des Moines Central Campus
Des Moines, IA
Tanzania, Factor 5: Climate Volatility

Tanzania: Farm Management and Technology Adaptation

Tanzania is located in Sub-Saharan, Eastern Africa. It borders the Indian Ocean and lies between Kenya and Mozambique. The coastal country, which is slightly larger than twice the size of California, has a land area of roughly 885,800 square kilometers along with about 61,500 square kilometers of water within its borders. 1,424 kilometers of Tanzania's border is coastline. The climate varies from tropical (non-arid, average of at least 64 F year-round), along the coast, to temperate (relatively moderate temperatures) in the highlands. The plains of Tanzania exist along the coast and the central plateau, while the northern and southern areas are made up of highlands. Natural resources found within the country include hydropower, tin, phosphates, iron ore, coal, diamonds, gemstones, gold, natural gas, and nickel (World Factbook). Tanzania is home to highly diverse resources and rich coastal areas, which support a diversity of natural habitats (GEF). 12.25% of Tanzania's land area is arable, only about 108,510 of the total 885,800 square kilometers that make up the total land area. 1.79% of the country's land is used for permanent crops, and only about 1,843 square kilometers of land is irrigated. 26.7% of the country's total population resides in urban areas, with a 4.77% annual rate of change. Tanzania's economy has achieved high overall growth rates based on gold production and tourism in recent years. The economy is mainly dependent on agriculture, which accounts for more than one-quarter of GDP, provides 85% of exports, and employs about 80% of the work infrastructure. The government spends 7% of its annual budget on agriculture. Tanzania's population pyramid reveals a very young country, with a vast majority of its population under age 30. The coastal areas of Tanzania are critical to the country's development. Around 75% of the country's industries are located in coastal areas (Advameg). These areas are extremely important in promoting economic growth and development throughout Tanzania.

The basic family structure in Tanzania is extended (extended family lives together). However, development has led to increasingly nuclear (immediate family only, parents and their children, Live together) family units, especially in urban areas. Clanship systems are common among most ethnic groups. Children usually have the most contact with their female relatives throughout their development. Most children go to school, but if there is not enough money, boys are favored, and girls stay home to help their mothers in the household until marriage. Teachers are to be respected, and corporal punishment is still practiced in Tanzanian schools: 98% of children attend primary school, but only about 5% go on to secondary school (World Factbook). Because of rising fees, families are finding it difficult to send their children to secondary schools. Life expectancy is roughly 60 years for males and 63 years for females. Ethnic groups have highly sophisticated healing systems to make up for a lack of Western drugs and biomedical health services. Traditional healers treat body, mind, and spirit as an integrated system, and herbal medicines are utilized. A typical meal features a staple carbohydrate (corn, rice, cassava, sorghum, plantains), accompanied by a meat, usually fried or in stew, usually with several kinds of vegetables or condiments. Indian food is popular in urban areas as well (Advameg).

Agriculture provides the mainstay of Tanzanian economy, and farmers grow for both subsistence and for sale. Therefore, increasing their productivity would feed the population and help the economy substantially. On the farm, women perform the bulk of agricultural labor, but they are often restricted from owning land (MICCA). Enhanced access to and control of land by women would result in significant increases in agricultural production throughout the country. Many livestock farmers wish to keep large herds, which leads to poor management of animals. Smaller, more manageable herds lead to healthier animals and healthier people. The heaviest physical labors (clearing fields, etc.) are still performed by men, and lighter tasks are reserved for women. Few women are allowed to work with

machines and other highly valued equipment. Children as young as 3 or 4 years old help with household and field chores, though girls often shoulder a much greater work burden than boys, a trend which continues on into adulthood. The average plot size is roughly 2.5 hectares, or a little more than 6 acres. About 20% of farm households report owning more than 5 hectares, or 12.4 acres, of land. Agriculture in Tanzania has become increasingly mechanized in its practices. The main food crops grown include maize, sorghum, millet, cassava, sweet potatoes, bananas, pulses, paddy, and wheat. Cash crops include coffee, cashew nut, tea, cotton, tobacco, and sisal. Over 90% of agriculture in sub-Saharan Africa is rain-fed (WorldBank).

Tanzania has many national problems that need solving, and adjusting to its changing climate is vital to its survival. Flooding takes place on the central plateau during the rainy season, but drought also causes many unsuccessful yields. Environmental issues include soil degradation, deforestation, destruction of coral reefs, and droughts affecting marginal agriculture. In addition, the survival of wildlife is threatened by illegal hunting and trade. Tanzania is one of the world's poorest countries in terms of per capita income because of the many problems it faces. The government has significantly reduced health care spending recently due to high levels of foreign debt, which has led to a decrease in vaccinations available and in vaccinations administered (World Factbook).

Due to climate volatility, vast areas of sub-Saharan Africa will experience a loss in suitability for bean production, while the suitability for cassava production will increase, especially in Eastern Africa (CGIAR). A shift from bean production to cassava production would increase agricultural productivity in coming years. Projected reductions in yield in some African countries could be as much as 50% by 2020, and net crop revenues could fall up to 90% by 2100, resulting in a disastrous decline, especially for Tanzania since it is among the countries most vulnerable to climate change, located on the continent most vulnerable to climate change and climate variability (Tubiello). Additionally, the 21st century brings about challenges for agriculture because of the need to increase food production. Droughts and dry-spells will occur more frequently, and rainfall will be substantially more inconsistent. The risk of soil erosion and damage to vegetation will increase as a result of the expected increase in severity of torrential downpours. Temperatures will also increase, causing an elevation in the evaporation of soil moisture. Rising sea levels threaten agriculture along the coast. Rainfall is expected to increase by 7%, with more variable and extreme weather events, so the increase in rainfall may actually harm the crops and especially the soil in which they grow. Drought periods will lengthen, but the length of the growing season will decrease in the face of climate change. East Africa is projected to experience an 11-12% drop in net crop revenue in the near future. 20-30% of plant and animal species studied to date are likely to be at increased risk of extinction (Thomas). Natural disasters, which are also expected to occur more often, destroy development, making it extremely challenging to make any progress.

In order to combat climate volatility, Tanzania is in need of a new plan for farm management and technology. This new plan will promote the upgrading of local livestock at crop breeds, and making herds and cropland a more manageable size in order to ensure the quality of production. In addition, women must be allowed equal access to resources, land, and equipment. With equal access, women could increase yields on their farms by as much as 20-30% (MICCA). In case of disasters, the development of alternative sources of income is vital. The incorporation of value-added activities, such as marketing animal milk, food, leather, etc., would help to support and supplement current incomes. Water harvesting and conservation agriculture techniques will be extremely helpful in times of drought, so the introduction to these practices would also increase food security. A shift from farming to raising livestock may serve as marketable insurance in times of hardship, but some crops are still needed in order to feed the animals, so the implementation of the previous farming practices on a smaller scale in conjunction with the shift to raising livestock would greatly increase insurance. The introduction and development of livestock breeds more resistant to drought and new crop varieties would further the progress. Other farming practices that help combat climate change are irrigation for times of drought, use of cover crops to enhance selling

survival, and the use of contour planting for erosion control. One of the most common solutions was diversification of income through off-farm activities and migration, which is extremely common internationally. Natural resources provide the basis for economic growth in Tanzania for the years to come.

The most common and plausible solution that I came across in my research was adaptation of farm management and technology, some of which is described above. Adjustments in land use and livelihood strategies are included in farm management. In addition to shifting from farming to raising livestock, farmers can reassess the crops and varieties that they grow. In addition to the development of new crop varieties, technological changes include the development of improved climate information systems. Crop selection varies greatly from coastal Tanzania to the plateau. Farmers in Tanzania already use cover crops and contour planting in the highlands. Scientists involved in the Interspecific Hybridization Project of the Africa Rice Centre are developing improved, drought-resisting rice species. Many are tolerant of Africa's conditions and climate. Improved weather forecasting systems are important to agricultural productivity in the face of climate change. Forecast models must be improved so that they produce more timely forecasts, which often come too late to affect planting decisions. Data on rainfall must be more readily available to farmers.

A major barrier to overcome will be the willingness and ability of farmers to accept new technologies. Many farmers will not have money to spend on new technology, and many farmers will also avoid low-cost interventions if they fail to minimize production risk. One important factor in influencing their decision is their understanding of the urgency of climate volatility. If they are unaware of the consequences of refusing to adapt, they will be much less likely to spend money on adaptations. Farmers look at forecasts differently than scientists do. Therefore, the forecasts that they receive must be adjusted to their understandings. Tanzanian farmers will be much more likely to adopt new practices if they are able to see them in the context of existing practices. When a farmer considers his or her ability to avert harm from climate change using adaptation, the adaptation practices will be put to use and spread once it is seen that they are successful. Each farmer's level of willingness will differ based on economic interests and social and ecological values. Adaptation is necessary in order to reduce the risk of climate-related income loss, and if more farmers understand this, more farmers may have a willingness to participate in the aforementioned practices. Additionally, corruption is a serious problem in Tanzania, however there is hope. Tanzania has recognized that good governance is the key to combating corruption: they have policies in place to prevent corruption, and a history of strong presidents who are likely to be open to assisting the implementation of policies and practices in order to improve food security.

The Sustainable Coastal Livelihoods Project focuses on the coastal regions of Tanzania. These coastal regions provide a promising outlook as they are rich with resources and natural habitats, as well as home to about 25% of Tanzania's population and 75% of the country's industries (SCLP). The objective of the project is to improve the livelihoods of coastal communities of mainland Tanzania and Zanzibar through implementing various development and economic activities while maintaining natural resources and habitats. Other local projects and organizations to consider are TASAF, which targets communities nationwide and addresses more tangible priorities, PADEP, which promotes agricultural extension and productivity at the community level, and LGSP, which aims to improve the performance and accountability of local authorities. Farm Africa has started several projects in Tanzania aimed at helping communities and people to become more self-sufficient (Farm Africa). Each of the above projects represents a cohesive collaboration for the good of Tanzanian communities, and will provide vital insights for productivity. Often, these organizations run out of money before they are ever able to produce tangible benefits. Using the experiences of these and other organizations, the Sustainable Coastal Livelihoods Project aims to give the Tanzanian people themselves more power in their decisions. This example is appealing since they will be the ones to determine the success of any adaptation practices, and

if these practices are not appealing to the people who are supposed to utilize them, there will not be success or productivity.

Adaptation of farm management and technology in the coastal regions of Tanzania is vital to the survival of the economy and the environment in the face of climate change. The application of new techniques and technologies will save Tanzania from major losses due to climate change. Adaptation is an ongoing phenomenon, and as the climate continues to change, people must continue to adapt. These solutions are long-term ones, and efforts must continue in the future in order for them to be sustainable. Once applied, however, the strengthening of the economy and agriculture will provide for the future of adaptation. As the introduction of new practices and technologies produces successful outcomes, farmers and workers will open their minds to adaptation, and education will continue to assert its importance. The development of more sustainable crops and better technology will be adjusted to existing farming practices in Tanzania, so that willingness to accept adaptation will increase. The urgency of climate volatility must be promoted so that farmers feel moved to action and realize that these updated practices and technologies are necessary. Most Tanzanian communities already foster a strong interest in and commitment to sustainable development, so as long as the proposals make sense and appeal to them, there is a very positive outlook. Educating the people of Tanzania on these developments and their importance will provide for the present and future success of this solution. Many already use adaptation practices and ideals in times of drought or disaster, so putting them to use more commonly would not be out of reach. Many of the required resources are already there, and some are already in use. Reducing the consequences of climate change through the adaptation of farm management and technology will strengthen Tanzania and its people for years to come.

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