

Melissa Robins
Cathedral High School
Indianapolis, Indiana
Burkina Faso, Factor 5

Burkina Faso: Adapting to Climate Change through Traditional Farming Techniques

The world is changing, but this change is not necessarily always for the better. While many gains have been made to improve agricultural productivity, a complexity of demographic, economic, and natural forces are all combining to make the challenge of reducing hunger and poverty that much more difficult. Despite the existence of policies and technologies to alleviate food insecurity, people around the world are still living in fear of hunger and starvation. Traditional problems faced by rural farmers are compounded by the emergence of climate change, which is causing higher temperatures, extreme weather events, desertification, and shifting seasons. Farmers in the developing world, who already face food insecurity, are likely to be hit the hardest by these changes. In the upcoming years, variations in precipitation patterns and rising temperatures are expected to increase the likelihood of short-run crop failures and long-run production declines (Nelson et. al.). When added to the pre-existing problems of growing populations, lack of infrastructure, and the degradation of natural resources, climate change threatens food security everywhere. Still, adapting to climate change can be done if we focus on acting now and implementing targeted reforms that fit each country's unique challenges.

Burkina Faso is a landlocked country in the Sahel region of western Africa that is particularly vulnerable to climate change. Despite being only slightly larger than Colorado, Burkina Faso is home to over seventeen million people, and around 90 percent of those people rely on subsistence agriculture to survive ("The World Factbook –Burkina Faso"). Burkina Faso is one of the poorest countries in the world and ranks 181 out of 187 countries on the Human Development Index, indicating how most Burkinabe live well below the global average health, education, and income standards ("Burkina Faso Country Profile..."). The country's main source of income is its cotton and gold exports, but very few of its citizens directly benefit from these products, especially since gold extraction contributes to water pollution ("Burkina Faso" *HELVATAS*). The country's largest cash crop, cotton, also fails to provide adequately paying jobs because of low world prices, caused by overproduction in the US and Europe (Jallow). The climate of Burkina Faso is mainly dry with rainfalls that decrease from south to north and vary year to year. Droughts during the dry season and flooding during the rainy season help contribute to instability in food production. Although the majority of the population relies heavily on agriculture, only 17 percent of the land is considered arable ("The World Factbook –Burkina Faso").

A typical family in Burkina Faso lives in rural areas and practices subsistence farming, working small, family-run plots with some livestock. Families are composed of an average of six children and two parents, although many men may migrate annually to neighboring countries for seasonal employment, leaving a large portion of farm work to the women ("The World Factbook – Burkina Faso"). Typical Burkinabe staple foods include sorghum, millet, rice, maize, peanuts, potatoes, beans, yams, and okra. Meat is seldom eaten in rural villages due to its cost, but eggs and fish are available as an extra source of protein ("Burkina Faso" *Compassion International*). With an unemployment rate of 77 percent, however, many Burkinabe have trouble buying the food they need if their own crops fail ("The World Factbook – Burkina Faso").

Public education by law is free, but the government does not have the resources to provide universal free primary education to all, so children are required to pay for school supplies. Many parents cannot afford to send their children to school or can only send one or two children out of a large family. Children are often taken out of school so that they can collect water or take on the responsibilities that their mother does not have time for. Not so long ago, boys received preference over girls if a parent had to choose which child to send to school, but although this gender imbalance is still a factor, government policy has helped to decrease it. Burkinabe parents recognize that education is the key to a better future for their child, and usually try to facilitate their children's education to the best of their ability. In Burkina Faso, the educated are held in high regard, and an educated child can have a strong influence in the community. However, even those families who can afford to send their children to school may not be able to due to a shortage of available facilities. Legally, the size limit for one class is sixty-five students, but in rural areas classes are usually much larger because of a lack of schools. If the school is full, children may get turned away to try to enroll again next year because that school is the only one within reasonable walking distance ("Burkina Faso" *Compassion International*).

In addition to education challenges, Burkinabe also face limited access to health care. Since the majority of people live in rural villages, making the long trek to the nearest hospital is often difficult or impossible. Even if the sick are able to reach a hospital for treatment, Burkina Faso lacks the infrastructure to provide them adequate care. According the CIA World Factbook, there are only 0.064 physicians per 1,000 people and only 0.9 beds per 1,000 people. Burkinabe are at a high degree of risk for malaria, meningitis, yellow fever, food or waterborne diseases, and diseases caused by insufficient nutrition. Also alarming is the fact that 37 percent of children under the age of five years are underweight ("The World Factbook – Burkina Faso"). This can have a lasting effect on the child's development and lead to stunted growth and susceptibility to communicable diseases. Yet, under-nutrition could have been prevented if the child had been fed breast milk exclusively for the first six months of life. In a developing country, a child who is breastfed is almost three times more likely to survive infancy than one who is not, but in Burkina Faso, only 20 percent of children are breast fed ("In Burkina Faso..."). Along with increased education efforts on the benefits of breastfeeding, improving the nutritional health of the mother will be the key to infant survival and health.

Most families in Burkina Faso rely on a small plot of land, generally from one acre to five acres, to provide for their food needs (Rodale 87). Farmers mainly grow cereals such as millet, sorghum, and maize, and sometimes other commercial crops, such as beans, peanuts, cowpeas, or potatoes intended for self-consumption. Startlingly, cereals represent almost 100 percent of food products consumed in rural Burkina Faso ("Climate Change..."). The dominance of starchy cereals as the main source of energy for rural farmers partly explains the protein and vitamin deficiency which reigns in Burkina Faso. Local vegetables, which can provide essential amino acids, vitamins, and protein, are under exploited because of insufficient knowledge on their food potential. Farmers typically plant, harvest, and water their crops by hand; however, a few more prosperous farmers use ploughs drawn by bulls to help them (Jallow). Overall, the major barriers preventing farmers from achieving food security are scarcity of water, export methods, lack of infrastructure, water-borne diseases, loss of arable land, unemployment, and lack of yield improvement knowledge.

Access to irrigation and fertilizers remains a major barrier for improving agricultural productivity in Burkina Faso. The variability of annual rainfall has resulted in drought and made rain-collection-supplied irrigation systems increasingly difficult to maintain. Soil fertility managements have been poorly implemented, since fertilizer is expensive and usually unavailable at local markets. Also, Burkina Faso's population growth has led to increased demand for food, putting more pressure on the already stressed land ("AGORA..."). With more people comes more need for firewood, and as the desert has spread and firewood has become harder and harder to find, many people have resorted to using animal manure as fuel. More manure burned in cook fires equates to less manure used on crops and lower yields due to the general infertility of the land. Deforestation has itself also contributed to the spread of the desert, soil erosion, and increased damage from flash flooding. Every year entire harvests can be devastated by unforeseen weather events such as drought, strong winds, or torrents of rain, causing a lack of adequate nutrition (Rodale 106-109).

Burkina Faso's food insecurity is intensified by climate change which has caused changing weather patterns and increased desertification. Due to its location in the Sahel on the border of the Sahara desert, Burkina Faso has long suffered from low rainfall and infertility, but mismanagement of land, overgrazing, population pressure, deforestation, and global temperature changes have all contributed to make regional conditions worse. Desertification, which was mainly a problem in the north, has now spread in pockets to the south ("Burkina Faso: Farmers Act..."). In 2011, Burkina Faso faced a severe drought, the third time in only ten years, which decimated harvests and grazing land (Negus). Wind from the Sahara also aggravates the issue because there are no longer as many trees to block its path and prevent the gusts from destroying vulnerable seedlings.

Meanwhile, when the rain does come, it is increasingly heavy and does not allow the ground enough time to soak up the water. The torrents have the capacity to flood a field in fifteen minutes. The top layer of soil is swept away with the flash floods, taking fertilizer and the hopes of a good harvest with it. Repeated plantings and deforestation are quickly depleting the nutrients in the soil, leaving it barren and vulnerable to erosion. Over the recent years, the rains have begun and ended later than usual, continuing into October, though September is traditionally harvest time, and longer rains mean crops risk rotting. Bassiako Dao, confederation of farmers in Burkina Faso president, says that forty percent of the cowpea crop and much of the sorghum crop rotted in 2009 ("Burkina Faso: Farmers Act..."). Climate change trends are worsening as evidenced by the fact that average rainfall between 2000-2009 has remained 15 percent lower than the 1920-69 mean average and temperatures have continued to steadily increase ("A Climate Trend Analysis...").

As climate change worsens, poor rural farmers and particularly women, are at a severe disadvantage. Extreme weather and a general decrease in rainfall causes erratic harvests and means that families cannot produce enough food to feed themselves throughout the year. Furthermore, women are usually responsible for providing food for their family during the time between harvests, but climate change has meant an increased workload and more and more time spent away from the field in order to gather water and wood. As the land becomes drier and harder, more manual labor is required to be able to cultivate it, but women usually do not have the necessary physical strength or appropriate tools to accomplish the task by themselves. Food scarcity combined with high levels of physical labor has long-term consequences on the women's health and the health of their babies. While climate change negatively affects all inhabitants

of Burkina Faso, men and women have different resources at their disposal with which to tackle these effects. Although women depend on natural resources for their livelihood, they have very limited rights to land ownership, and so, are less targeted by government subsidies and less eligible for loans. Thus, women, as well as their babies, are particularly vulnerable to the effects of climate change (“Climate Change...”).

Helping farmers adapt to climate change and halting the spread of desertification would significantly increase agricultural productivity in Burkina Faso. While no one can make the rainfall more dependable, farming techniques can be adjusted to match the changing weather patterns. Many more farmers need access to quick growing seeds that can withstand extremes, but sustainable solutions in agroforestry and conservation agriculture are also critical. Enabling crops to survive droughts and floods could bring currently unusable land back into production and help halt the spread of desertification (“Burkina Faso: Farmers Act...”). Soil protection is the key to fighting against climate change. If the top 20cm of the soil, the part most essential to sustaining life, is gradually rebuilt through conscientious farming techniques, fertility of the land will skyrocket and more water will make its way to the actual crops instead of becoming run-off (Dumanski et. al.). Similarly, if more trees are planted near crops and on vulnerable hillsides, the ground has a greater chance of soaking up the water from a sudden tropical deluge and wells have a greater chance of being filled. Eventually, if the right plants are planted on the desert’s edge, more moisture will be available to condense into clouds and rainfall may even return to a more predictable pattern (Rodale 108).

Fighting climate change will be especially necessary in the upcoming years as Burkina Faso’s population continues to grow and urbanize, increasing the strain on production. While fertility levels have steadily decreased due to improvements in education levels and greater opportunities for women, population growth remains a startling factor. Burkina Faso has a growth rate of 3% per year, the eighth highest in the world, and the annual rate of Burkinabe abandoning the countryside in favor of urbanized areas is 6.2% (“The World Factbook – Burkina Faso”). This means that in order to avoid heavy reliance on imports, Burkinabe farms will have to be able to produce more food on less land. Urbanization and population growth also serve to accelerate climate change in Burkina Faso, because more trees are cut down to make way for towns and feed the growing demand for wood used for building, supplies, and firewood (Rodale 100-110).

In order to effectively help Burkinabe farmers adapt to climate change, I recommend assisting local communities to strengthen the capacity of their farming practices and ensure their sustainability by utilizing pre-existing local knowledge. Specifically, however, I would suggest the following: placing more emphasis on indigenous, drought resistant crops, scaling up and perfecting the traditional Zai technique, and promoting agroforestry to help protect crops from climate change.

Burkina Faso, like much of the rest of Africa, relies heavily on cereals and maize, often at the expense of native grains and vegetables. Too much of a dependence on one crop or a small group of crops has led to vulnerability to pests and diseases. Maize and other imported crops need massive amounts of water to thrive and suffer greatly during Burkina Faso’s frequent droughts. Since Africans have developed a taste for maize, it is unlikely to go away any time soon, but Burkinabe can decrease their risks of losses by also planting a wide variety of plants that, because they are native to the land, can flourish in the natural cycle

of droughts and excessive rainfall. Although still relied on during times of famine, these crops were discouraged during colonization and are now surviving mainly without human cultivation. While awareness for their agricultural potential is growing, more research and promotion by plant breeders, universities, and humanitarian programs should be encouraged. With a little attention, a range of improved versions of the neglected plants can be given back to the Burkinabe farmers (Rodale 80-90). Research will also show that these plants are not only drought resistant, but also sometimes more nutritious than foreign foods. For example, the Bambara bean, native to Burkina Faso, has higher protein content and more amino acids than maize. A report from the U.S. National Academies of Science stated that “the nutritional balance [of the Bambara bean] is so good that some consumers claim they could live on the seeds alone.” Bambara beans are easily stored, low cost, hardy, and because they are leguminous, add much needed nitrogen back into depleted soils. Dialogue with local communities could reveal many other crops like the Bambara bean that can increase biodiversity and be a powerful tool to help fight Burkina Faso’s food crisis (“Africa’s Indigenous Crops...”).

Over the last decade or so, a traditional farming technique called Zaï has gained growing recognition due in large part to the efforts of local farmer and community leader Yacouba Savadogo, who has taught countless farmers the life-saving technique. Zaï involves digging a hole in the ground about 15cm deep and 30cm in diameter and filling it with some organic manure and a few seeds. The holes concentrate and conserve rainwater, while the manure attracts termites which break up the soil and allow previously unusable land to be brought into production (“Burkina Faso: New Farming Technique...”). During a 2003-2004 campaign by local NGO, AVAPAS, to spread the Zaï technique, the practice led to an improvement in soil structure and an increase of production by about 500% if properly implemented. Unfortunately, lack of livestock for manure and the burning of manure due to lack of firewood, meant that some farmers in the project were unable to provide the compost necessary for the technique to work (“Burkina Faso: The Zaï Technique...”). One way to overcome this challenge and further increase the productivity of the land would be to plant native leguminous trees, such as the *Leucaena*, near and around the holes. Leguminous trees, like the *Leucaena*, can provide fertilizer-rich cuttings, animal fodder, plant stakes, firewood, and even food for humans from its leaves. *Leucaena* can be continually cut back to provide either shade or sunlight, and one researcher managed to get more than 279 pounds of nitrogen by trimming a hectare of *Leucaena* plants that were only four-months old. Trees like *Leucaena* can provide firewood without every needing to be cut down and free up animal manure for Zaï holes (Rodale p. 110-120).

Alley-cropping and Zaï techniques could be spread even more effectively if, along with more action by local NGOs and the training of community leaders, Burkina Faso’s government were to teach these techniques in public schools. Each educated child would be empowered with the knowledge of a traditional way to fight climate change and could relate this information to his/her parents. The 2003-2004 campaign by AVAPAS demonstrated that once introduced to the idea, Burkinabe communities will unite to help each other with the labor and continue the practice once aid organizations have left (“Burkina Faso: The Zaï Technique...”). Burkina Faso already possess the tools to deal with climate change; our job is to make sure that the traditional knowledge is returned to them. A simple change of tactics has the potential to put into motion a series of events that can help us feed ourselves and save the world.

Works Cited

- “A Climate Trend Analysis of Burkina Faso.” Famine Early Warning Systems Network. USAID, June 2012. Web. 28 February 2013.
- “Africa’s Indigenous Crops.” State of the World 2011: Innovations that Nourish the Planet. Worldwatch Institute, January 2011. 1 March 2013.
- “AGORA: Helping Burkina Faso’s Researchers Develop Innovative Agricultural Solutions.” The Food and Agriculture Organization (FAO). Microsoft Corporation, September 2010. Web. 25 February 2013.
- “Burkina Faso.” Compassion International. Compassion International, Inc., n.d. Web. 1 March 2013.
- “Burkina Faso Country Profile: Human Development Indicators.” UNDP, n.d. Web. 1 March 2013.
- “Burkina Faso: Farmers Act on Climate Change.” IRIN News Service. A Service of the UN Office for the Coordination of Humanitarian Affairs, 20 January 2010. Web. 20 February 2013.
- “Burkina Faso.” HELVETAS Swiss Intercooperation, n.d. Web. 1 March 2013.
- “Burkina Faso: New Farming Technique Brings Trees Back to the Sahel.” allAfrica.com. AllAfrica Global Media, 31 October 2009. Web. 2 March 2013.
- “Burkina Faso: The Zaï Technique and Enhanced Agricultural Productivity.” IK Notes. No. 80. World Bank, May 2005. 1 March 2013.
- “Climate Change and Women Farmers in Burkina Faso.” Oxfam International, July 2011. Web. 1 March 2013.
- Dumanski, J., R. Peiretti, J. Benetis, D. McGarry, and C. Pieri. “The Paradigm of Conservation Tillage.” Proceedings of World Association of Soil and Water Conservation, 31 August 2006. Web. 28 February 2013.
- “In Burkina Faso, Breastfeeding Programme Works to Lower Infant Mortality.” UNICEF, 4 August 2006. Web. 1 March 2013.
- Jallow, Maimouna. “Photo Journal: Burkina Faso Cotton Farmer.” BBC News, n.d. Web. 1 March 2013.
- Negus, Sanna. “Burkina Faso: Food Shortages Leave Families on the Brink of Crisis.” allAfrica.com. AllAfrica Global Media, 22 February 2013. Web. 2 March 2013.

Nelson, G. C, Rosegrant, M. W., Koo, J., et. al. "Climate Change: Impact on Agriculture and Costs of Adaptation." International Food Policy Research Institute (IFPRI), 6 November 2009. Web. 25 February 2013.

Rodale, Robert. *Save Three Lives: A Plan for Famine Prevention*. San Francisco: Sierra Club Books, 1991. Print.

"The World Factbook – Burkina Faso." *CIA*. Central Intelligence Agency, 14 February 2013. Web. 2 March 2013.