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Climate Change Adaptation Practices for Smallholders in Burkina Faso

Burkina Faso is a developing country in western Africa bordered by six countries: Mali to the north, Niger to the east, Benin to the southeast, Togo and Ghana to the south, and Côte d'Ivoire to the southwest. One of the most noticeable and deterring factor about Burkina Faso is that the entire country is landlocked which severely impedes development. Adam Smith (1723 –1790), a Scottish philosopher commonly called the father of modern economics, explains how landlocked countries are limited by the costs of land transportation compared to countries with water transportation. In today's world, the same applies as landlocked countries are at a distinct disadvantage due to transportation costs relative to their coastal neighbors when competing in global markets (Faye et al. 32). General statistics of Burkina Faso's condition also illustrates the country's impoverishment and demonstrate other obstacles and challenges facing advancement and progress. It is one of the poorest countries in the world with a gross domestic product (GDP) per capita of $440. More than 80% of the population relies on subsistence agriculture, with a large lack of infrastructure and a very low literacy rate of 26% as recorded in 2009 (Burkina Faso, sect. 7, par. 1). For a while now, a new problem has arose. Climate change that has terrorized the mentality of this developed country is exerting frightening physical effects that greatly jeopardize food security in Burkina Faso. Erratic weather has been lowering crop production, destroying land, and drying up sources of water. Smallholders, farmers, and their families are in need of aid to handle the situation. Adaptation and advancement of agricultural practices becomes an important issue in dealing with climate change in a country where farming is everything.

Several students from the Wilmington Community Evangelical Church (WCEC) visited Burkina Faso in 2009 on a food distribution mission and recounted their personal experiences about life in the country. They worked mostly in the rural areas near the capital city of Ouagadougou with local farmers and families. Dan Wu, an undergraduate at the University of Villanova, tells about the sharp contrast between the city and its rural surroundings. He states, "In the city, the streets are very modern and there are vendors and shops, but when you reach the rural areas, the only means of transportation are dirt roads." (Wu) Adult leader Pastor Bill Englehart of WCEC tells about how the rural population lives mostly in communal villages (Englehart). The people of Burkina Faso's (Burkinabe) dietary habits include rice and other grains such as millet and sorghum as well as milk and various local vegetables; however, meat is only for rare occasions since they usually reserve it for visitors or special events. An undergraduate student from the University of Columbia, Jimmy Yeh gives more information on the Burkinabe's dietary and agricultural habits in Burkina Faso. "Well, they [Burkina residents] have three basic grains in their diet. In order of preference (and costliness), they are corn, rice and sorghum. Of course they're all really cheap by US prices, but for them, that's not always the case. Cotton is also their primary cash crop. They till the soil and plant the seeds right before the rainy season starts (late May/early June), and they harvest in September," (Yeh).

While helping distributing food out to the people, the WCEC mission team encountered issues with Burkina Faso's low technological levels. From the team's first hand accounts, Burkina Faso, especially the rural areas, lacks simple technology including agricultural technology, running water and even electricity. Farming technology in Burkina is still limited to oxen and plows, and all the tilling and planting is done by hand. Running water is only available in the city, so out in the fields, farmers must find means to support crops when hit by drought. Additionally, Burkina imports electricity from Europe, but competition with neighboring Côte d'Ivoire for European electricity causes frequent shortages. "Because they don't have enough electricity, the power would completely shut off unexpectedly around

the afternoon to night. If that happens, they would have to use candle light in order to see," Dan states (Wu).

Although technological advancements would greatly benefit the country, advancement is deterred by several factors. As mentioned above, the biggest factor is the fact that Burkina Faso is landlocked which results in the high cost of land transportation and limited accessibility to sea trade. Along with restricted trade with outside areas, internally, Burkina lacks the resources capable for self development. Pastor Bill tells about how the land is devoid of resources useful in industrialization (Englehart). The only abundant resources are natural productions. Being constrained by land and lacking internal resources, it has little opportunity to advance without any outside aid. One aspect of increasing food security by combating climate change would be to focus on developing the technology needed for farmers and smallholders to adapt.

For internal production and development, Burkina must rely on its agriculture in the long run to support itself and increase food security. Because of this focus, water and the environment will always remain one of the top concerns. Water is the lifeblood of agriculture and the environment supports the practice. Farmers rely on rainfall and the natural rivers running through Burkina as sources of water. If water sources become unreliable, then the farmers would experience decreases in crop production. In addition, agriculture depends on the environment. The land must also be suitable for the growing of plants, and if the environment is altered, then agriculture will suffer if farmers cannot restore or adapt to the changes. Lately, though, climate change has been affecting both water supplies and the environment along with destructive human practices on the land. All these problems are potentially devastating to smallholders.

The weather and climate in Burkina Faso are not homogenous. The northern and southern regions have different climates, and they are affected differently by climate changes. Normally, the northern region has low amounts of rainfall while the southern region has high amounts. The recent changes have caused the northern region to experience an unnaturally high amounts of rain that cause severe flooding ('BURKINA FASO: Farmers act on climate change', sect. 2, par. 2). Meanwhile, the southern regions have been hit with drought that decreases water supplies, degrades soil, and spreads pests (Sawadogo, sect. 1, par. 2). This unpredictable weather presents a challenge in both regions, and Burkina Faso must overcome it by quickly responding to these changes. In response, all of Burkina Faso needs to adapt their ways to this new wave of unpredictable weather.

In eastern and southwestern Burkina Faso, lower rainfall and high temperatures have been reducing water supplies which lead to lower crop production. Examples of smallholders being affected include Albert Bouda, a local vegetable farmer, who says that he must supply extra water by digging wells to support his irrigated vegetable fields (Sawadogo, sect. 1, par. 2). A decline in crop yield would not only impact human population but livestock populations as well. Along with water shortages, human activities also present problems that affect the environment. Antoinette Ouédraogo, president of a women's development association and a member of a national climate change experts' group states, "We see growing pressure on the land, especially around protected conservation areas, rivers and lakes" (Sawadogo, sect. 1, par. 4). Human activities such as excessive cutting of trees, overgrazing of livestock, and intensive farming further damage the environment. This growing decline in rainfall and destruction of the environment can seriously impact food production and security in the south.

Focusing on how climate change has decreased water amount in the southern region, multiple groups have done measurements and research regarding the water status in Burkina. The Integrated Water Resources Management (IWRM) and its advocate the Global Water Partnership (GWP) have implemented themselves in Burkina Faso and performed studies regarding its water situation. According to a 2009 IWRM report, the annual national water demand (550 million m3 except hydroelectricity) is mainly divided between irrigation (64%), domestic water (21%) and animal husbandry (14%). The

inhabitants of this country are close to the hydric stress threshold, with an average of 1081 m 3/inhabitant/year (Petite and Barron 54). In 2006, another group of experts working under the Ministry of Environment drew up a National Adaptation Plan of Action (NAPA). The group predicts average temperatures for Burkina to increase by 0.8% in 2025 and 1.7% in 2050. Meanwhile, average annual rainfall could decline 3.4% in 2025 and 7.3% in 2050 (Sawadogo, sect. 2, par. 2). This decreasing trend shows that water scarcity will become more severe in the country without any intervention.

On the other hand, the northern region which is usually the driest area being part of the Sahel began to have heavy rainfall. September is harvest time, but recently, the rainy season begins later and continues to October, according to Bassiaka Dao, confederation of farmers in Burkina Faso (CPF) president ('BURKINA FASO: Farmers act on climate change', sect. 2, par. 1). The northern areas suffer from changing weather patterns that lead to flooding and destruction of crops. World Bank natural resource management specialist, Emmanuel Nikiéma, explains how the heavy rains create flash floods, which erode soil ('BURKINA FASO: Farmers act on climate change', sect. 2, par. 2). Along with flooding destroying the environment and crops, desertification, a common problem in northern Africa, has been growing in Burkina. More lands are becoming consumed as the sands began to encroach more and more south. The instability of the weather leads to the individual farmers as well as the country's economy to be put in jeopardy.

Adapting to climate change and changing agricultural techniques to abnormal weather patterns will benefit individual smallholders and family units and the country as a whole. Because of almost complete agricultural reliance, Burkina Faso needs to be able to rely on internal crop production to support the country in the present and also in the future. Because climate change is world-wide, many developing countries are also experiencing similar problems. In the 2008 report "Impact of Climate Change on Food Security in Times of High Food and Energy Prices." by Joachim von Braun, Director General of the International Food Policy Research Institute (IFPRI), the author makes these predictions for countries that will be severely affected by climate change:

> "By 2080, agricultural output in developing countries may decline by 20% due to climate change, compared to 6% in industrialized nations. Also due to climate change, yields in developing countries could further decrease by 15% on average by 2080. Taking into account the effects of climate change, the number of undernourished people in Sub-Saharan Africa may triple between 1990 and 2080." (Braun, sect. 1, par. 3).

By providing solutions now and acting on them, the country can assure stable crop productions to increase food security for smallholders for a long period of time. Additionally, while answers to climate change problems can provide more food, they will also create a stable environment able to support all the country's agriculture and be more resistant to climate change. Since agriculture also includes the cotton cash crop, effectively addressing the problem will also increase Burkina's income which in turn shall improve the economy. By improving the economy, Burkina can have more new opportunities to advance in areas, such as technological advancement, electricity amount, possible infrastructure like textile factories, and improved living for the population. Most importantly, the government can distribute money to help alleviate poverty in the nation. Positive changes in agricultural practices to confront climate change can lead to a chain of benefits that can help lead Burkina Faso to become more developed.

Obstacles to improving the climate change situation must also be considered. Problems arise from the poor technological level in Burkina Faso, and the country's unlikelihood of internal technological development due to lack of resources. Quick responses to climate change will require improved technology that can allow benign treatment of the environment. Any solution that is to be implemented will require technology to help improve the speed of implementation as well as increase the extent where the solution can be put into practice. External aid is required for such widespread development, but local

farmers and their families can act too. Through education of safe and effective agriculture practices, the population can more easily resist climate change effects.

Finding effective solutions to the climate change problem will take more than piecing together facts and trying to make the puzzle fit. Luckily, I had the opportunity to speak to someone who has dedicated his entire life to helping Burkina Faso. Long term missionary Reverend Pete Brokopp in Burkina Faso has had the opportunity to work in the country and observe the land‘s alterations due to climate change first hand. He confirms the many reports about the different effects climate change has on the southern and northern region. Staying in the country for more than a decade, he also sees possible solutions and areas that smallholders of Burkina should focus on to combat climate change. His experience has given insight in how climate change problems can be dealt with. He supports the planting of trees as one of the most effective solutions in tackling climate change.

In order to help restore the climate, the environment is a large factor. If the environment and its plants were to depreciate in number and quality, then the climate will be affected negatively. Less trees and plants will make the land more vulnerable to the weather. Trees provide many positive benefits to the environment and the climate as well. Reverend Brokopp has seen how trees have made the environment more resilient by rooting the soil as well as assisting in improving the climate through the natural photosynthesis process of cleaning the air. Trees can also store water and provide cooling shade. Other sources agree as well in the benefits of trees. In an article called “Regreening Africa”, independent journalist Mark Hertsgaard also reports firsthand on how trees have improved the lives of Yacouba Sawadogo and his family in Burkina Faso.

> “But the most significant result was one he hadn't anticipated: tiny trees began to sprout amid his rows of millet and sorghum, thanks to seeds contained in the manure. As one growing season followed another, it became apparent that the trees—now a few feet high—were further increasing crop yields while also restoring soil fertility. "Since I began this technique of rehabilitating degraded land, my family has enjoyed food security in good years and bad," Sawadogo says.” (Hertsgaard, par. 5)

It seems that with trees, climate change effects like drought are lessened and the land becomes more adapted. Practices that include using agro-forestry, the mixing of trees and cropland, are extremely efficient, having a more sustainable response to climate change than most western aid programs. (Fighting drought with trees in Burkina Faso, par. 17) In answering the proximate causation of the effects of trees on the environment, beginning research in agro-forestry looks towards the potential of trees in cleaning the air through carbon sequestration. Other main points include rehabilitating degraded land and conserving soil and water. (Agro forestry and the Achievement of the Millennium Development Goals, 5, 9)

A specific type of tree in Burkina Faso has had more added benefits than just environmental protection. Brokopp reports that before, Burkina had tried to plant more eucalyptus trees, but they have fallen from favor due because they drained the ground of water. Now, another tree has been the center of attention. Requiring little water and its leaves being extremely abundant in vitamins, the moringa tree has been almost a miracle plant that has aided Burkina in many ways. In addition to all the advantages that trees provide against climate change, the moringa tree’s leaves have another special property. Brokopp recounts,

> “If you crush the leaves of the tree into a powder, and give it to a child regularly, in a couple of weeks, he/she will not show any sign of malnutrition. It can also decrease blood pressure by about 20%” (Brokopp)

Many other missionaries have seen this tree in action and can test to its beneficiary powers. Besides vitamin-packed leaves, different parts of the moringa trees can also serve as a water purifier, medicine, fuel, fertilizer, and livestock feed as well as a dietary supplement. Every aspect of the moringa tree is extremely beneficial to smallholders and farmers. It can grow very fast and is also drought tolerant, so it thrives in arid climates. (Moringa: a supermarket on a tree!) The moringa tree is an ideal tree that should be a top priority investment in aid for Burkina Faso.

I believe that funding should be directed into the planting of trees in Burkina Faso, particularly the moringa tree. If a national program is to promote agro-forestry in Burkina Faso, there should two primary factors needed to extend the program to all smallholders in Burkina Faso. First, financial support should be given to advance the distribution of moringa seeds, allowing smallholders to have the opportunity to take part in new practices of planting trees. Alongside the physical tools, education on agro-forestry practices also plays a primary role in further developments. Specialized workers and scientists should be brought into the country to educate the people on the advantages of agro-forestry and effective practices. Then slowly, Burkina Faso can see gradual improvements in crop yield and climate stability. Having worked many years in Burkina Faso, Reverend Brokopp firmly believes in the widespread growing of trees in aiding environmental protection and reversal of adverse climate change effects. Large aid organizations of the UN and World Bank can provide the financial backbone in developing and promoting this field. Gradually, with the help of the world aid organizations, the growth of trees in the region of Burkina Faso can help bring the country to a more stable point in the future in order for further developments to occur.

Burkina Faso has the chance for great improvements through dealing with climate change. By addressing this issue, everyone in the country from smallholders to the national economy can benefit from developments in agriculture and climate change for years to come. As climate change gradually becomes more of a concern, Burkina needs to be able to adapt. The country needs to deal with both the drought issue in the south as well as the flooding issues in the north. As a result, outside aid should focus on technology in planting trees. Although restricted by land, Burkina Faso can still obtain aid, and it can also internally deal with climate change by having skilled users of agro-forestry teach other smallholders with valuable agricultural skill and the importance of planting trees. There are many advantages to trees that can provide environmental protection, wood, and increase in crop production. The moringa tree in particular should be a particularly prioritized investment because of many benefits to reap such as nutrient supplement and medicinal uses. Not only will moringa trees help restore the climate and protect the environment, but it can be a great asset for the reduction of malnutrition. By having outside aid raise technology levels to promote the growing of trees and internal support of the people in a forestry campaign, Burkina can steadily develop through increase in agricultural production and restoration of land. Having more food on the table is a huge step for a developing country like Burkina Faso.

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