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Burkina Faso, Climate Volatility

Burkina Faso: Climate Volatility

I. *Overview*

Known as the "Land of the Incorruptible Men," Burkina Faso is a landlocked Sahel country home to some twenty million people and over sixty ethnicities, with Mossi and Fulani as the predominant groups. Burkina Faso is also known for its religious tolerance, with approximately 60% and 23% of its inhabitants as Muslim and Roman Catholic, respectively. While the official language is French, much of the population speaks Moore, Dioula, and Fulfulde, and oral traditions remain a core component of Burkinabé culture (CIA Factbook, Our Africa).

Burkina Faso's geography and limited water reserves and natural resources render it vulnerable to changes in climate and the global market. In fact, over 70% of its population resides in rural areas and over 65% of its population is under the age of 25, predisposing the country to food insecurity and chronic malnutrition by limiting resource accessibility and stunting long-term physical growth (WFP, CIA Factbook). Since 1902, climate volatility has become an increasingly worrisome issue, with dry areas spreading south (decreasing the availability of arable land) and droughts have also become more common since the 1970s. Moreover, average temperatures in Burkina Faso are expected to rise by 3-4℃ (5.4-7.2℉) between 2080 and 2099 (relative to average temperatures from 1980-1999), and the wet and dry seasons are expected to become more severe (World Bank). These statistics have serious issues as stronger rainstorms can weaken infrastructure, hinder local trade, and destroy crops. Fluctuations in precipitation patterns (whether above or below average levels) can also disrupt agricultural production as different plant species have different water requirements. For example, sorghum is usually farmed in southern regions while millet is usually farmed in northern regions (AGRA).

A. *Family and Education*

According to a 1985 analysis conducted by the UN, a typical Burkinabé household consists of 6.2 people. Families in rural areas typically dwell in traditional mud houses with thatch roofs while urban families reside in more developed buildings like apartments and condominiums. A typical family diet consists of millet, cowpea, sorghum, poultry, and fish, which are procured through small markets or harvests (Our Africa). Education is largely limited to eight years, as the gross domestic product per capita is $1900 USD and government expenditures in education are a mere 3.9% of the country's gross domestic product, limiting educational opportunities for younger generations (CIA Factbook). Furthermore, according to 2006 national census of Burkina Faso, there was a significant difference between the average amount of time females spent in school (4.9 years) versus that of males (6.1 years) and continues to this day (Jean-François, UNICEF). Overall, the adult literacy rate of Burkina Faso is 36% compared to sub-Saharan Africa's 75% (UNESCO). With such a discrepancy between genders, a larger percentage of the growing young population remains unprepared for an increasingly globalized workforce.

B. *Health*

Government health expenditures, at 5.0% of Burkina Faso's growth domestic product, or GDP, are only

slightly better than that of educational expenditures. As a result, Burkina Faso's healthcare system lacks a proper supply of medical staff, and the leading causes of death are often preventable diseases like malaria, respiratory infections like tuberculosis, meningitis, diarrhea, and measles (CIA Factbook, WHO). Access to clean water has improved for 82% of the population (largely in urban areas) while remaining unimproved for the remaining 18%. As for access to sanitation facilities, little progress has been made as access has remained unimproved for 80% of the population, 93% of which are from rural areas (CIA Factbook). Equally consequential is that 55% of the population continues to practice open defecation, which increases the risk for fecal-borne illnesses and groundwater contamination (UNICEF).

C. *Energy and Infrastructure*

In terms of energy usage, Burkina Faso has limited access to electricity and derives most of it from nonrenewable resources like fossil fuels. Only 1% of the rural population, 56% of the urban population, and 17% of the entire population have access to electricity, leaving 14,100,000 citizens without. Renewable resources like hydroelectric, solar, and wind power remain largely underdeveloped, with renewable energy resources constituting only 13.8% of national energy sources. Burkina Faso is also vulnerable to changes in global oil prices and losses in GDP growth, as its urban population and petroleum imports (for lack of natural reserves) continue to grow (CIA Factbook). Burkina Faso also lacks the infrastructure necessary for effective communication and trade since it has only 15,272 km of roadway, compared to 94,902 km in New Zealand, a country of similar geographic size. As a result, rural populations find major trade markets (concentrated in major cities and trade network intersections) inaccessible due to poor road planning, high transportation costs (of products), high barriers to trade (compared to neighboring African countries), and substandard road maintenance (Briceño-Garmendia, Domínguez-Torres). Therefore, Burkina Faso's poor infrastructure and unstable economic base have had significant consequences on the people's socioeconomic mobility and living standards (Briceño-Garmendia, Domínguez-Torres, Ogwo, Benjamin A., et al).

D. *Economic Sectors*

Currently, agricultural land composes 43% of the total geographic area and includes staple and cash crops like cotton, sorghum, shea nuts, and millet. 80% of its population is centered in the agricultural sector and practices subsistence farming, which predisposes the soil to degradation, desertification, and erosion. These practices rapidly leach nutrients from the soil, as Burkina Faso has nutrient-poor soil low in permeability, making it disadvantageous for crop farmers (Climate Change Knowledge Portal). Pasture land is also an integral part of Burkina Faso's informal economy and accounts for 21.9% of the total land mass (CIA Factbook). In terms of economic exports, gold has also emerged as an increasingly important export alongside cotton in the global economy, as both accounted for 75% of the country's total exports in just 2015. Livestock, another export, include goats, sheep, cattle, and pigs (CIA Factbook, Our Africa). However, fluctuations in the global prices of main exports limit GDP growth and emphasize Burkina Faso's weak industrial base limited supply of natural resources beyond select minerals like limestone, salt, and manganese (African Wildlife Foundation, WTO). Burkina Faso's increasingly varied climate has also placed significant stress on rural and urban populations, as the majority of the working population depends on the consistency of wet and dry seasons typical of savannahs (African Wildlife Foundation). With increasing global temperatures, the warm, dry winter seasons and the hot, wet summers have already raised significant concern regarding the frequency of floods and droughts.

II. *Current Issues*

For most families, food insecurity stems from volatile climate patterns and lack of preparation for oncoming natural disasters (World Bank). Notably, the severe droughts of 2011 took a considerable toll on Burkina Faso's annual GDP growth, with a sharp decline from 8.446 % to 6.627%. Given the fact that the agricultural sector contributes to nearly a third of the country's GDP, changes to an already drought-

sensitive country have reverberating effects on poverty, general productivity, disease outbreaks, and freshwater reserves (CIA Factbook, World Bank). Since an overwhelming majority of the population practices subsistence farming, or low-impact, self-sufficient agricultural techniques, many farmers are unprepared for sudden floods and droughts and fail to sustainably farm the land (McIntyre). In addition, central-southern regions have also been degraded by poor agricultural practices (e.g. not allowing for soil recovery and nutrient recovery) and animal husbandry practices (e.g. livestock overgrazing). The rise in national temperatures, likely to bring harsher droughts, will also increase desertified area (land that it no longer arable), reduce crop production, and bring heat waves that can cause psychological and physiological stress.

In contrast, floods also pose a major issue during the monsoon months (generally April through October) due to the country's poor infrastructure and still-developing responses to natural disasters, resulting in the destruction of hundreds of households and crops (World Bank). However, wet seasons are projected to shorten in coming decades, posing another set of risks for a country with 40.1% of its population living below the poverty line, over 50% of families suffering from food insecurity even under normal weather conditions, and an estimated $158 million lost in productivity and health care annually (CIA Factbook, McIntyre, World Bank). Moreover, the recent flood in May 2017 resulted in the destruction of over 700 homes and affected over five thousand individuals (Relief Web). Burkina Faso's largest exports, cotton and gold, are also subject to external factors like weather and global market prices; in fact, cotton comprises 44.9% of total exports but is less drought-resistant than sorghum and millet. Future droughts and floods could impede agricultural productivity and GDP growth for a still-developing economy (Kabedi-Mbuyi, Malangu, et al., UNESCO).

Despite foreign and domestic efforts to improve living standards, ensure economic stability, and promote beneficial environmental practices, food insecurity remains a pressing issue for Burkina Faso (World Bank). Erratic federal investments in agriculture, continued foreign dependence, and limited crop diversification have reduced the flexibility of sustainable agricultural practices due to cultural differences between foreign and domestic organizations as well as economic costs of initial agricultural investments (McIntyre, Sivakumar, Mannava V.K., et al.). In addition, government domestic expenditure in research and development (GERD) is a mere 0.60% of its GDP compared to the minimum threshold (1%) set forth by the African Union and ECOWAS, two supranational organizations aiming to unify and improve African governments and societies. To further highlight the under-investment of the agricultural sector despite its economic significance, only 8.6% of Burkinabe researchers are in agricultural sciences (UNESCO).

As for groups affected by climate volatility, as many as 1 in 4 children (< 5 years old) experience growth stunting and only 1 in 5 children (6-23 months of age) receive the minimum acceptable diet. These numbers foretell long-term impacts on immune systems, life expectancies, and mental development (Ministry of Health, UNICEF). Severe acute malnutrition (SAM) has also risen to worrisome levels, with some areas reaching 2% (considered a national emergency) and 4.1% in particularly arid regions near the Sahel. In 2018, rates of SAM in children (< 5 years old) are only expected to rise and exceed 187,000. This poses a serious issue, as only 64% of SAM victims were able to be properly treated (Ministry of Health, UNICEF, Relief Web). Climate projections also predict increases in outbreaks of communicable diseases like meningitis, yellow fever, measles, and cholera, since extreme rains can lead to water contamination (increasing the incidence of cholera) and warmer temperatures allow vectors (e.g. mosquitoes) to spread diseases more often (Relief Web).

In addition to climate volatility-related issues, the sudden influx of over 33,000 Malian refugees in recent years has also exacerbated current environmental, population, and societal issues (UNHCR). Burkina Faso's annual population growth of 3.0% is also ranked eighth globally, with a total fertility rate of 5.7 children per woman. The high birth rate, combined with the seventh highest infant mortality rate in the

world (72.2 per 1000 live births), highlights more population- and urbanization-related issues to come, as urban areas are growing by an average of 5.29% each year (CIA Factbook). For the expanding population of young Burkinabé people, a reliable source of food is imperative.

III. *Environmental Proposals*

With any issue involving many environmental, socioeconomic, and political spheres, solutions and methods of implementation require comprehensive analysis and solutions. Therefore, proposals to adapt to Burkina Faso's climate volatility should have sustainable focuses on both economic policy and environmental planning. The ANSD, or the non-governmental organization Association Nourrir sans Détruire, with its experience working in Burkina Faso to improve people's socioeconomic statuses and promote good farming practices, should implement customized, sustainable programs in degraded and high-risk areas. ANSD will also work with the Alliance for a Green Revolution in Africa (AGRA), a non-profit group with experience in genetically-modified seed development and distribution to other African countries like Burkina Faso (Balch). In fact, drought-resistant maize seeds in 13 African countries and pest-resistant varieties of cotton have significantly increased yields by 20 to 30% and a "70% reduction in pesticide use" from 2008 to 2015, respectively (Balch, Gakpo).

ANSD and AGRA should also collaborate with local governments in select communities (those with major levels of malnutrition according to Global Hunger Index standards) and launch pilot programs depending on each society's level of development and openness. Each program can serve as an opportunity for farmers to learn about new, effective farming practices and other farmers' experience. The agricultural aspects of these programs will include: (1) crop rotation with plants that introduce nitrogen back into the soil (legumes like gum arabic, rooibos, and cowpea, hardy crops that can grow in tropical climates like Burkina Faso's); (2) agriculture-livestock systems that use livestock (goat, fish, and chicken) to produce organic manure necessary for improved zai farming (when farmers dig small wells into the soil and fill it with organic matter to reduce water loss, encourage germination, and increase soil fertility) and rock contouring (land manipulation to limit erosion during rainstorms); (3) intercropping with genetically modified varieties of staples like millet, cowpea, and sorghum (which are a part of many Burkinabé diets, although increases in food prices from lower yields have limited their popularity); and (4) meetings for local farmers to come together and track agricultural progress, discuss crop varieties and their respective adaptations, climate patterns, and publicize new practices. For example, recommendations could be made depending on the crop type, predicted rain and temperature patterns, and location; notably, millet fares better than sorghum in drier (<500 mm) areas (AGRA). These resolutions will address the pervasive effects of climate volatility by increasing public awareness and educating farmers about how they can adapt to climate change with long-term goals like soil fertility and crop diversity in mind. Finally, if villagers do not have a well-maintained record of crop productivity, yield, and agricultural techniques, then they should begin cataloging practices and findings to ensure the longevity of these solutions.

IV. *Economic Proposals*

In order to alleviate the financial burdens of seed, fertilizer, and equipment costs, the World Bank and the Ministry of Agriculture should assist Burkina Faso with financing and loans for farmers. The World Bank will subsidize small farmers and agricultural scientists (since there are currently just over 700 scientists in Burkina Faso or 48 per million people) to research and develop drought-resistant and flood-resistant crops (UNESCO). By stimulating technological innovation and sustainable techniques, Burkina Faso should expect advancements in agricultural output, grain carryover, and economic independence. Additionally, the appeal of social mobility and economic opportunities beyond farming should appeal to both urban and rural populations; rural citizens can learn more about seed technologies from government officials and urban citizens can explore different careers and entrepreneurial opportunities. Farmers can also participate

in risk-sharing opportunities where they can qualify for microloans to offset losses during off-years and cover long-term investments (e.g. purchased land, genetically modified seeds -- which often need to be bought each year unlike traditional seeds) and use crop output and future loan eligibility as collateral. These programs will not only encourage farmers to work together even after foreign intervention has left, but they will also create a basis for future farmers and programs to develop.

Currently, funds for the agriculture sector and social security are mainly from foreign or external sources, reducing the country's economic independence and potential for GDP growth. While current efforts to diversify exports are currently underway, most funding still goes toward mining and cotton, with the former often prioritized over the latter (FAO, FAPDA). Therefore, the Ministry of Agriculture should use funds to prioritize sorghum, shea, sesame, cowpeas, and other markets to diversify both diets and exports through farm subsidies supported by the WHO. In doing so, climate volatility will inflict less damage on communities since food stores and financial stability should stabilize. If the solutions are properly implemented, both urban and rural communities should experience a consistent variety of food for a growing population and public expenditures exceed current levels, or above 10% of their GDP (UNESCO). Eventually, Burkina Faso should become more economically independent from the combined effects of research and adaptive farming.

Burkina Faso and other African nations are not strangers to foreign intervention and agricultural innovation; similar programs like the West Africa Cotton Improvement Program and C4Cotton Partnership have successfully encouraged the growth of the cotton industry in Benin and Mali, reducing malnutrition and food insecurity even with climate change and population growth (USAID). Burkina Faso has also shown promise in the past with public expenditures; from 2009 to 2010, public expenditures in irrigation increased from $6.6 billion FCFA to $14.7 billion FCFA (FAO). Therefore, with proper implementation and leadership with the Burkinabé government and foreign institutions, food insecurity can gradually be alleviated through empowered peoples and economies in response to climate volatility.

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