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Chad: An Enhanced Approach to Agricultural Education

Knowledge is power. This common phrase may be the most essential tool in improving the agricultural landscape of Chad. Chad struggles with many issues, including underdeveloped infrastructure, poverty, and malnutrition. The Chad Agricultural Education Program is a proposed solution utilizing various educational administration techniques focusing on three specific areas: droughts and climate change, Lake Chad, and microfinance. This education system can empower the people of Chad to improve agricultural processes, reducing food insecurity.

Context

Chad has a population of 18,686,642 (Chad Population 2024 (Live), n.d.) and continues to face challenges ranging from humanitarian emergencies to laggard economic growth. Chad, a landlocked country in Central Africa, is one of five countries within the Sahel strip and has poor economic and social performance, primarily due to fragile institutions and governmental corruption (Chad, n.d.). Thus, poverty and vulnerability remain entrenched in Chad, with 42.3% of the population living below the national poverty line (Overview, n.d.). Chad is a food-deficient and low-income country (*Chad*, 2015). 24% of Chadians reside in urban areas and 74% in rural, making agriculture a key market sector as more than 80% of the workforce is involved in agriculture (globalEDGE, n.d.; World Bank Open Data, n.d.-a). Nevertheless, Chad's unpredictable climate challenge its agricultural sector, and the lack of advanced agrarian techniques hinders citizens' ability to produce agriculture beyond their own consumption permitting their use of subsistence farming and pastoralism (Chad Market Overview, n.d.; "Migration, Environment, and Climate Change in Chad," 2022).

Soukenya Kane, the World Bank Country Director for Chad, stated, "Although Chad possesses a total agricultural area of over 49 million hectares, only 6% is currently being farmed. Moreover, only 9% of the available water resources are used, and less than 1% of agricultural land is irrigated" (World Bank Group, 2018). Rain-fed crops are often cultivated on plots of 2–5 hectares, and irrigated crops on plots of 0.1–1 hectare (Food and Agriculture Organization & The World Bank, n.d.). For context, the average farm size in the U.S. is 187.8 hectares (USDA, Farming and Farm Income, n.d.). Subsistence farming provides food for the average family size of 5.02 in Chad (Family Size by Country, 2024).

According to the World Food Programme, "High food prices, below-average market supplies, continued disruption of cross-border trade in the east – due to the conflict in Sudan – and the

impact of climate shocks have contributed to worsening hunger and poverty in the country," (*Chad*, 2024). The underdeveloped agricultural sector contributes not only to food insecurity and underdevelopment but also to Chad's subpar quality of life. Agricultural education that further advances agricultural-related techniques is necessary to better rural life and foster prosperity in Chad.

Like many developing nations, the fiscal and environmental factors limiting efficient and high-yielding agricultural growth have led to Chad's dependence on food imports and aid. Foreign aid, typically grain, reduces the demand for domestic farming, discouraging local production (W, 2017). In Chad, food is often cooked over open fires and served on mats from a large communal bowl (Rise, 2016). The diet consists primarily of meat, dairy, and grains (*Country Nutrition Profiles*, n.d.). In 2018, 39.5% of the population was malnourished, and The Global Nutrition Report identifies Chad as 'off course' to meet all targets for maternal, infant, and young child nutrition (*Country Nutrition Profiles*, n.d.). The demand for diversified food opportunities rests on the ability of the agricultural sector in Chad to transform. Food security is not the only disproportional aspect of Chad; infrastructure has yet to make adequate transformations. A report by the Columbia Mailman School of Public Health concludes that access to primary health care is limited, with out-of-pocket payment being the most common healthcare financing mechanism, representing 50% of total health expenditure (2023). Restricted access to healthcare correlates to the high prevalence of malnutrition in Chad, exemplifying the negative impacts poor healthcare infrastructure has on nutrition (Chad, 2023).

A lack of advanced infrastructure is also apparent in restricted access to the Internet. The Internet has existed in some form in Chad since 1997; however, poor digital security, a high cost of access, and little awareness of the Internet's significance limit its use (*More Than 80% of Chadian Students and Officials Know How to Use the Internet but Lack Advanced Skills*, 2013). UNICEF reports that education has become one of Chad's priorities. However, the Chad educational system still consists of low-level schooling, with a 70 percent rate of illiteracy among youth (Education, n.d.). Furthermore, there is little access to higher education, technical education, and professional training, and the academic level of teachers is generally low (Education, n.d.). Chad's education system is already underdeveloped, and the additional issue of food insecurity limits agricultural education and, therefore, stunts agricultural growth.

Findings

There are many layers to addressing food insecurity and agricultural development in Chad, including education. Agricultural education can increase awareness of sustainable practices and stimulate growth. However, agrarian education should not be approached generalized because Chad consists of over 200 ethnic groups that speak over 100 languages. Furthermore, many of Chad's citizens belong to nomadic or pastoral tribes, and agricultural education efforts must

account for these stipulations (World Relief, 2023). Thus, a comprehensive program that utilizes an interflow of Indigenous education styles, AI technology, and in-person schooling could increase the reach and quality of agricultural education in Chad.

With funding from the European Union, the Food and Agricultural Organization (FAO) collaborated with the Government of Malawi to design the KULIMA project. KULIMA utilized the existing agricultural extension delivery strategy of nurturing model villages through the Farmer Field Schools (FFS) approach (Chen, 2023). FFS provides agricultural advisory services, helping smallholder farmers acquire new skills and knowledge. This approach supports transformative learning, sustainable production, and efficiency by empowering farmers to identify and cope with emerging challenges (Chen, 2023). The KULIMA project has been a resounding success, creating 4,970 Farmer Field Schools and assisting 44,000 farmers (KULIMA, 2018; Reporter & Reporter, 2022). Notably, the project has played a significant role in promoting women's participation, with women constituting 60% of the beneficiaries (Reporter & Reporter, 2022). This emphasis on gender equality has been critical to the project's success. Additionally, the project has fostered sustainable agricultural innovation, such as the creation of a solar dryer designed to preserve vegetables at the Chimwemwe Farmer Field School (Africa, 2023).

Solution

A program in Chad resembling KULIMA could teach agricultural techniques that further Chad's ability to withstand abrupt shifts in climate and give Chadians the agricultural and technical education needed to transition from subsistence to profitable smallholder agriculture. The program would be called the Chad Agricultural Education Program (CAEP). The FAO would oversee the program and would follow the FFS model. The FAO should collaborate with various organizations to send volunteers, NGO representatives, and experts to Chad's regions to administer in-person agricultural education in Chad. The program should collaborate with local organizations like the Chadian Volunteers' Association for the Protection of the Environment (ATVPE), which uses various methods, including environmental education and reforestation, to fight desertification and land degradation. Partnering with local organizations ensures effectiveness and maintains cultural sensitivity. Funding for the program could come from developed nations such as countries part of the European Union.

Malawi has ten ethnic groups, and five languages are mainly spoken (*Malawi*, 2011; *List of Languages in Malawi*, n.d.). In comparison, Chad has 200 ethnic groups with over 100 languages spoken (*Chad*, 1992). FFS must adopt new teaching methods to ensure that Chadians of various ethnic groups can access agricultural education. AI technology can make it easier to administer agricultural education in various languages, such as the existing AI technology of KissanAI. KissanAI is an AI-powered agricultural assistant program that provides personalized, voice-

based assistance to farmers. It is currently adaptable to fourteen languages, but if this type of technology were made adaptable to the different languages in Chad, it could increase the reach of agricultural education. The implementation of AI in agriculture education becomes increasingly feasible with the 2024 development of Chad's premier Spatial AI Center, indicating increased government tolerance towards the usage of AI in development (Kjallstrom, 2024). Further, AI technology does not need the Internet to function, removing the barrier of Chad's struggling technological security. Integrating AI technology into FFS spaces transforms how agricultural education is administered and encourages Chadians to integrate AI into sustainable agricultural practices.

The KULIMA project held training in government-owned, run-down residential centers renovated by the program. In Chad, the minority is nomadic, making standalone training centers impractical for that portion of the population. However, there are effective educational practices that address these concerns. During the COVID-19 pandemic, the UN partnered with the troubadours, or traditional storytellers, to deliver and communicate information about the virus to Chad's remote and nomadic communities. These troubadours and community-selected health workers traveled between communities and shared critical health safety measures instead of news or songs to help stop COVID from spreading (World Relief, 2023). By using troubadours to administer education to nomadic populations, we increase accessibility. Moreover, mobile pastoral schools that adapt to pastoralist communities' migratory routes and integrate traditional education forms could increase educational opportunities for nomadic populations.

The FAO can work with Chad's four different bodies of rural environmental management to administer CAEP. These ministries consist of the Ministry of Agriculture, the Ministry of Livestock, the Ministry of Environment and Fisheries, and the Ministry of Water. These ministries are responsible for designing, implementing, and monitoring rural development projects and programs (*Chad*, 2018). With no formal framework for decentralized agricultural support, the structure of the CAEP could eventually be a collaborative program between the FAO and the ministries, providing a foundation for future government-led agricultural education initiatives (*Chad*, 2018). Chad's governmental instability may warrant some concerns regarding the ministries; however, with the newly elected president, Mahamat Idriss Deby, there is hope for intentional efforts to progress Chad's infrastructure, including education and the economy, thus attributing to possible collaboration for CAEP. The curriculum should be specific to Chad's agricultural needs and the different regions' climates and practices. Overall, the program should encompass three principal areas of importance.

1. Droughts and Climate Change

The Zaï technique, an indigenous method for saving rainwater, has been utilized in drought and insufficient irrigation. The Zaï technique involves a farmer digging out excess soil in holes and filling in more compost before the wet season. Zaï pits have helped Chad's agriculture withstand drought, but they need constant attention, and if there is too much rain, the holes could fill with water, damaging crops (Jacob, 2023). A global meta-analysis found drip irrigation can save water and ensure crop yield (Pei et al., 2023). Introducing small-scale irrigation technologies, such as drip irrigation, can successfully harness smallholder production. Educating the people of Chad on how to utilize, install, and operate small-scale drip irrigation systems is vital. Using irrigation systems with the Zaï method can improve Chad's agricultural resilience to climate change. One downside is the upkeep of drip irrigation systems; however, AI literacy could allow Chadians to utilize predictive analytics to establish efficient irrigation schedules, which can ensure scarce water is being preserved and can even detect leaks, making upkeep easier. Another downside may be the high cost of installments for drip irrigation systems. However, CAEP funding, local loan opportunities, and education regarding the installment of this system can resolve this concern.

2. Lake Chad

Lake Chad is a significant water source for irrigation and other farming activities (Olawuni et al., 2023). There are three primary sources of livelihood around Lake Chad: agriculture, livestock farming, and fisheries. Each of these sources depends closely on the environment. Drought, unsustainable management, security, and political unrest compromise these resources (*Ecological Restoration*, 2021). The implementation of sustainable water management practices is crucial to restoring and maintaining the water levels in Lake Chad. This can be done by improving water efficiency in agricultural practices, promoting water conservation measures, and regulating water usage to meet the lake's and surrounding ecosystems' ecological needs (African Conservation Foundation, 2023). UNESCO and the Lake Chad Basin Commission partnered to implement ecological restoration activities surrounding the sustainable harvest of spirulina algae at three pilot sites in the Chadian area of Lake Chad (*Biosphere and Heritage of Lake Chad (BIOPALT)*, 2024). This project carried out 80% of the activities planned in the project framework (Radio Ndarason International, 2022). Including sustainable opportunities like harvesting spirulina in the curriculum creates jobs and empowers local communities to employ agricultural practices that preserve Lake Chad.

3. Microfinance

Establishing sustainable and more advanced farming techniques requires financial investments, yet individuals need to be more aware of how to access financial opportunities. To aid the issue of food insecurity in Chad, people must be educated on various agricultural practices to increase

yield and productivity, but funds must be available for citizens to put these new practices to use. Thus, properly utilizing government financial resources, like microfinance, must be taught. A deeper and more inclusive financial sector could help reduce poverty and improve growth in Chad; financial inclusion and expanding access to financial services can lower poverty by reducing credit constraints on people experiencing poverty and helping small farms do business (*Chad: Selected Issues*, 2016). Financial inclusion can be met through opportunities like microfinance. In Chad, the total balance sheet of the microfinance sector amounted to 30.3 billion Central African Francs (USD 52 million) in 2019, which is barely 0.5% of GDP. Moreover, microfinance institutions have poor geographic coverage, which limits financial inclusion (*Chad*, n.d.-b). Thus, microfinance needs to be revitalized by promoting cashless loan systems like Musoni, the first completely cashless microfinance institution in the world, which can allow customers to receive and repay their loans via Safaricom's M-PESA system (*The Future of Microfinance for Kenya's Smallholder Farmers*, n.d.).

Microfinance options are available in Chad, but they are largely unknown. There are existing efforts like "Microfinance in Chad," a digital network for people to learn and get connected to investment activities; however, only 17.87% of the population has access to the Internet (*Microfinance in Chad*, 2022; World Bank Open Data, n.d.-b). Thus, increasing awareness of financial opportunities for funding agricultural efforts gives more people the chance to grow their farms and implement agricultural practices presented to them through CAEP. Teaching people how to access and appropriately use microloans can stimulate the economic growth and prosperity of the agricultural sector.

Conclusion

These three areas should be the curriculum's focus but should not limit what is taught. The proposed CAEP program should adapt its curriculum and its teaching styles to the needs of Chad citizens to further agricultural education because, without agricultural education, Chad's growth is inevitably stunted. The CAEP program holds the potential to equip Chadians with the necessary resources and knowledge to grow the agriculture sector, reduce food insecurity, and increase the quality of life in Chad. Knowledge is power, and it carries the power to change the people of Chad's lives.

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