Rohan Dumpala
Fayetteville-Manlius High School
Manlius, NY, United States
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The Roots to Resilience Solution: An Inclusive and Adaptive Approach to Climate Change-Related Food Insecurity in Mozambique

More than 75% of Mozambique's population lives in extreme poverty, leaving little room to recover when droughts, floods, or cyclones destroy a season's crops ("Mozambique"). As climate shocks become more frequent, the already elevated risk of food insecurity in the coastal East African nation intensifies further. Agriculture and livestock are highly climate-sensitive, and their stability is closely tied to the well-being of nations like Mozambique. Therefore, the Roots to Resilience Solution is essential for strengthening local food systems and protecting vulnerable communities ("Food Security and Climate Change…").

Socioeconomic and Infrastructure Overview

Mozambique has a population of more than 33 million people, with 60.7% living in rural areas ("Mozambique Population, 1950 - 2025"). The substantial rural population faces challenges with building and maintaining roads, electrical grids, and water sanitation systems. As of 2022, only half of the country's total population has reliable access to electricity and clean drinking water. Specifically, only 40% of rural areas have access to safe drinking water, compared to 85% in urban areas. ("More than 65% of the Population…"). Healthcare disparities between urban and rural communities are also prevalent, with rural residents often having to travel more than an hour to access basic care.

The average household size in Mozambique is 4-5 people, which is greater than in many developed countries (around 2.5 people in the United States) because of cultural practices, such as extended families living together ("Mozambique", CIA World Factbook). Agriculture remains a major source of employment and income in Mozambique, particularly in rural areas. However, employment opportunities in sectors such as retail, information technology, finance and engineering are becoming more common, particularly in urban areas, which account for approximately 24% of jobs. ("The economic context of Mozambique").

Key Problems Related to Climate and Food Insecurity

Mozambique is one of the most disaster-prone countries in the world, facing recurrent droughts, floods, and cyclones, particularly during the wet season. These recurring disasters continue to erode local livelihoods and deepen national food insecurity ("Climate Risk Country Profile: Mozambique"). In fact, approximately 3.2 million small-scale farmers produce 95-97% of agricultural output, creating a dependence on small-scale farming for production ("Mozambique"). As a very low-income, predominantly rural country (ranked 182 out of 193 countries on the 2025 Human Development Index), Mozambique is particularly vulnerable to climate-related disruptions ("Country Insights | Human Development Reports"). Specifically, many households living below the poverty line have few economic buffers, such as savings or access to advanced irrigation systems, making them susceptible to chronic food insecurity. As climate change runs rampant across the continent, efforts to strengthen local resilience are becoming increasingly critical.

Women tend to face greater consequences of climate change due to their substantial involvement in farming, water collection, and household nutrition, while often having limited access to land, financial resources, and climate-resilient resources (Verfuerth et al.). Extreme weather events, including cyclones,

severe droughts, and flooding, can destroy crops and traditional farming systems. Because women make up a significant portion of the agricultural workforce and are often responsible for managing family food and water supplies, these climate-related shocks directly undermine their ability to feed their households. Additionally, children and elderly populations are more at risk due to limited mobility, existing health challenges, and dependence on others for food, water, and care. Overall, climate change affects all demographics of Mozambique's population to varying degrees, as improvements are often highly inconsistent (Segala et al.). A truly sustainable solution needs to be implemented to incorporate and support all sections of the population.

In cooperation with the government, the World Food Program (WFP) has published multiple analyses to guide climate and food security planning. These analyses help understand historical climate impacts, identify vulnerabilities associated with natural hazards, project future climate effects and inform prioritization of adaptation actions ("Food security and climate change…"). Although some monitoring systems and forecasting tools are presently being used to detect drought and other climate events early, their scope is limited. Systems must be strengthened and expanded to allow actions to be taken in both urban and rural zones before disasters fully unfold.

I. Introduction of the Global Food & Climate Response Alliance (GFCRA)

The GFCRA, operating under the World Food Programme, will specifically tackle climate-related food insecurity. This alliance works to improve regional resource sharing, ensuring lower risk from climatic crises that affect food production and purchase. The GFCRA will pair countries in relatively climate-secure regions with those subject to climate-related agricultural instability. This partnership will allow efficient resource mobilization across borders (Rylander and Talebian). Anchor countries (one per regional division) will contribute technical expertise, logistical capacity, and financial support, helping ensure fast and reliable responses during climate or food crises. These countries will be selected on the basis of their infrastructure (e.g., transport networks, storage facilities, and emergency response systems), allowing resources to be mobilized efficiently across borders (Otieno). The above structure will reduce delays caused by large-scale international initiatives and allow countries to support one another more directly during times of crisis.

This coordination follows a governance model similar to the Southern African Development Community's (SADC) Humanitarian and Emergency Operations Centre (SHOC), headquartered in Nacala, Mozambique, which already organizes regional disaster response for SADC member states ("SADC Humanitarian…"). Within each GFCRA region, the anchor country leads this collaboration, directing the deployment of emergency response teams and resources while affected nations report directly to the anchor country to request assistance ("SHOC Standard Operating Procedures"), establishing a structured chain of command in crises.

Another major focus of the GFCRA is strengthening market access and economic recovery for small-scale farmers affected by climate shocks. When harvests fail, the Alliance will not only provide short-term stabilization support such as seed and tool replacement, but will also prioritize reconnecting farmers to local and regional markets as quickly as possible. To strengthen food supply during crises, GFCRA will coordinate partnerships with trusted traders and regional suppliers to provide affordable staple crops in affected areas, helping prevent extreme price spikes ("From crisis response to resilience…"). Shared transport systems and government-subsidized delivery networks will lower the cost barrier for smallholders to move goods to market, improving both income recovery and food distribution efficiency (Russell). By focusing on restoring trade flows and protecting farmer participation in local markets, the GFCRA reduces the likelihood that temporary climate shocks escalate into long-term economic and food insecurity.

The third focus of the GFCRA is the creation of specialized response and recovery units that can be rapidly deployed at the regional level after climate shocks. These regional divisions, made up of agronomists, engineers and local extension workers, will conduct immediate damage assessment, coordinate community leaders and prioritize recovery before the next planting season is lost ("Frequently Asked Questions…"). Through the GFCRA, regional databases will record information and track patterns relative to climate change, which will then be integrated into an international system to demonstrate global trends. The work of regional workers will include restoration of irrigation systems and water access, distributing replacement seeds and tools, and supporting soil recovery to prevent long-term degradation ("FAO emergencies and resilience…"). By providing hands-on technical guidance and focusing on rapid agricultural recovery rather than only emergency food aid, these units shorten recovery time, reduce repeated crop losses, and strengthen long-term resilience so farming communities can better withstand future climate extremes.

II. Creation of Climate Adaptation Hubs

Another key element of the Roots to Resilience Initiative is the creation of Climate Adaptation Hubs. These centers will host frequent community meetings for discussion where farmers and local residents will be encouraged to share experiences regarding crop performance, climate impacts, and any adaptive strategies they may have (Hunt et al.). This approach mirrors the "Radical Listening" methodology developed by Health In Harmony, in which community members are asked directly what support they need and that input is implemented and continually adjusted, rather than imposed from outside, a model increasingly used in community-led conservation and development work worldwide. In Indonesian Borneo, this method was linked to a 70% reduction in deforestation and a 67% drop in infant mortality over a decade, demonstrating that community-directed solutions can produce measurable, lasting results (Hsu et al.).

Climate Adaptation Hubs will also function as early warning sites, providing real-time updates on droughts, floods, cyclones and pest outbreaks. By consolidating climate and agricultural information in one local, trusted location, the hubs help communities plan collectively, make informed decisions and respond more quickly to emerging climate risks in a coordinated manner ("USDA Climate Hubs").

Hubs will also include emergency storage areas where all farmers in the region contribute 5-10% of their surplus harvest each cycle. Including emergency crop storage, each Climate Adaptation Hub would cost approximately $20-30 million USD (1.3-2.0 billion MZN), with $6-7 million USD (378-441 million MZN) in annual operating costs thereafter ("Grain Storage Building Cost…"). In the South, three hubs will be placed in the provinces of Gaza, Inhambane and Maputo. In Central Mozambique, three hubs are to be established in Sofala, Manica and Zambezia. Throughout the North, three additional hubs will be built in Cabo Delgado, Nampula and Niassa (Collet). In all, nine hubs strategically placed in Mozambique would cost about $180-270 million USD (11-17 billion MZN) to build.

Beyond initial construction financing, long-term hub operations will draw on a blended model rather than prolonged grant dependency.

- A portion of the farmer surplus contribution will be sold during high-price periods to generate steady revenue.
- A farmer credit-rating system, similar to the "Grain Card" model proposed for Communal Storage Centers in Nigeria, will build farmers' access to small loans and create modest transaction-fee income for the hub ("The Role of Grain Storage...").
    - Under this model, farmers who store grain at a communal center can open a bank account and receive a "Grain Card" linked to it. This card tracks storage activity over time, building a credit history they previously lacked and increasing their ability to secure small agricultural loans.

- A share of operating costs could also be drawn from the Mozambique Climate Fund, established under the country's National Climate Finance Strategy 2025-2034, which commits to domesticating and mobilizing climate financing (Correia and Daniel), reducing reliance on external donors over time.

Finally, these hubs will create employment and leadership opportunities, including for youth and women. The capabilities of women and younger groups are regularly overlooked and undermined, but with proper training, all groups can play an important role in disaster response. Specifically, community members will be trained to operate early warning systems, collect local climate and crop data, manage distribution of seeds and farming inputs and conduct outreach to vulnerable households (Langunas and Jackson). Experienced officials from the GFCRA will use the Climate Adaptation Hubs to host workshops and training sessions to ensure that locals understand their role during climate shocks and overcome them without much external assistance. Knowledge of warning systems will be shared through a combination of hands-on demonstrations, local extension workers and printed materials, making education accessible to both literate and non-literate community members (Yore et al.). This approach works to equip households with the tools to protect their livelihoods.

III. Implementation of the Farming Advancement & Resilience Module (FARM)

FARM, a sub-solution within the Root to Resilience program, will provide targeted, hands-on workshops in marginalized areas through Climate Adaptation Hubs. In addition to the education on emergency preparedness and warning systems mentioned above, FARM allows farmers to learn more about modern farming practices. Sessions will focus on climate-smart agriculture, soil and water management, integrated pest control, and sustainable farming techniques. Farmers will participate in demonstration plots, practical exercises and peer-learning sessions, allowing them to test methods like improved planting patterns, intercropping, and small-scale irrigation before applying them on their own farms (“Climate Smart Farming”). By combining practical skills with climate education, the program ensures that farmers can make informed decisions that protect yields and reduce losses under changing environmental conditions.

As part of FARM, farmers will be taught to grow a wider variety of climate-resilient and nutritious crops. This strategy reduces dependency on a single staple, increases food security, and improves household nutrition (“Climate-Resilient Agriculture…”). Hubs will also provide guidance on intercropping, crop rotation and integrating higher-value crops that can also be used to generate income. Where resources allow, programs could include tasting and cooking demonstrations to introduce new foods, showing how households can prepare balanced, nutritious meals with the crops they grow. The table below summarizes a few crops that could be used to diversify production, even in small-scale farms (“FoodData Central”).

Crop	**Typical Seed Cost (per ha)**	**Avg. Yield (kg/ha)**	**Kcals (per kg)**	**Flood Tolerance**	**Drought Tolerance**	**Pest Resistance**	**Est. Gross Revenue (per ha)**
Cassava	2,000 - 3,500 MZN ($32-56)	8,000 - 12,000	~1,600	Moderate	High	Moderate - High	35,000 - 60,000 MZN ($555 - 950)
Sorghum	2,500 - 4,000 MZN ($40-64)	1,000 - 2,000	~3,400	Low	High	High	25,000 - 45,000 MZN ($400 - 715)

Cowpeas	1,500 - 3,000 MZN ($24-48)	600 - 1,200	~3,400	Low	Moderate	High	20,000 - 40,000 MZN ($320 - 635)
Taro	3,000 - 5,000 MZN ($48-80)	5,000 - 8,000	~1,460	High	Low	Moderate	30,000 - 55,000 MZN ($475 - 875)

By diversifying crops and diets, the initiative helps mitigate the effects of climate shocks, ensures households have more options if one crop fails, and strengthens both health and economic stability.

Expected 5 Year Impact

Global Food and Climate Response Alliance (GFCRA)

- Regional coordination and early-warning–linked response could reduce post-disaster food insecurity spikes by ~10-15% ("Ready, set, anticipate!").
- Faster deployment of aid and recovery teams could cut agricultural recovery time by 30-40% after floods or droughts, limiting long-term income losses ("The Impact of Disasters…").
- Prioritizing smallholder and women farmers (who make up ~50% of Mozambique's agricultural workforce) improves equity and household food stability.

Climate Adaptation Hubs

- Scaling climate-smart agriculture (CSA) through local hubs could raise adoption rates to 30-40% of farmers in targeted districts ("Climate Smart Agriculture Sourcebook").
- CSA practices typically increase yields by 20-30% under variable rainfall, even during drought years ("Climate-Smart Agriculture in Action").
- Early-warning access and market linkages could reduce total crop failure rates by ~15-25%, stabilizing local food supply and prices (Teku and Tariku).

Farming Advancement & Resilience Module (FARM)

- Crop diversification and farmer training could reduce annual crop-loss risk by 15-30% compared to monocropping systems (Mihrete and Mihretu).
- Improved storage and post-harvest handling can cut food losses from ~20-30% to under 10%, increasing both food availability and income (Kumar and Kalita).
- Nutrition-dense, resilient crops could raise household caloric availability by 10-20% during climate-shock years (Mihrete and Mihretu).

Funding

Green Climate Fund (GCF): It provides extensive grants and concessional financing for climate adaptation infrastructure in highly vulnerable nations. Typically provides $50-250 million USD per project through a combination of low-interest loans and grants ("GCF.10: 10 years of climate impact").
African Development Fund: In the past, it has provided grants of $11 million for climate-resilient food security and nutrition projects that benefit women, youth and small-scale farmers ("African Development Fund (ADF)").
African Development Bank Group: It has approved additional financing ($5.6 million) for climate-adapted seeds, inputs, and agriculture extension services that strengthen resilience and food security ("African Development Bank Group").
Government of Norway: Contributed over $14 million to *World Food Programme* operations in Mozambique, including climate adaptation, nutrition, and livelihoods support (Scott).

Food and Agriculture Organization (FAO): Finances projects to benefit farmers directly in underdeveloped nations. This UN organization is also actively working to scale up financing for agriculture because of climatic shifts in Mozambique through engagement with global funds and private-public co-investments ("FAST Partnership").
Banco Nacional de Investimento (BNI): National Bank of Mozambique provides development financing for agriculture and related sectors, which could be leveraged for education, market access and climate-resistant farming. It is currently in the process of enhancing the development of its banking structure, but current internal capital is limited, so for large or high-risk projects it usually partners with multilateral development banks, donor governments, or climate funds (Braun and Paffhausen).
Climate Adaptation Hubs: Beyond these external sources, Hub operations will also rely on self-generated funding to reduce long-term donor dependency. Selling surplus farmer contributions during high-price periods, a Nigeria-inspired "Grain Card" credit system that creates transaction-fee income, and a share of Mozambique's own Climate Fund under its National Climate Finance Strategy 2025-2034 will together help sustain Hub operating costs over time (Correia and Daniel).

Conclusion

The Roots to Resilience Initiative offers a practical, multi-layered, community-driven approach to Mozambique's climate-related food-insecurity challenges. By first addressing immediate crises through the coordinated regional response of the GFCRA, the program gives Mozambique the stable foundation it currently lacks. Climate Adaptation Hubs build on this foundation at the community level by equipping marginalized farmers with essential tools, food storage capacity, and early-warning systems to better withstand future climate shocks rather than simply recover from them. Finally, FARM ensures this resilience is not temporary. Through hands-on education in climate-smart agriculture, farmers gain the long-term knowledge and self-sufficiency to adapt as conditions continue to change. Where climate change once left families with nowhere to turn, the Roots to Resilience Initiative gives them a foundation to build on, turning vulnerability into lasting resilience.

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