



# Strengthening Agriculture & Food Systems' Resilience to Climate Change in Sub-Saharan Africa: An Analysis of Climate-Smart Technology, Innovations & Programs

## Regional Centre of Excellence against Hunger and Malnutrition (CERFAM)

*School of International and Public Affairs,  
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### *Acronyms*

ACZ	Agro-climatic zones
CCCF	County climate change funds
CERFAM	Regional Centre of Excellence against Hunger and Malnutrition
CIDP	County integrated development plans
CSA	Climate-smart agriculture
DAS	Digital agriculture services
FAO	Food and Agriculture Organization
GDP	Gross domestic product
IFAD	International Fund for Agricultural Development
IPM	Integrated pest management
KII	Key informant interview
NCCAP	National Climate Change Action Plan
SDG	Sustainable Development Goal
SIPA	Columbia University's School of International and Public Affairs
SSA	Sub-Saharan Africa
UN	United Nations
WFP	World Food Programme



## Executive Summary

This collaboration between the Regional Centre of Excellence against Hunger and Malnutrition CERFAM and Columbia University's School of International and Public Affairs (SIPA) sought to identify three leading, potential good practices in climate-smart agriculture (CSA) - as identified by CERFAM's robust methodology - for replication and implementation across Sub-Saharan Africa's agriculture and food systems, with the ultimate goal of protecting vulnerable stakeholders from the detrimental, ongoing effects of climate change. Our SIPA team also identified core themes, challenges, and recommendations related to scaling general CSA practices from in-depth research conducted in Kenya, Madagascar, and Namibia

The SIPA-CERFAM project began with a detailed literature review of previous and current CSA initiatives in Sub-Saharan Africa's agriculture and food-systems. Based on initial desk research, the three countries were selected for continued, deeper analysis, in-country visits in March 2024, and 57 strategic interviews to comprehensively understand and document leading CSA initiatives and challenges to their implementation, based on local conditions and contexts. Detailed interview guides were designed depending on whether interviews were conducted with (i) farmer associations and corporations, (ii) public officials, (iii) multilaterals, development agencies and NGOs, or (iv) research and academic institutions. All interviews were then coded and analyzed to identify intersectional patterns and insights using a customized interview tool. Drawing from rich insights collected via our in-country visits and diverse stakeholder interviews, the SIPA team proposed the following initiatives for CERFAM's database of good practices, based on high potential for replicability across African agriculture and food systems, and commitment to protect smallholder farmers and other vulnerable individuals from climate change:

**(i) Commercial Agriculture for Smallholder and Agribusinesses**

*Regional Scope: Ethiopia, Malawi, Rwanda*

**(ii) Sustainable Landscapes for Eastern Madagascar**

*Regional Scope: Madagascar*

**(iii) Permaculture Food Circles**

*Regional Scope: Namibia*

Limitations of this SIPA-CERFAM research collaboration include the lack of their generalizability across diverse geographic, cultural, and socioeconomic contexts in the African continent; inability to observe certain CSA practices beyond the short term; a small interview sample; and lack of additional data in certain country contexts, such as Namibia, as well as the project's overall reliance on the qualitative insights primarily drawn from stakeholder interviews.



## I. Client Agency

The [Regional Centre of Excellence against Hunger and Malnutrition](#) (CERFAM), is a centre specialized in knowledge management, technical assistance, and south-south cooperation, created in 2019 by the Republic of Cote d'Ivoire with the support of the World Food Programme (WFP) to accelerate progress toward ending hunger and malnutrition on the continent. Embedded within the framework of the Sustainable Development Goal (SDG) 2, CERFAM identifies, documents, promotes and disseminates good practices and lessons learned while facilitating the provision of technical expertise and capacity building to support the implementation of good practices through South-South and Triangular Cooperation (SSTC). CERFAM aims to bring together all initiatives in the field of nutrition, home-grown school feeding (HGSF), community resilience, and value chain optimization with a focus on post-harvest losses in a synergy of action with relevant stakeholders and strategic partners.

## II. Background

### A. Context of Climate Change in Sub-Saharan Africa (SSA)

Climate change and greenhouse gas emissions are expected to disproportionately impact Africa's agricultural and food systems by increasing the incidence of natural disasters like droughts and floods, temperatures, and reducing the frequency and predictability of rainfall in coming years. These shifts will undoubtedly also influence social and economic capacities of the African countries with large portions of their GDP stemming from direct or indirect activity in agricultural sectors. These threats to agriculture also have an equally strong impact on Africa's complex food systems' as they may render uncertain African farmers' capacity to meet growing local, national, and international food demands. Thus, the urgency to tackle climate change issues through innovation and technology in agriculture and food systems has never been greater, when considered alongside the anticipated population explosion and subsequent increase in food demand by this century's end in the African continent.<sup>1</sup>

The detrimental impacts of climate change on global food and agriculture systems are extensive, including rising temperatures, unpredictable rainfall, and more natural disasters such as droughts and floods. These changes pose substantial challenges to economies by affecting key agriculture, water resources, and public health sectors. Globally, Sub-Saharan Africa has emerged as one of the most vulnerable regions to the harmful impacts of climate change.<sup>2</sup> Inequality and inadequate funding from wealthy countries and multilateral organizations towards sustainable development

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<sup>1</sup>Abegunde, Victor O., Melusi Sibanda, and Ajuruchukwu Obi. "The Dynamics of Climate Change Adaptation in Sub-Saharan Africa: A Review of Climate-Smart Agriculture among Small-Scale Farmers." *Climate* 7, no. 11 (November 2019): 132. <https://doi.org/10.3390/cli7110132>.

<sup>2</sup> Maino, Roldofo, and Drliona Emrullahu. *Climate Change in Sub-Saharan Africa Fragile States: Evidence from Panel Estimations*. IMF, Mar. 2022.

further exacerbates the ill-effects of climate change in SSA.<sup>3</sup> It is estimated that roughly 40 million people in the continent will be pushed into extreme poverty due to climate change by 2030, representing an 8% increase compared to predictions *excluding* climate change effects.<sup>4</sup>

The African continent grapples with a plethora of agricultural issues including deforestation, soil erosion, desertification, wetland degradation, and insect infestations, which are exacerbated by climate change; on its expansive land area of approximately 30 million km<sup>2</sup>.<sup>5,6</sup> Many scientific projections indicate that rising night temperatures, longer and more frequent heat waves, and increased drying will continue to threaten environmental systems and agricultural productivity in SSA. Further, the continent's varied semi-arid, arid, tropical, and humid climates demand country-specific responses to climate change.<sup>7</sup> While agriculture contributes 17% of SSA's gross domestic product (GDP), national reliance on agriculture as a share of GDP varies across the continent, from less than 3% in Botswana, 17% in South Africa, and 50% in Sierra Leone.<sup>8</sup> Moreover, nearly 80% of SSA's farmers are smallholders.<sup>9</sup> Pivotal determinants of smallholder farmers' livelihoods include regular rainfall patterns and reliable water access during planting and growing seasons: consequently, the interplay between climate change and poverty is not to be underestimated.<sup>10</sup> For instance, exposure to a flood shock is associated with a 35% decrease in consumption and a concomitant 17-percentage-point increase in the incidence of extreme poverty.<sup>11</sup> The vulnerability of SSA's small-scale agriculture and food systems to the impact of climate change brings various socioeconomic challenges which require targeted solutions, as these farmers play a crucial role in ensuring food security for local and national populations.

The harmful effects of climate change also extend beyond the immediate agriculture sector to negatively impact food prices and economic growth across African countries.<sup>12</sup> Disturbingly, projections indicate that a potential 3°C temperature rise could precipitate a 9% annual reduction in Africa's GDP until 2060. However, adherence to the 1.5°C target outlined in the Paris Agreement offers a more optimistic outlook, forecasting a modest decline of roughly 4%

<sup>3</sup> IPCC. "Summary for Policymakers." [www.ipcc.ch](http://www.ipcc.ch), 2022, [www.ipcc.ch/report/ar6/wg2/chapter/summary-for-policymakers/](http://www.ipcc.ch/report/ar6/wg2/chapter/summary-for-policymakers/)

<sup>4</sup> Maino, Roldofo, and Drilona Emrullahu (2022). *Climate Change in Sub-Saharan Africa Fragile States: Evidence from Panel Estimations*.

<sup>5</sup> Kombat, Richard, Paolo Sarfatti, and Oluwole Abiodun Fatunbi. "A Review of Climate-Smart Agriculture Technology Adoption by Farming Households in Sub-Saharan Africa." *Sustainability* 13, no. 21 (January 2021): 12130. <https://doi.org/10.3390/su132112130>

<sup>6</sup> Desjardins, Jeff. "Mapped: Visualizing the True Size of Africa." *Visual Capitalist*, February 19, 2020. <https://www.visualcapitalist.com/map-true-size-of-africa/>.

<sup>7</sup> Ayanlade, A., Oluwaranti, A., Ayanlade, O., Borderon, M., Sterly, H., Sakdapolrak, P., Jegede, M., Weldemariam, L., Ayinde, A. (2022) "Extreme climate events in sub-Saharan Africa: A call for improving agricultural technology transfer to enhance adaptive capacity." *Climate Services*. 27:100311. doi:10.1016/j.cliser.2022.100311

<sup>8</sup> Statista. "Africa: Agriculture as GDP Share by Country 2022," accessed December 12, 2023, <https://www.statista.com/statistics/1265139/agriculture-as-a-share-of-gdp-in-africa-by-country/>.

<sup>9</sup> IFAD. (n.d.). *The Field Report*. International Fund for Agricultural Development. <https://www.ifad.org/thefieldreport/>

<sup>10</sup> Liebmann, Brant, et al. "Seasonality of African Precipitation from 1996 to 2009." *Journal of Climate*, vol. 25, no. 12, 15 June 2012, pp. 4304–4322, <https://doi.org/10.1175/jcli-d-11-00157.1> Accessed 12 July 2020.

<sup>11</sup> Azzarri, Carlo, and Sara Signorelli. "Climate and Poverty in Africa South of the Sahara." *World Development*, vol. 125, Jan. 2020, p. 104691, <https://doi.org/10.1016/j.worlddev.2019.104691>.

<sup>12</sup> Brookings Institute (2020). Okonjo-Iweala, N. "Combating climate change. An urgent call for comprehensive global and local action." *Foresight Africa*; Kompas, T., Pham, V. H., & Che, T. N. (2018). *The Effects of Climate Change on GDP by Country and the Global Economic Gains From Complying With the Paris Climate Accord*. *Earth's Future*, 6(8), 1153–1173. <https://doi.org/10.1029/2018ef000922>.



annually through the year 2100. This highlights the pivotal role of international climate mitigation efforts on building SSA's economic resilience in the face of climate change. The International Monetary Fund's Regional Economic Outlook from 2020 also suggests that SSA's regional economic activity may decline by 1%, monthly, when the average temperature exceeds that month's 30-year average by 0.5°C.<sup>13</sup> Thus, regions of SSA's which are heavily reliant on agriculture and grow temperature-sensitive crops, are particularly sensitive to climate change.

## B. Climate-Smart Technologies & Innovation in SSA

Climate-smart agriculture (CSA) has emerged as a leading response to the effects of climate change outlined above. Broadly, CSA techniques simultaneously promote (i) sustainably increasing productivity and incomes in agriculture, (ii) adapting and building food systems' resilience to climate change, and (iii) reducing or eliminating greenhouse gas (GHG) emissions.<sup>14</sup> The Food and Agriculture Organization (FAO) defines CSA as “*an approach to help people who manage agricultural systems respond effectively to climate change ... not a set of practices that can be universally applied, but an approach that involves different elements embedded in local contexts. CSA relates to actions both on-farm and beyond the farm, and incorporates technologies, policies, institutions and investment.*”<sup>15</sup> CSA technologies thus aspire to strengthen food systems and communities by increasing their capacity to anticipate, mitigate, and adapt to climate change.<sup>16</sup> The FAO advises implementing CSA by (i) expanding an evidence base for CSA, (ii) supporting enabling policy frameworks, (iii) strengthening national and local institutions, (iv) enhancing financing options, and (v) implementing practices at the field level.<sup>17</sup>

CSA practices and impacts in SSA need to be tailored for specific regions since climate change effects vary across the continent. Variability in government policies, access to finance, farmer's understanding of climate change, and education also affects SSA country responses and implementation of CSA strategies and techniques.<sup>18</sup> Most CSA technologies are drought-resistant, pests and disease-resilient, remain effective in suboptimal soil fertility, and capable of thriving and yielding in a brief time frame.<sup>19</sup> Successful CSA innovations in SSA over

<sup>13</sup> “Regional Economic Outlook.” IMF, 2020, [www.imf.org/en/publications/reo?page=4&sortBy=Region#:~:text=The%20current%20outlook%20for%202020](http://www.imf.org/en/publications/reo?page=4&sortBy=Region#:~:text=The%20current%20outlook%20for%202020). Accessed 14 Apr. 2024.

<sup>14</sup> FAO (2021). “Climate-smart agriculture case studies 2021 – Projects from around the world.” Rome. Available at: <https://doi.org/10.4060/cb5359en>. Accessed November 28, 2023.

<sup>15</sup> FAO (2023). “Climate Smart Agriculture Sourcebook”. Available at:

<https://www.fao.org/climate-smart-agriculture-sourcebook/concept/en/>. Accessed November 28, 2023.

<sup>16</sup> Kombat, Richard, Paolo Sarfatti, and Oluwole Abiodun Fatunbi. “A Review of Climate-Smart Agriculture Technology Adoption by Farming Households in Sub-Saharan Africa.” *Sustainability* 13, no. 21 (January 2021): 12130. <https://doi.org/10.3390/su132112130>.

<sup>17</sup> FAO (2023). “Climate Smart Agriculture Sourcebook”.

<sup>18</sup> Ariom, Thaddaeus Obaji, Elodie Dimon, Eva Nambeye, Ndéye Seynabou Diouf, Oludotun Olusegun Adelusi, and Sofiane Boudalia. 2022. “Climate-Smart Agriculture in African Countries: A Review of Strategies and Impacts on Smallholder Farmers” *Sustainability* 14, no. 18: 11370. <https://doi.org/10.3390/su141811370>

<sup>19</sup> Kombat, Richard, Paolo Sarfatti, and Oluwole Abiodun Fatunbi. “A Review of Climate-Smart Agriculture Technology Adoption by Farming Households in Sub-Saharan Africa.”

recent years can be categorized by their respective impacts on (i) agriculture, (ii) degraded land, (iii) livestock, and (iv) water resource sectors, all of which are elaborated below.<sup>20</sup>

### **(i) Agricultural practices**

Across SSA, smallholder farmers employ CSA techniques such as crop diversification, no-tillage, and organic farming to reduce GHG emissions and mitigate climate change impacts. The most common CSA technologies in SSA for 2021 included intercropping, seed selection, improved varieties, agroforestry, and minimum tillage. Almost 72% of farmers compost residue after harvesting in the region, while roughly 95% use organic manuring and intercropping. Regenerative agriculture, which focuses on minimum or zero-tillage, soil cover maintenance, and crop rotation, is widely practiced across Ghana and other West African countries.<sup>21</sup> Roughly 73% of Ghanaian farmers practice crop rotation and 83% practice intercropping or plant legumes among crops.<sup>22</sup> In South Africa, regenerative agriculture has also emerged as one of the most advantageous practices and is widely adopted in the Western Cape. The practice is proven to effectively increase farmer's crop yields, soil fertility and moisture, and reduce soil erosion.<sup>23</sup>

Further, across East Africa, 70% of the population engaged in farming began to implement CSA tools beginning in 2010.<sup>24</sup> For example, in Kenya, many farmers have started to use CSA tools like climate-smart species and climate information services, which have proved effective in improving their overall productivity and crop-yield.<sup>25</sup> Agroforestry, improved livestock management, veterinary care, and manure management, and water conservation are also widely used by East African farmers. Similarly, using organic fertilizers through CSA have demonstrated a positive and consistent impact on productivity in Tanzania and Uganda.<sup>26</sup>

<sup>20</sup> Ariom, Thaddaeus Obaji, Elodie Dimon, Eva Nambeye, Ndèye Seynabou Diouf, Oludotun Olusegun Adelusi, and Sofiane Boudalia. 2022. "Climate-Smart Agriculture in African Countries: A Review of Strategies and Impacts on Smallholder Farmers."

<sup>21</sup> Partey, S., Zougmore, R., Ouédraogo, M., Campbell, B. (2018). "Developing climate-smart agriculture to face climate variability in West Africa: challenges and lessons learnt." *Journal of Cleaner Production*, 187: 285-295. <https://doi.org/10.1016/j.jclepro.2018.03.199>.

<sup>22</sup> Kombat, Richard, Paolo Sarfatti, and Oluwole Abiodun Fatunbi. "A Review of Climate-Smart Agriculture Technology Adoption by Farming Households in Sub-Saharan Africa."

<sup>23</sup> Senyolo, M., Long, T., Blok, V., Omta, O. (2018) "How the characteristics of innovations impact their adoption: An exploration of climate-smart agricultural innovations in South Africa". *Journal of Cleaner Production*, Volume 172, Pages 3825-3840, ISSN 0959-6526, <https://doi.org/10.1016/j.jclepro.2017.06.019>.

<sup>24</sup> Kirina, T., Groot, A., Shilomboleni, H., Ludwig, F., & Demissie, T. 2022. Scaling Climate Smart Agriculture in East Africa: Experiences and Lessons. *Agronomy*, 12(4), Article 820. <https://doi.org/10.3390/agronomy12040820>

<sup>25</sup> World Bank (2017). Hou, X., Morales, X., Obuya, G., Bobo, D., Braimoh, A. "Climate smart agriculture: successes in Africa" (English). Washington, D.C. Available at:

<http://documents.worldbank.org/curated/en/622181504179504144/Climate-smart-agriculture-successes-in-Africa>

<sup>26</sup> Lamanna, C, Namoi N, Kimaro A, Mpanda M, Egeru A, Okia C, Ramirez-Villegas J, Mwongera C, Ampaire E, van Asten P, Winowiecki L, Läderach P, Rosenstock TS. 2016. Evidence-based opportunities for out-scaling climate-smart agriculture in East Africa. CCAFS Working Paper no. 172. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark.



## **(ii) Restoration of degraded lands**

CSA restoration involves recovering the fertility and productivity of SSA's lands, which have been degraded by overgrazing, deforestation, or poor agricultural practices over centuries. These CSA practices have had broad success in the West African countries of Senegal, Guinea, Burkina Faso, Nigeria, and Ghana. Today, roughly 82% of West African farmers use trees as farm boundaries.<sup>27, 28</sup> CSA techniques like composting, organic manure, desalination of mangrove rice fields, and restoring salty soils also proved successful in Senegal.<sup>29</sup> Notably, Senegalese farmers often use assisted natural regeneration, agroforestry, and neem pesticides.<sup>30</sup> Moreover, in Benin, farmers have adopted CSA strategies like crop and livestock diversification, enhanced seed varieties, improved disease and pest control. Erosion control, stone bunds, and stabilization of gullies by filtering dikes have been successfully applied in Senegal, Ghana, Guinea, and Burkina Faso.<sup>31</sup> In East African countries of Kenya, Tanzania, and Uganda, land restoration through CSA has the potential to enhance climate change mitigation of highly degraded tropical soils: lands restored through CSA practice store 1.3 to 2.1 times more soil carbon than regular lands.<sup>32</sup> Other successful CSA tools in SSA include integrated agroforestry and building perennial plantations like oil palms, orchards, and various forest species.<sup>33</sup> Overall, these CSA techniques significantly increased crop yields and land adaptation to climate extremes like floods and droughts in SSA.<sup>34</sup>

## **(iii) Livestock practices**

CSA strategies to make livestock farming more sustainable, climate-resilient, and efficient involve improving animal health and managing grazing lands. SSA's livestock sector has the potential to account for nearly 50% of the continent's mitigation potential in agriculture, forestry, and land-use sectors.<sup>35</sup> West Africa's CSA practices for livestock protection include the use of fodder cultivation, forage conservation, grazing management, and crop-livestock production.<sup>36</sup> In countries like Senegal livestock farmers face challenges due to reduced availability of animal

<sup>27</sup> Kombat, Richard, Paolo Sarfatti, and Oluwole Abiodun Fatunbi. "A Review of Climate-Smart Agriculture Technology Adoption by Farming Households in Sub-Saharan Africa."

<sup>28</sup> Barasa, Paul M., Christina M. Botai, Joel O. Botai, and Tafadzwanashe Mabhaudhi. 2021. "A Review of Climate-Smart Agriculture Research and Applications in Africa" *Agronomy* 11, no. 6: 1255. <https://doi.org/10.3390/agronomy11061255>.

<sup>29</sup> Ariom, Thaddaeus Obaji, Elodie Dimon, Eva Nambeye, Ndèye Seynabou Diouf, Oludotun Olusegun Adelusi, and Sofiane Boudalia. 2022. "Climate-Smart Agriculture in African Countries: A Review of Strategies and Impacts on Smallholder Farmers"

<sup>30</sup>Ibid.

<sup>31</sup>Ibid.

<sup>32</sup>Ambaw G, Recha JW, Nigussie A, Solomon D, Radeny M. 2020. Soil Carbon Sequestration Potential of Climate-Smart Villages in East African Countries. *Climate* 8(11):124. <https://doi.org/10.3390/cli8110124>.

<sup>33</sup>Ibid.

<sup>34</sup> Partey, S., Zougmore, R., Ouédraogo, M., Campbell, B. (2018). "Developing climate-smart agriculture to face climate variability in West Africa: challenges and lessons learnt."

<sup>35</sup> Herrero, M., Henderson, B., Havlik, P. et al. Greenhouse gas mitigation potentials in the livestock sector. *Nature Clim Change* 6, 452–461 (2016). <https://doi.org/10.1038/nclimate2925>; World Bank (2018). "Scaling Up Climate-Smart Agriculture through the Africa Climate Business Plan". Washington, DC: World Bank. Available at: <https://documents1.worldbank.org/curated/en/309551539629069636/pdf/130849-WP-P161380-CSAReportWeb.pdf> Accessed 2 December, 2023.

<sup>36</sup> Amole, Tunde Adegoke, and Augustine Abioye Ayantunde. "Assessment of Existing and Potential Feed Resources for Improving Livestock Productivity in Niger." *International Journal of Agricultural Research*, vol. 11, no. 2, 15 Mar. 2016, pp. 40–55, <https://doi.org/10.3923/ijar.2016.40.55>. Accessed 19 Nov. 2022.



feed and water, and alterations in the intensity and spread of pests and diseases that impact livestock and grazing lands, and affect integrated crop-livestock systems of smallholders.<sup>37</sup> In response, CSA practices of haymaking, treating straw with urea, and pastoralism are currently present and have proven effective in Senegal. In Benin, to diversify their income streams, numerous smallholder farmers have adapted to rearing small ruminants and poultry under CSA.

Across East Africa, seasonal transhumance, or the practice of moving livestock from one grazing ground to another, involves crossing international borders and is highly prevalent.<sup>38</sup> This requires regional cooperation, coordination, and the use of effective CSA strategies. East African farmers may 'destock' by selling unproductive male animals before a drought to maintain a smaller herd through such transportation and productivity efforts. Restoring natural vegetation using CSA is also critical to improve feed availability during dry seasons and ensure adaptive livestock grazing in the Horn of Africa, including Kenya, Uganda, and Ethiopia.<sup>39</sup>

#### **(iv) *Water resources***

CSA can guarantee the efficient and sustainable management of water resources, which is critical for SSA regions facing water scarcity due to the changing climate. Roughly 77% of West African farmers plant early during rainy seasons to capitalize on extra rainwater, while 43% plant cover crops to retain soil moisture.<sup>40</sup> Across the Sahel, farmers in Mali, Niger, and Burkina Faso use water harvesting techniques based on indigenous knowledge of crops such as sorghum and millet, which can increase crop yield substantially.<sup>41</sup> Large-scale adoption of such practices faces challenges due to insufficient labor supply and education on erosion mitigation. In semi-arid regions of Ghana and Nigeria, drip irrigation systems are gaining popularity for their application in vegetable and cocoa farming, and the ability to conserve water while increasing crop yields.<sup>42</sup> In South Africa, precision irrigation, including drip and micro-sprinkler systems, is increasingly being used in water-scarce areas. A recent study classifying CSA innovations in South Africa concludes that rainwater harvesting, drought-tolerant seed varieties, and early maturing may be the most appropriate CSA technologies, particularly for the country's smallholder farmers.<sup>43</sup>

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<sup>37</sup>Ariom, Thaddaeus Obaji, Elodie Dimon, Eva Nambeye, Ndèye Seynabou Diouf, Oludotun Olusegun Adelusi, and Sofiane Boudalia. 2022. "Climate-Smart Agriculture in African Countries: A Review of Strategies and Impacts on Smallholder Farmers."

<sup>38</sup> World Bank (2023). "Climate Smart Agriculture: Successes in Africa". Washington, DC: World Bank. Available at: <https://www.worldbank.org/en/news/feature/2023/03/30/east-african-countries-bet-on-a-regional-approach-to-improve-resilience-and-sustainability-of-pastoral-livestock> Accessed 18 December, 2023.

<sup>39</sup>Ibid.

<sup>40</sup> Kombat, Richard, Paolo Sarfatti, and Oluwole Abiodun Fatunbi. "A Review of Climate-Smart Agriculture Technology Adoption by Farming Households in Sub-Saharan Africa."

<sup>41</sup> Partey, S., Zougmore, R., Ouédraogo, M., Campbell, B. (2018). "Developing climate-smart agriculture to face climate variability in West Africa: challenges and lessons learnt."

<sup>42</sup> ILSSI (2021). "Ghanaian farmers use solar-powered irrigation to innovate and diversify". Available at: <https://ilssi.tamu.edu/2021/11/11/ghanaian-farmers-use-solar-powered-irrigation-to-innovate-and-diversify>. Accessed 2 December, 2023.

<sup>43</sup> Senyolo, M., Long, T., Blok, V., Omta, O. (2018) "How the characteristics of innovations impact their adoption: An exploration of climate-smart agricultural innovations in South Africa."

Within East Africa, Ethiopia has embarked on the promotion and implementation of small-scale irrigation across the country.<sup>44</sup> Kenya also uses small-scale water harvesting; big concrete structures and certain dams are being constructed for CSA in the country's arid and semi-arid area. These include zai pits, shallow retention ditches, runoff harvesting, rock catchment harvesting, roof rainwater harvesting, ponds, dams, and water pans. Water harvesting is also practiced in many parts of Uganda, to supply water for domestic use, livestock, and crop production. In fact, water harvesting can be combined with low-cost irrigation technologies to provide greater benefits on water and soil conservation.<sup>45</sup>

### C. Conditions to Implement Technologies and Innovations

CSA technologies are either an adaptation of traditional methods, or entirely novel techniques. Many of the aforementioned CSA practices have been tested for effectiveness across SSA.<sup>46</sup> For example, soil conservation and multiple stress crop practices in Western and South Africa have been observed to notably increase yields of drought-resistant maize varieties and sustainably increase incomes of smallholder farmers.<sup>47</sup> CSA practices that have gained widespread adoption in West African countries include using organic manure and compost and intercropping.<sup>48</sup> Regional farmers prefer these techniques primarily as they are proven to increase agricultural production, improve soil quality, and lessen the chances of unsuccessful crop outcomes. In recent years, several East African countries have also launched national CSA strategies.<sup>49</sup>

Despite these areas of progress and knowledge gains, there continues to be a gap in smallholder farmers' understanding of CSA, as well as their resources and capacity to properly implement these in SSA.<sup>50</sup> Barriers to farmers' successful adoption of CSA include poor information access, credit availability, secure land rights, agricultural inputs, and market access, amongst others.<sup>51</sup> CSA adaptation is also influenced by availability of public funds, legislative policies, labor and land access, up-front investment costs and gender roles.<sup>52</sup> Analyzing the enabling policy, economic, and social environment for adopting CSA practices using concrete case studies from SSA is critical when identifying best practices that are scalable.

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<sup>44</sup> FAO, 2016. *Eastern Africa Climate-Smart Agriculture Scoping Study: Ethiopia, Kenya and Uganda*. By Njeru, E., Grey, S. and Kilawe, E. Addis Ababa, Ethiopia. <https://www.fao.org/3/i5485e/i5485e.pdf>

<sup>45</sup> Ibid.

<sup>46</sup> Barasa, Paul M., Christina M. Botai, Joel O. Botai, and Tafadzwanashe Mabhaudhi. 2021. "A Review of Climate-Smart Agriculture Research and Applications in Africa."

<sup>47</sup> Ibid.

<sup>48</sup> Ouédraogo, Mathieu, et al. "Farmers' Willingness to Pay for Climate Information Services: Evidence from Cowpea and Sesame Producers in Northern Burkina Faso." *Sustainability*, vol. 10, no. 3, 27 Feb. 2018, p. 611, <https://doi.org/10.3390/su10030611>.

<sup>49</sup> "Annual Report 2021." *Www.kas.de*, 29 Mar. 2022, [www.kas.de/en/annual-reports/detail/-/content/annual-report-2021](http://www.kas.de/en/annual-reports/detail/-/content/annual-report-2021). Accessed 14 Apr. 2024.

<sup>50</sup> Kombat, Richard, Paolo Sarfatti, and Oluwole Abiodun Fatunbi. "A Review of Climate-Smart Agriculture Technology Adoption by Farming Households in Sub-Saharan Africa."

<sup>51</sup> FAO (2023). "Climate Smart Agriculture Sourcebook". Available at: <https://www.fao.org/climate-smart-agriculture-sourcebook/concept/en/> Accessed November 28, 2023.

<sup>52</sup> FAO (2014). *FAO Success Stories on Climate-Smart Agriculture*. Food and Agriculture Organization, Accessed December 20, 2023, <https://www.fao.org/3/i3817e/i3817e.pdf>.



### III. Rationale & Objectives

As outlined in Section II, climate change has substantial effects on global economic growth through its impacts on key agriculture, water, and public health sectors. In recent decades, SSA has emerged as one of the world's most vulnerable regions to climate change. The disproportionate impact faced by SSA's smallholder farmers to shifting climate patterns underscores the urgent need for innovative solutions to protect their livelihoods and productivity, as they remain crucial to ensuring food security of local communities and national populations.

This collaboration between CERFAM and Columbia SIPA aimed to research, identify, critically evaluate, and recommend successful climate-smart technologies and innovations to fight climate change and build the climate resilience of SSA's agriculture and food systems. The SIPA student team carefully researched, cataloged and analyzed these practices in the context of specific African countries. SIPA integrated the agriculture nexus with water and energy systems, wherever feasible, in this comprehensive research approach. The ultimate goal of this project was to help CERFAM combat malnutrition and achieve SDG 2, while also guiding WFP's regional offices, institutional partners, and key stakeholders to protect farmer communities and battle ongoing climate and food system challenges through SSA and beyond.

#### **The primary objectives of this SIPA-WFP-CERFAM collaboration are:**

1. Map the general state of, regional variation in, and leading solutions to climate change risks across SSA's food and agricultural systems
2. Identify and analyze successful technologies and tools for strengthening SSA's integrated food, water, and energy systems' resilience to climate change
3. Conduct detailed literature reviews, while inviting feedback from CERFAM and WFP contacts, to narrow regional focus for further analysis and field visits in SSA
4. Identify at least three effective good practices in each of these SSA regions on Climate-Smart Technologies, Strategies, Techniques and Tools using CERFAM's methodology
5. Present data-driven evidence on selected SSA regions' successful innovation and technologies,' including their impacts on food security, farmer livelihoods, and climate resilience, along with core challenges faced in adoption of such solutions
6. Compile a comprehensive report containing findings from desk research, interviews, and recommendations focused on successful climate-smart innovations and technologies to increase awareness and adoption amongst SSA farmers and promotion by policymakers



## IV. Methodology

### A. Research Questions

1. How have climate patterns and changes evolved in the past decades across SSA?
2. What are the effects of climate change on SSA's agriculture and food systems?
3. How have and how can SSA's farmers cope with increased climate variability while maintaining and improving incomes from production and food security?
4. Which have emerged as the most effective technologies and innovations for strengthening resilience of SSA's food and agriculture systems to climate change?
5. How can successful strategies from climate resilience projects in one SSA country be adapted and applied to benefit other SSA regions?
6. What are the general limitations of these technologies and innovations in SSA?
7. What challenges will SSA's agriculture systems, especially smallholder farmers, face in adopting and accessing these technologies and innovations?
8. What are SSA's institutional capacities and limitations to support adoption of these technologies and innovations?
9. How can the insights from the Rapid Rural Transformation<sup>53</sup> initiative inform a broader strategy for effectively utilizing water, energy, and food in other SSA regions' agriculture and food systems?

### B. Country Selection Criteria

Three countries were selected for in-depth study through a combination of a consultative process with CERFAM, meetings with and recommendations from WFP regional bureaus, and desk research. A variety of factors were considered including geographical diversity, climate change vulnerability, and existing initiatives targeting climate change and food security. Priority was given to countries with demonstrated success or innovation in climate-smart tools and practices. Based on this due diligence, Namibia, Kenya, and Madagascar were selected to provide case studies from a diverse range of contexts as well as collect good practices that could be applicable to a variety of environments and actors. Field research was conducted from March 6-18, 2024. By examining these three countries in SSA, several cross-cutting findings have emerged allowing this SIPA team's identification of common success factors and challenges, as well as development of recommendations that can be used to inform the broader region's efforts to bolster food security through climate-smart practices. *Brief justification for the country selection is provided below:*

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<sup>53</sup> Under the Rapid Rural Transformation (RRT) initiative, WFP and the Government of Madagascar have launched an innovative project that seeks to establish solar-powered hubs, a sustainable water source and ICT allowing for the provision of essential services such as energy, water, and digital platforms to members of the Androy and Anosy regions. The initiative is committed to delivering these services in an environmentally responsible and sustainable manner. Source: World Food Programme. Accessed on January 23, 2024, <https://www.wfp.org/news/wfp-and-government-join-hands-transform-rural-communities-madagascar>.



**Kenya**, one of the largest economies in SSA, has a robust agricultural sector and significant investments in climate-smart practices that make it a prime opportunity to map climate-resilient technologies and policies, while gathering evidence of their impact on farmer’s food security and livelihoods. Additionally, **Namibia**, the driest country in SSA, faces unique challenges with climate vulnerability and drought that can offer valuable lessons to other arid and semi-arid regions particularly as advancing desertification poses a major threat in the region. Lastly, **Madagascar**, renowned for its rich biodiversity, faces a dual challenge of addressing extreme climate change vulnerability and bolstering conservation efforts, providing a unique opportunity to explore climate-smart initiatives that operate at this nexus and could be replicated elsewhere.

### C. CERFAM Good Practices Methodology

CERFAM’s Good Practices Methodology is employed throughout the SIPA team’s research to identify, classify, and assess certain potential good practices. Using this methodology, three stand-out practices have been selected due to their high performance and score along the criteria. CERFAM defines good practices as “*interventions, business practices, processes or methodologies with proven or potential evidence of impact on food security or nutrition.*” These are classified into three levels depending on the degree of evidence and scalability: (i) innovative practices, (ii) successfully demonstrated practices, and (iii) replicated or scalable practices.

After classifying potential good practices into one of the above levels, the practices are assessed on the basis of nine criteria by inserting relevant information about them through a CERFAM-approved quantitative questionnaire that scores them (Table 1). If the practice achieves a minimum score of 50%, they are further vetted using a qualitative questionnaire, expert panel, and additional steps. Notably, this research focused exclusively on identifying the potential good practices and only passing them through the initial quantitative questionnaire before providing context and information on the good practices, for additional analysis, to CERFAM.

CERFAM Criteria	Description
<b>Effectiveness</b>	Effectiveness tests whether the practice works and achieves measurable results. CERFAM measures the extent to which the practice’s objectives were achieved or are expected to be achieved and figure out the major factors influencing the achievement of identified objectives.
<b>Efficiency</b>	Efficiency measures how well were resources used by the programme in achieving its outcomes. A good practice should demonstrate that it applies cost-effective methodologies in its implementation, including showing the link between activities and results. Moreover, there is great need to factor social and environmental impacts into the cost of interventions.

<b>Relevance</b>	The proposed practice must address priority problems related to food security and nutrition. Additionally, the context in which the practice has been carried out, should be clearly considered.
<b>Feasibility</b>	The practice should not be complex, so target groups can quickly and easily understand and benefit from it. Different factors, including human, financial, and environmental factors, should be considered and addressed to ensure the practice is technically feasible. The good practice should be easy to learn and to implement.
<b>Innovation and Learning</b>	Innovation refers to the component of a good practice perceived as new. This may be a new technology or technique, but also a managerial process or participatory approach. Monitoring and evaluation (M&E) during and after project implementation may provide an opportunity to learn from the experience and improve similar initiatives in the future.
<b>Sustainability and Scaling Up</b>	The good practice should have a durable effect on its target groups, even after the withdrawal of project interventions. Moreover, the practice should demonstrate potential for scale up with success factors and lessons learned identified through research or practical experience.
<b>Accountability (Good Governance and Transparency)</b>	The project should be transparent with clear structure for participation, management and decision-making. Information should be readily and always available to stakeholders. Moreover, the project should have explicit funding sources and avoid any conflict of interest.
<b>Replicability and Adaptability</b>	The practice should show potential for replicability and therefore be adaptable to achieve similar objectives in various situations. Evaluation may assist in identifying the conditions of replicability. With clear conditions of replicability, good practices can be replicated and adapted by other practitioners in different or similar contexts.
<b>Partnership and Multi-Sectoriality</b>	Participatory approaches are essential as they support a joint sense of ownership of decisions and actions. The proposed practice should involve and foster collaboration among several stakeholders, especially local communities and national or local authorities, to ensure the practice is transferred at local and national levels.

**Table 1. CERFAM's Good Practice Criteria**

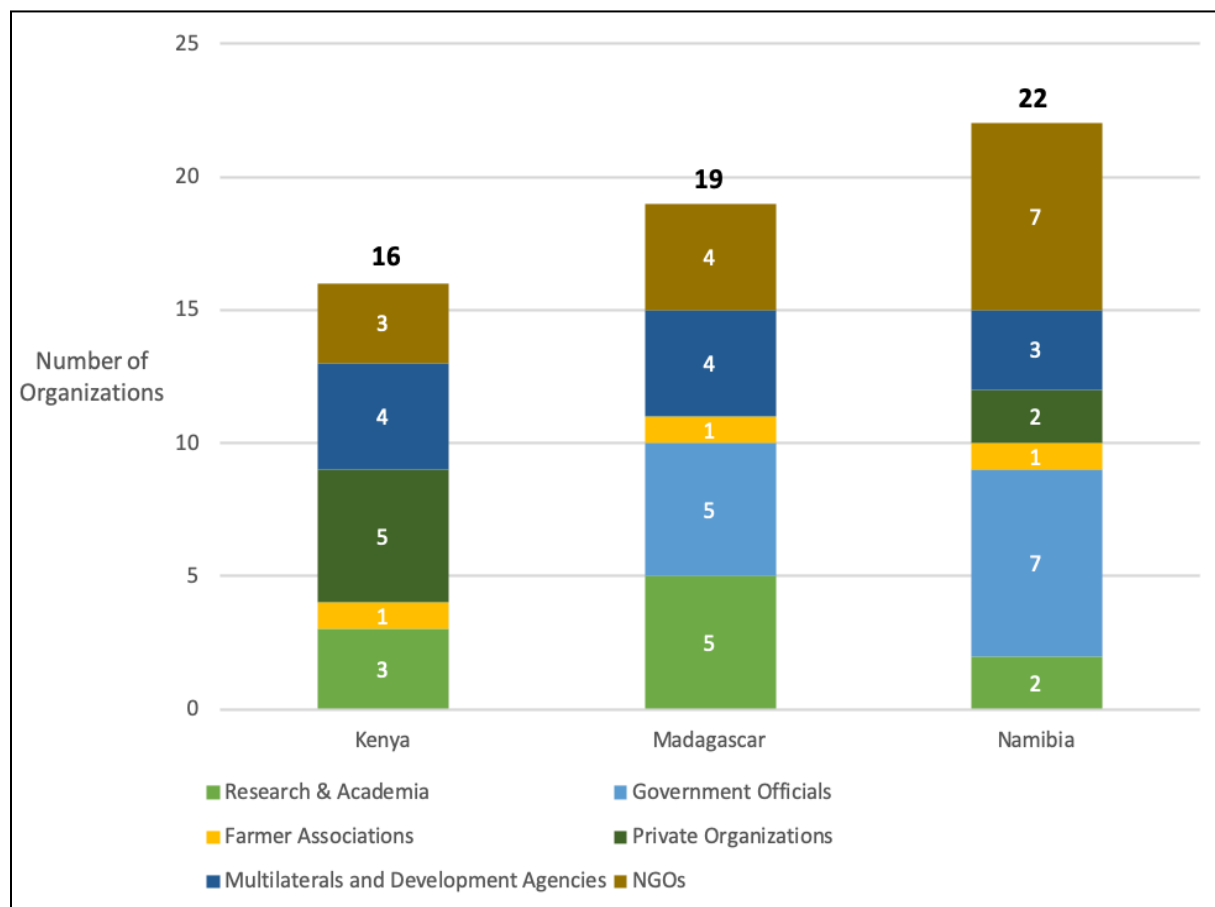


#### D. Literature Review

Desk research was conducted in two key phases throughout the SIPA-CERFAM collaboration. First, **preliminary research** identified key concepts and analytical frameworks for understanding SSA's food systems and climate change at the local, country, and regional levels. An in-depth review of existing technologies and innovations to build SSA's climate-resilient agriculture and food systems was also conducted, using the SIPA team's **customized case mapping tool**. In doing so, potential case study countries were identified for future inquiry through in-country and virtual stakeholder meetings. Once Kenya, Madagascar and Namibia were selected using this method, a **second phase of desk research** was conducted which focused on additional and more in-depth research specific to the original scope and new African regions. This included **country-specific analysis** focusing on identifying unique climatic, agricultural, and socio-economic conditions, as well as institutional actors and environments which enable (or impede) climate-smart innovation and technology.

#### E. Stakeholder Interviews

Across preliminary desk research and fieldwork, the team conducted key informant interviews (KIIs) with 57 organizations (Image 1). The SIPA team, in collaboration with CERFAM, developed and employed interview guides for four key stakeholder types of: (i) farmer associations and corporations, (ii) government officials, (iii) multilaterals, development agencies and NGOs, and (iv) research and academic organizations. Interviews were then coded and analyzed thematically to identify patterns and insights, using another **customized interview tool**. Particular focus was given to identifying opportunities for adaptability, replicability, and scale-up of climate-smart practices, local institutional context and challenges, and solutions and opportunities for the advancement of leading practices using holistic and sustainable approaches.



**Figure 1. Key informant interviews by region & organization-type**

## F. Limitations

Over the course of the research project, we encountered several limitations, including (i) limited geographic scope, (ii) predominance of qualitative data, (iii) focus on short-term efficacy of climate-smart practices, and (iv) relatively small interview sample. The SIPA team's research on climate resilience in SSA was geographically and demographically confined to specific regions within Namibia, Kenya, and Madagascar. This limited scope restricts the broader applicability of the findings to other countries within the region that may have different ecological, socio-economic, and cultural characteristics. Furthermore, the use of a referral-based, snowball sampling method for selecting stakeholders may introduce sampling bias. This approach could over-represent certain groups while excluding others, particularly from underrepresented sectors within the agricultural community, thereby limiting the diversity and inclusivity of perspectives.



The predominance of qualitative data gathered through interviews also introduces a layer of subjectivity in data collection. Despite employing structured interview techniques to standardize the process, the subjective nature of qualitative research can impact the objectivity and reliability of the data collected<sup>54</sup>. Additionally, logistical and financial constraints limited the scope of the research, affecting the number of field visits and the duration of engagements in each country. These limitations may have impeded a more comprehensive examination of varied CSA practices across the targeted nations.

Moreover, the assessment of innovative CSA practices primarily focused on their immediate efficacy and short-term benefits, with less consideration given to their long-term sustainability and scalability. A more extended evaluation period is necessary to fully determine the viability and broader applicability of these CSA good practices and innovations. Further, the exclusion of interviews with government officials limits the study by omitting critical perspectives essential for understanding the policy environment and institutional frameworks underpinning climate resilience initiatives. Lastly, although the research engaged a wide array of stakeholders, it did not comprehensively include all relevant actors. Notably, in Kenya, the absence of direct engagement with government officials and the limited representation of smallholder farmers restricts the depth and representativeness of the insights gathered. This selective engagement may affect the overall formulation of effective climate resilience and CSA strategies.

## V. Country Study 1: Kenya

### A. Background

According to the World Bank, Kenya is a lower-middle-income country in East Africa with a GDP of US\$415.34 billion (2023) and population of 54 million people (2022).<sup>55</sup> Kenya is SSA's seventh-largest economy and an important economic and strategic player within both the region and the continent. The country's capital of Nairobi is a regional hub for transportation, business, and commerce; meanwhile Mombasa, Kenya's second largest city, is an important and historical trading center and tourist destination. Kenya's main economic sectors are agriculture (29%), industry (20%), and services (51%).<sup>56</sup> Agriculture comprises about a third of Kenya's GDP, employs 70% of the rural population, and accounts for about 69.7 percent of export earnings.<sup>57</sup>

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<sup>54</sup> Note: The analysis from Namibia is a triangulation between the qualitative data collected through the KIIs and the quantitative data collected by WFP Country Office.

<sup>55</sup> "Kenya | GDP | 2021 | Economic Data." n.d. World Economics. <https://www.worldeconomics.com/Country-Size/Kenya.aspx>; World Bank. 2021. "Population, Total - Kenya | Data." Data.worldbank.org. 2021. <https://data.worldbank.org/indicator/SP.POP.TOTL?locations=KE>

<sup>56</sup> "Agriculture and Food Security | Kenya | Archive - U.S. Agency for International Development." 2020. 2017-2020. Usaid.gov. October 7, 2020.

<https://2017-2020.usaid.gov/kenya/agriculture-and-food-security#:~:text=Agriculture%20is%20the%20engine%20of.>

<sup>57</sup> International Fund for Agricultural Development (IFAD), "Kenya Country page," IFAD, accessed April 13, 2024, <https://www.ifad.org/en/web/operations/w/country/kenya#:~:text=Kenya%20has%20a%20population%20of,million%20households%20keep%20dairy%20cattle.>

Per the Kenya Poverty Report, the national poverty rate in Kenya was 38.6% in 2023.<sup>58</sup> Moreover, the rural poverty rate was 40.7%, while the urban poverty rate was roughly 27%. Amongst the various provinces, poverty rates vary quite a bit; 16.5% for Nairobi County, for example, and nearly 78% for Turkana County.<sup>59</sup> Notably, Kenya's population is set to increase to 57 million by 2030.<sup>60</sup> Kenya's score on the Human Development Index has risen steadily, positioning it at 143 out of 191 countries, with a 36% poverty rate.<sup>61</sup> Kenya is also urbanizing, and the country's urban population is anticipated to rapidly increase in coming years. In 2022, the urban population percentage was 29%, while the percentage of rural population was 71 and has been on the decline since the early 1990's.<sup>62</sup>

## Agriculture

Kenya is bisected by the equator and has several different climatic zones; extending from its famous White Highlands region, to beaches on the country's Swahili coast. Kenya boasts a rich variety of ecological zones and habitats; encompassing lowland and mountain forests, wooded and open grasslands, semi-arid scrubland, dry woodlands, inland aquatic environments, and coastal and marine ecosystems.<sup>63</sup> As a result, Kenya experiences three distinct climatic types: (i) a temperate subtropical climate in the West and South-West highlands, including Nairobi; (ii) a hot and humid climate along its coast; and (iii) a hot and dry climate in the North and East (Image 2).

Further, agriculture comprises about a third of Kenya's GDP, proving a critical sector to the country's economy.<sup>64</sup> Subsistence farming is quite common in the country and nearly 75% of Kenyans earn some income from agriculture.<sup>65</sup> The majority of Kenyan farmers are considered smallholder farmers, 80% of whom are women.<sup>66</sup> Moreover, the average age of a Kenyan farmer

<sup>58</sup> "From Poverty to Prosperity: Making Growth More Inclusive ." 2023. *World Bank*. Washington, D.C.: The World Bank Group . <https://documents1.worldbank.org/curated/en/099121323073037589/pdf/P1773530a7eb3009308e3f08663aa95c826.pdf>.

<sup>59</sup> Ibid.

<sup>60</sup> Government of Kenya. National Treasury & Economic Planning. "The Annual State of Kenya and State of World Populations Reports 2023 Launch – State Department for Economic Planning." 2023. October 28, 2023. <https://www.planning.go.ke/the-annual-state-of-kenya-and-state-of-world-populations-reports-2023-launch/#:~:text=Kenya>.

<sup>61</sup> UN Women. "STRATEGIC NOTE 2023-2026." UN Women. Accessed April 18, 2024. [https://www.unwomen.org/sites/default/files/2023-06/UN%20Women%20Kenya%20Office%20Strategic%20Note%202023-2026%20Popular%20Version\\_2023.pdf](https://www.unwomen.org/sites/default/files/2023-06/UN%20Women%20Kenya%20Office%20Strategic%20Note%202023-2026%20Popular%20Version_2023.pdf); UNDP. "Briefing note for countries on the 2023 Multidimensional Poverty Index." UNDP. Accessed April 18, 2024.

[https://hdr.undp.org/sites/default/files/Country-Profiles/MPI/KEN.pdf?\\_gl=1\\*17fri8c\\*\\_ga\\*MTQ5NjlyMjAzMi4xNjg0NDU3NDkx\\*\\_ga\\_3W7LPK0WP1\\*MTY4NDc5NDc1MC4yLjEuMTY4NDc5NTc3My42MC4wLjA.#:~:text=Based%20on%20these%20estimates%2C%2037.5,18%2C969%20thousand%20people%20in%202021](https://hdr.undp.org/sites/default/files/Country-Profiles/MPI/KEN.pdf?_gl=1*17fri8c*_ga*MTQ5NjlyMjAzMi4xNjg0NDU3NDkx*_ga_3W7LPK0WP1*MTY4NDc5NDc1MC4yLjEuMTY4NDc5NTc3My42MC4wLjA.#:~:text=Based%20on%20these%20estimates%2C%2037.5,18%2C969%20thousand%20people%20in%202021).

<sup>62</sup> World Bank. 2018. "Rural Population (% of Total Population) | Data." *Worldbank.org*. 2018. <https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?locations=KE>.

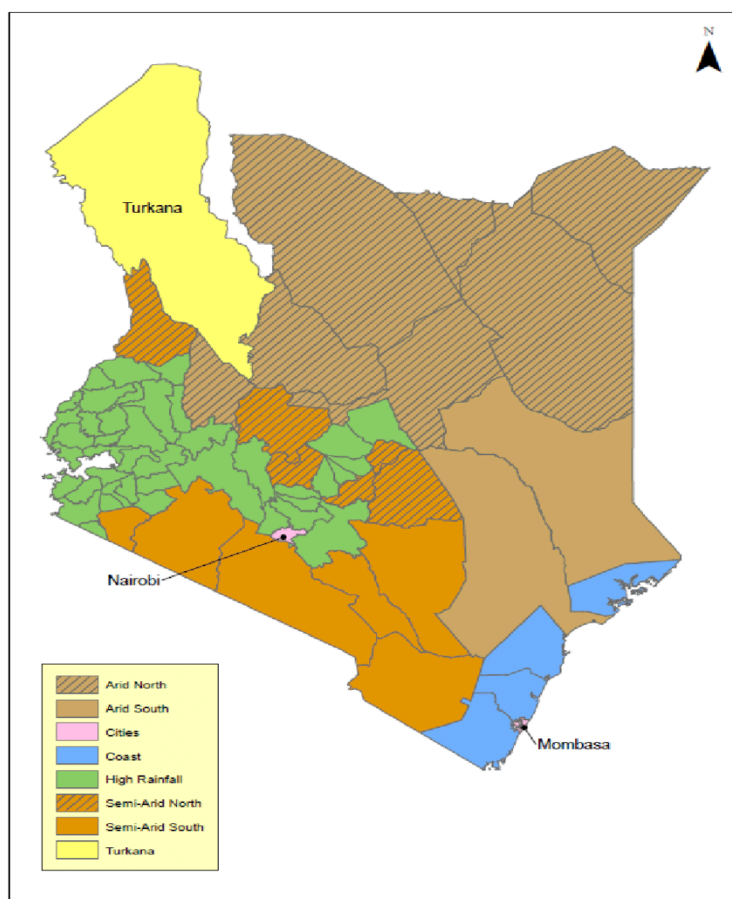
<sup>63</sup> "Kenya - Country Profile ." n.d. *Www.cbd.int*. Convention on Biological Diversity . Accessed December 13, 2023. [www.cbd.int/countries/profile?country=ke#:~:text=Kenya%20has%20a%20large%20diversity](http://www.cbd.int/countries/profile?country=ke#:~:text=Kenya%20has%20a%20large%20diversity).

<sup>64</sup> Kiambi, Stella, Pablo Alarcon, Jonathan Rushton, Maurice K. Murungi, Patrick Muinde, James Akoko, Gabriel Aboge, et al. 2018. "Mapping Nairobi's Dairy Food System: An Essential Analysis for Policy, Industry and Research." *Agricultural Systems* 167 (November): 47–60. <https://doi.org/10.1016/j.agsy.2018.08.007>.

<sup>65</sup> Kioko, Jane. n.d. "STATUS of FAMILY FARMING in USE of ADVANCED TECHNOLOGIES in KENYA State Department for Crop Development Ministry of Agriculture and Livestock Development." Ministry of Agriculture and Livestock Development . Accessed 2023. [https://unctad.org/system/files/information-document/atfa\\_p05\\_Kenya\\_Kioko\\_en.pdf](https://unctad.org/system/files/information-document/atfa_p05_Kenya_Kioko_en.pdf).

<sup>66</sup> Torres-Rahman, Zahid. 2023. "Women Smallholders Will Drive Africa's Transition to Regenerative Agriculture." *Business Fights Poverty*. February 22, 2023.

is relatively old at 61 years old, despite the fact that 75% of Kenya’s population is under 35 years old.<sup>67</sup> Also, the average land mass for agriculture is approximately 1.5 acres, and within that plot farmers typically practice mixed use farming with a variety of crops (maize, beans, potatoes, rice) and livestock in Kenya.<sup>68</sup> The country has two main growing seasons depending on rainfall patterns - a longer rainy season between March and May (*masika*) and a shorter rainfall season between October and November (*vuli*). Notably, climate change has destabilized and shortened these rainy seasons, threatened crop production, harvests, farmer food security and nutrition.<sup>69</sup>



**Figure 2. Kenya’s Agro-Ecological Zones<sup>70</sup>**

<https://businessfightspoverty.org/women-smallholders-will-drive-africas-transition-to-regenerative-agriculture/#:~:text=Regenerative%20agriculture%20improves%20the%20soil.>

<sup>67</sup> Citizen Digital. “Out of 47.6 Million Kenyans, 35.7 Million Are under the Age of 35.” 2020. February 21, 2020 [www.citizen.digital/news/out-of-47-6-million-kenyans-35-7-million-are-under-the-age-of-35-323822](http://www.citizen.digital/news/out-of-47-6-million-kenyans-35-7-million-are-under-the-age-of-35-323822).

<sup>68</sup> Kioko, Jane. n.d. “STATUS OF FAMILY FARMING in USE of ADVANCED TECHNOLOGIES in KENYA State Department for Crop Development Ministry of Agriculture and Livestock Development.” Ministry of Agriculture and Livestock Development . Accessed 2023.

<sup>69</sup> “Kenya Weather & Climate.” n.d. [www.nathab.com](http://www.nathab.com) .

<sup>70</sup> Vigani, M, H Dudu, and E Ferrari. “Estimation of Food Demand Parameters in Kenya a Quadratic Almost Ideal Demand System (QUAIDS) Approach.” Accessed May 15, 2022. <https://doi.org/10.2760/479781>.



Kenya's seven agro-ecological zones have different crop varieties suitable to the climate based on weather patterns and soil quality. Over 80% of Kenya's land is arid or semi-arid (ASAL) and is more prone to drought, food insecurity, and climate change impacts, and therefore requires technologies and techniques that take into consideration these unique vulnerabilities.<sup>71</sup> Due to the wide-ranging climatic idiosyncrasies, agricultural activities in the country differ by region. Kenya's Ministry of Agriculture has thus categorized the country into 40 different agro-climatic zones (ACZs) based on different moisture indexes, agricultural potential and suitability.<sup>72</sup> These ACZs will likely need to shift as Kenya's climate becomes hotter and drier, affecting ecosystem vitality, agricultural systems, crop yields, and food prices across the country (Image 2).<sup>73</sup>

Importantly, and beginning in 2013, Kenya's agriculture policy also became devolved from the national government to the country's 47 county-level governments. Division of labor between Kenya's governments is as follows: the national government is mandated with agricultural policy while county governments are responsible for "crop and animal husbandry, livestock sale yards, county abattoirs, plant and animal disease control, and fisheries."<sup>74</sup> The intended effect of this devolution was to improve agricultural production at Kenya's county level, given each county's specific climatic, production, and technological needs. Additionally, Kenya's 47 counties have County Integrated Development Plans (CIDPs) to guide their development over a five-year period. Key components of the CIDPs include the climate actions to be undertaken by counties over the next 5 years, and ideally given Kenya's high reliance on agriculture, this sector would demand a significant level of attention across counties.<sup>75</sup> Unfortunately, some Kenyan counties like Makueni and Wajir have allocated only 1% and 2% of their annual development budget to climate change respectively, while in other counties there is no legislation that supports the County Climate Change Funds (CCCFs). As one of the KII respondents highlighted, a "clear distinction between what is considered development and adaptation, remains absent in Kenya."<sup>76</sup>

### **Box 1: Overview of Kenya's Key Climate Change Legislation**

#### **National Climate Change Response Strategy**

Kenya's National Climate Change Response Strategy provides a comprehensive framework designed to mitigate and adapt to the effects of climate change. The strategy emphasizes the need for a coordinated response that integrates climate change considerations into national and regional development plans across all sectors. It identifies key vulnerable areas such as agriculture, water, health, and infrastructure. The strategy also outlines measures to build institutional capacity, develop appropriate technologies, and mobilize financial resources. It

<sup>71</sup> Climate Knowledge Portal, "Kenya Vulnerability Overview," World Bank, accessed April 13, 2024, <https://climateknowledgeportal.worldbank.org/country/kenya/vulnerability>.

<sup>72</sup> Lawrence, T, Justin M Vilbig, Geoffrey Kangogo, Eric M Fèvre, Sharon L Deem, Ilona Gluecks, Vasit Sagan, and Enbal Shacham. 2023. "Shifting Climate Zones and Expanding Tropical and Arid Climate Regions across Kenya (1980–2020)." *Regional Environmental Change* 23 (2). <https://doi.org/10.1007/s10113-023-02055-w>.

<sup>73</sup> Ibid.

<sup>74</sup> Njagi, Timothy, Lilian Kirimi, Kevin Onyango, and Nthenya Kinyumu. 2014. "THE STATUS of the AGRICULTURAL SECTOR after DEVOLUTION to COUNTY GOVERNMENTS."

[https://www.tegemeo.org/images/\\_tegemeo\\_institute/downloads/publications/policy\\_briefs/policy%20brief%20no%2013.pdf](https://www.tegemeo.org/images/_tegemeo_institute/downloads/publications/policy_briefs/policy%20brief%20no%2013.pdf).

<sup>75</sup> Interview with Technical University of Kenya, March 8, 2024.

<sup>76</sup> Ibid.



focuses on creating climate-resilient communities through education and awareness, ensuring that both policy makers and the general populace are informed and prepared to act on climate-related challenges.

#### **National Climate Change Action Plan (NCCAP, 2018-2022)**

The NCCAP 2018-2022 is an operational tool that builds on the foundation laid by the National Climate Change Response Strategy. It sets specific, measurable targets and actions to guide Kenya towards a low carbon development pathway while enhancing resilience to climate change. Key initiatives include increasing the share of renewable energy to 100% by 2022, enhancing energy efficiency across all sectors, and implementing climate-smart agricultural practices. The plan aims to reduce the vulnerability of over 10 million Kenyans who are directly dependent on climate-sensitive sectors. It also details actions to improve water security through efficient water management systems and expanding water storage capacity, particularly in arid and semi-arid areas, which cover over 80% of the country's land area and are home to about 30% of the population.

#### **National Adaptation Plan (2015-2030)**

Kenya's National Adaptation Plan 2015-2030 extends the framework of the previous strategies by providing a longer-term vision for enhancing the country's resilience to climate change. It outlines specific adaptation measures tailored to local conditions and vulnerabilities, particularly focusing on securing water supplies, achieving food security, and protecting infrastructure. The plan highlights the importance of community-based approaches, ensuring that adaptation efforts are locally relevant and supported by national policies. For instance, the plan includes strategies for drought risk management and flood resilience, which are critical given Kenya's recurrent droughts and the increasing frequency of heavy rainfall events. This comprehensive approach aims to not only protect but also sustainably develop the livelihoods of rural and urban populations, with particular attention to marginalized groups and gender-sensitive interventions.

*Source: National Climate Change Action Plan 2018 - 2022, Republic of Kenya, 2018.*

### **Climate-Smart Agriculture, Technologies, and Innovation**

Kenya's commitment to bolstering its food systems in the face of worsening climate change is evident through its government policies (Box 1). Kenya also boasts an active climate technology ecosystem with its rich diversity of fintech and agritech firms, entrepreneurs, and other companies working on climate-smart technologies and innovations. The country's climate-smart landscape is characterized by a dynamic interplay between emerging technological solutions, certain policy frameworks to mitigate climate impacts, and inherent challenges of its enabling business and institutional environment. Kenya's journey towards a resilient food system is paved with innovations ranging from precision agriculture and renewable energy solutions to water-saving irrigation techniques and climate-resilient crops. As Kenya grapples with the diverse impacts of climate change, the Kenyan government will need to continue to support climate-smart technology and innovation that is both sustainable and resilient.

### **Overview of Existing CSA Practices and Technologies**

The adoption of CSA practices and technologies is instrumental to enhancing Kenya's resilience to climate variability. Prominent among these CSA are improved seed varieties and native drought-resistant crop varieties, which have become fundamental in maintaining agricultural productivity across Kenya's diverse agro-ecological zones. Based on our research, advanced precision agriculture technologies are increasingly being employed, these include satellite



imagery and sensor-based systems that enable precise mapping and analysis of soil health and water usage, optimizing inputs and bolstering yield efficiency. Water conservation using CSA is further supported by widespread adoption of micro-irrigation systems, such as drip and sprinkler technologies, which significantly reduce water wastage. Integrated pest management (IPM) strategies are also being adopted to sustainably control pest populations, reducing reliance on chemical pesticides and enhancing crop health. Moreover, renewable energy solutions, particularly solar-powered systems, are being integrated into farming operations, from irrigation to post-harvest handling, to decrease the carbon footprint and increase the energy independence of agricultural enterprises. These technologies contribute to sustainable agricultural practices and preparing Kenya's agriculture and food systems for the ill-effects of climate change.

## B. Key Findings

The SIPA team conducted desk research and interviews both virtual and in-person in Kenya with a total of 19 interviews from 16 different organizations. The sector breakdown of these stakeholders is as follows: 3 NGOs; 2 UN specialized agencies, 2 development agencies, including 1 development bank and 1 global development agency; 4 private companies in energy, technology, and agriculture sectors; 3 research organizations including 2 universities; 1 farmer association; 1 social impact organization (see **Appendix 1** for full list of organizations).

Kenya has embarked on a transformative journey towards integrating climate-smart technologies and innovations across its agricultural landscape in the face of escalating climate challenges. This movement is propelled by private, nonprofit, public and farmers who recognize the critical need for adapting their food and agriculture systems to changing weather and climate conditions. By embedding technology into agricultural processes—from precision farming that harnesses data analytics for optimized resource use, to solar-powered irrigation systems that mitigate dependency on erratic rainfall patterns—there is a paradigm shift towards a more adaptive and resilient agricultural ecosystem in Kenya.

**Key findings** from the desk research and interviews conducted by the SIPA team include: highly prevalent but under-financed **digital innovations**; a need to **revive and reclaim indigenous farming practices**, including mulching, intercropping, and agroforestry; **climate-adaptation** focus of most interventions; and a **robust policy framework** but with poor implementations.<sup>77</sup>

### Abundance of Digital Solutions

Kenya's advanced and rich digital ecosystem has enabled the country's public and private sector to develop and distribute effective CSA tools using existing infrastructure. The digital technology sector's high growth potential has made it very appealing for local and international entrepreneurs and technology firms to invest in innovative digital solutions for agriculture and

<sup>77</sup> Taskin, Eren, Chiara Misci, Francesca Bandini, Andrea Fiorini, Nic Pacini, Clifford Obiero, Daniel Ndaka Sila, Vincenzo Tabaglio, and Edoardo Puglisi. 2021. "Smallholder Farmers' Practices and African Indigenous Vegetables Affect Soil Microbial Biodiversity and Enzyme Activities in Lake Naivasha Basin, Kenya." *Biology* 10 (1): 44. <https://doi.org/10.3390/biology10010044>.



food systems' climate resilience in the last decade. Innovative digital agricultural services (DAS), for example, are helping Kenyan farmers to scale production and develop stronger market linkages. Given the success of fintech in Kenya, the digital ecosystem is advanced and primed for greater DAS. Moreover, M-Pesa has played a critical role in enabling CSA technologies' distribution by facilitating seamless financial transactions across different industries, incomes, and regions.<sup>78</sup> Nearly 40% of the SIPA team's interview respondents mentioned the use of digital platforms and big data in successfully distributing CSA initiatives.

Kenya's digital-friendly ecosystem has enabled Pula Advisors, an agriculture insurance company that offers agriculture insurance to small-holder farmers, to develop a unique digital solution for building climate resilience. Pula compiles its area yield index insurance based on farmer yield data using technology like satellite imaging and yield data to determine insurance payouts. Afterwards, the team compiles data from the farmers and uploads it to their FieldSense Monitor platform, where they can see their farm data in real-time through a live dashboard, while their other two platforms - FieldSense Engage and FieldSense Advise - provide agriculture advice and insurance education to farmers. Through these platforms, farmers gain access to data they previously would otherwise not have access to, allowing them to make better informed decisions about their farm.

Moreover, as part of the Kenya Cereal Enhancement Programme Climate Resilient Agricultural Livelihoods (KCEP-CRAL) program, an e-voucher system was developed and deployed by Equity Bank Limited through EU COVID-19 grant funding. The "E-voucher" innovation was introduced to improve farmers' access to agricultural inputs through a private-sector driven delivery approach.<sup>79</sup> This allowed farmers to choose between inputs or agricultural training services, as well as gain access to conservation agriculture service providers. Other initiatives have focused more on the dissemination of meteorological data or information-sharing, like the Kenya Agricultural and Livestock Research Organization (KALRO)'s mobile app that provides farmers with real-time weather forecasts, agronomic tips, and market information.<sup>80</sup> Finally, precision agriculture technologies, including drones for mapping and monitoring crop health, have been piloted by organizations like the International Potato Center (CIP) and Precision Agriculture for Development (PAD), have improved yields and resource use efficiency.

## Information Access

Improving access to meteorological and climate-related information has emerged as a critical solution for building smallholder farmers' resilience to climate-change. Several of our

<sup>78</sup> "Africa: Digital Agriculture Services by Country 2020." n.d. Statista.

<https://www.statista.com/statistics/1230244/number-of-active-digital-agriculture-services-in-sub-saharan-africa-by-country/>.

<sup>79</sup> IFAD. "Before and during COVID-19, an E-Voucher Initiative Makes a Difference for Kenyan Farmers." Accessed April 13, 2024. [https://www.ifad.org/zh-TW/web/latest/-/story/before-and-during-covid-19-an-e-voucher-initiative-makes-a-difference-for-kenyan-farmers?p\\_i\\_back\\_url=%2Fzh-TW%2Fweb%2Flatest%3Fdelta%3D125%26start%3D8](https://www.ifad.org/zh-TW/web/latest/-/story/before-and-during-covid-19-an-e-voucher-initiative-makes-a-difference-for-kenyan-farmers?p_i_back_url=%2Fzh-TW%2Fweb%2Flatest%3Fdelta%3D125%26start%3D8)

<sup>80</sup> World Bank. "Scaling up Disruptive Technologies for Agricultural Productivity in Kenya." Accessed April 14, 2024.

<https://www.worldbank.org/en/results/2023/06/07/scaling-up-disruptive-technologies-for-agricultural-productivity-in-kenya#:~:text=Kenya>



interviewees cited ‘Early Warning Systems’ as a high-potential, simple mechanism for enabling information and preparedness amongst agriculture and food systems. Remote-sensing and better meteorological data also help to empower farmers to make decisions regarding their farms and understand climate risks better. There are many examples of organizations leveraging data from private and public partners to facilitate the advancement of precaution and on-going agriculture process, including from AGRA, USAID, Science for Africa, WFP, and the World Bank. The World Bank’s One Million Farmer Platform, for example, was a joint project with the Kenyan Ministry of Agriculture, World Bank, agtechs, and county governments. It provided farmers with access to high-resolution geospatial agro-meteorological data, agronomic advisories, and customized advice from 2020-2022. The program achieved immense success, linking 1.1 million farmers to these platforms; five million messages were sent by the project’s end. Additionally, 900 technologies, innovations, and efficient management practices across 19 value chains have been digitized and are in the process of being disseminated across Kenya.<sup>81</sup>

Another initiative, KALRO’s Crop/Livestock/Pasture Selector, also harnessed big data to provide Kenyan smallholder farmers with advice on the best crops to cultivate and livestock to keep on their lands. KALRO is easily available to be downloaded in the Google app store and complements Kenya’s e-Extension Platform; furthermore, early warning systems like FEWSNET and ICPAC’s work have been successful at reducing risk of farm losses due to heavy rains and flooding and drought events. Farmers that are warned early on of these potential natural disasters have an increased range of options on how to prepare and to adapt to the consequences. Big data, therefore, presents an interesting opportunity for more targeted solutions, greater knowledge and information-sharing, and more effective service delivery.

### **Complementarity of Indigenous Practices and Modern-Day Innovations**

While climate-smart technologies and digital agriculture services are widely available in Kenya, many smallholder farmers rely on indigenous farming practices. Notably, 30% of the respondents mentioned that the country's smallholder farmers are returning to traditional and indigenous farming techniques to adapt their farms to changing climates. There is a critical need to balance the adoption of new technologies, and identification of these as ‘innovative’, with recognition for indigenous practices and their inherent contributions to CSA. Indigenous farming practices are often low cost and more accessible to farmers because of their lower barriers to entry. Initiatives like Fairways Green Markets showcase the effective fusion of organic farming with technology to tackle food system challenges head-on, especially in mitigating post-harvest losses and enhancing market access.<sup>82</sup> New usage of forgotten crops such as sorghum, a grain historically utilized primarily for brewing beer, is another great example. Farmers are now recognizing its dual utility, serving both consumption and commercial purposes.<sup>83</sup>

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<sup>81</sup> World Bank. “Scaling up Disruptive Technologies for Agricultural Productivity in Kenya.” [www.worldbank.org/en/results/2023/06/07/scaling-up-disruptive-technologies-for-agricultural-productivity-in-kenya](http://www.worldbank.org/en/results/2023/06/07/scaling-up-disruptive-technologies-for-agricultural-productivity-in-kenya).

<sup>82</sup> Interview with Fairways Green Markets, March 11, 2024.

<sup>83</sup> Interview with KCIC, March 14, 2024.



Another initiative is Grow Biointensive Agriculture (GBIA) methods which treat the farm as a self-contained, living organism with its own ecosystem; this mirrors indigenous agricultural wisdom involving recycling organic bio-materials within the farm through composting, utilizing plant matter and animal waste to enrich the soil.<sup>84</sup> The shift of bringing back traditional ways underscores the untapped potential of indigenous practices, which, when innovatively adapted, can significantly enhance farmers' resilience against the adversities of climate change.<sup>85</sup>

### **Energy-Efficient Solutions for Water Conservation**

Access to consistent sources of water remains one of the biggest challenges for smallholder farmers in Kenya. Nearly 30% of the respondents mentioned that a core challenge they faced while farming was reliable access to water. Innovators such as SunCulture have revolutionized using irrigation powered by solar energy, significantly reducing both water wastage and energy costs. SunCulture demonstrates the transformative potential of integrating renewable energy sources, like solar power, into agricultural practices, underscoring the importance of sustainability and efficiency in agricultural operations.<sup>86</sup> With unpredictable rainfall patterns, adaptations are necessary to ensure that crop output and food security do not suffer. H2GROW, WFP's hydroponics initiative, has been successful operating in peri-urban or urban areas like the Kibera neighborhood in Nairobi. H2Grow provides low-cost hydroponic solutions to vulnerable communities using 90% less water and 75% space than a crop typically needs to grow.<sup>87</sup>

### **Popularity of Cross-Sector Partnerships**

Programs focused on building resilience are increasingly popular as their goals are more long-term and promote sustainable outcomes for farmers. For instance, USAID's Partnership for Resilience and Economic Growth (PREG) sought to enhance food and nutrition security, increase agriculture-led economic growth, and build resilience among people and systems in Northern Kenya. PREG focused on building climate resilience through increasing adaptability, reducing risk, and improving social and economic conditions to target the causes of vulnerability.

### **Robust Policy Frameworks**

The Kenyan Ministry of Agriculture, Livestock, Fisheries and Irrigation has been instrumental in promoting climate-smart practices, by creating policies to build the foundation for a climate-resilient agricultural sector within Kenya (Box 1). More than half, 53%, of respondents indicated past or present partnerships with the Kenyan government while implementing their projects; highlighting the critical role of the public institutions in facilitating CSA uptake, and the potential for further improvement through the development of cross-sector partnerships with private companies.

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<sup>84</sup> Interview with G-BIACK, March 15, 2024.

<sup>85</sup> Interview with Busara, March 14, 2024.

<sup>86</sup> Interview with SunCulture, March 14, 2024.

<sup>87</sup> H2Grow | WFP Innovation." n.d. Innovation.wfp.org. <https://innovation.wfp.org/project/h2grow-hydroponics>.



## C. Challenges

The increasing unpredictability and severity of weather patterns in Kenya serves to undermine resilience and adaptability of both existing and emerging agricultural technologies and practices. Notably, 98% of all crops in Kenya are rainfed and are vulnerable to rising temperatures and extreme weather events such as droughts and floods.<sup>88</sup> **Challenges** to successful distribution of CSA in Kenya include those related to **information access;** **financial access for farmers and funding for local investors;** **poor extension services;** **CSA-specific knowledge-gaps;** and **restrictions to ownership of agricultural land and market access for women and youth.** Addressing these challenges is crucial for scaling up CSA and ensuring they help enhance agricultural resilience and sustainability.

### **Limited Technological Adoption and Information Access**

Divergent levels of uptake and adoption of technology amongst smallholder farmers limit overall agricultural productivity and climate-resilience. It is estimated that only 20-30% of Kenya's farmers use digital agricultural solutions.<sup>89</sup> This gap is likely attributable to poor mobile phone or internet coverage, lack of access to smartphones, or limited digital literacy or education. Integrating the technology into a farmer's everyday life is also challenging and expensive, as many may be reluctant to implement a new technology that they may not trust or see as valuable to their livelihoods.<sup>90</sup> For example, concerns about uncertainty contribute to low adoption rates of GMO-related inputs, while a lack of awareness regarding available data prevents farmers from fully utilizing valuable warning or accessing systems.<sup>91</sup> Many farmers regard GMOs or other Western-led technologies with skepticism and see them as a form of agro-imperialism led by Western private sector interests.<sup>92</sup> Moreover, poor market information and accessibility hampers the potential for CSA adoption among smallholder farmers in Kenya.<sup>93</sup> There is a pressing need for comprehensive training and capacity-building initiatives to equip farmers with the knowledge and tools necessary for adopting sustainable practices and technologies.<sup>94</sup>

### **Farmer's Financial Access, Overall Funding Gaps**

40% of the KIIs complained of unfavorable financial access for farmers. One of the main barriers to implementation of CSA practices is the smallholder farmers' access to reliable sources of finance (credit, loans, savings, etc.). Farmers' have difficulty acquiring banking accounts, especially from large banks with more stringent rules related to 'Know Your Customer' (KYC). Innovative KYC and loan granting standards like agricultural yields and sales data may be an

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<sup>88</sup> The World Bank Group. "Climate-Smart Agriculture in Kenya." CSA Country Profiles for Africa, Asia, and Latin America and the Caribbean Series. 2015.

<sup>89</sup> Baumüller, Heike, and John Kieti. 2022. "Digital Solutions Are Boosting Agriculture in Kenya, but It's Time to Scale Up. Here's How." The Conversation. November 1, 2022. <https://theconversation.com/digital-solutions-are-boosting-agriculture-in-kenya-but-its-time-to-scale-up-heres-how-192422>.

<sup>90</sup> Interview with G-BIACK, March 15, 2024.

<sup>91</sup> Ibid.

<sup>92</sup> Ibid.

<sup>93</sup> Interview with AGRA, March 15, 2024.

<sup>94</sup> Interview with University of Nairobi, March 8, 2024.



important substitute. The high cost of insurance and reliance on donor funding, are significant hurdles to achieving sustainable agricultural growth.<sup>95</sup> Moreover, limited access to markets hinders smallholder farmers' ability to optimize agricultural practices and mitigate risks associated with unpredictable weather patterns.<sup>96</sup> Fragmented market access also has led many farmers to use middle-men or other surrogates to access the market, often leading to exploitation.

Compounding this issue is a lack of robust market infrastructure and intense competition both within farmer's local markets and with international competitors, which diminish profit margins and undermine the viability of CSA investments. Additionally, poor knowledge about market prices make farmers vulnerable to exploitative practices and gives them less power over post-production activities, weakening their linkages within the Kenyan agriculture value chain.<sup>97</sup> Asset-based loans emerged as a potential solution for these challenges. For example, H2Grow provides hydroponics units as asset-based loans, which allows farmers to repay unit costs with the gross profit of the asset over a determined period and improves their overall market access.<sup>98</sup> On the private side, investors highlight that local African and Kenya entrepreneurs often lack enough funding and resources for building solutions to climate-resilient technology, especially at the seed stages, given high competition from international entrepreneurs and investors.<sup>99</sup>

### **Inconsistent Policy and Governance**

Inconsistency in Kenyan government policies between national and county governments, and a lack of effective enforcement mechanisms across all levels, present major challenges to the sustainability of conservation efforts and the broader adoption of CSA tools.<sup>100</sup> To this point, 40% of the KII respondents raised a concern regarding discrepancies between national and county-level policies. Furthermore, weak public extension services from Kenya's county-level governments make it difficult for farmers to get the knowledge and tools they need, like fertilizer or high-quality outputs. Extension officers in some counties require farmers to travel to the extension offices—not the other way around—which puts an unnecessary burden on farmers. Some estimates put the ratio of 1 extension officer for every 5,000 farmers in some counties.<sup>101</sup> Discrepancies in agriculture funding between Kenya's counties have also contributed to county-level differences in agricultural production and techniques, which lead to low yields for smallholder farmers. The shortcomings of public extension services have led to the creation of more private sector alternatives, but they are often too expensive for farmers to access. Finally, high turnover of public officials also further disrupts the consistent and smooth policy implementation.

<sup>95</sup> Interview with AGRA, March 15, 2024; Interview with Pula Advisors, March 13, 2024.

<sup>96</sup> Interview with Science For Africa, March 12, 2024; Interview with Fairways Green Markets, March 11, 2024.

<sup>97</sup> Interview with the World Bank, March 13, 2024.

<sup>98</sup> Interview with WFP, March 11, 2024.

<sup>99</sup> Interview with KCIC, March 14, 2024.

<sup>100</sup> Interview with USAID, March 14, 2024.

<sup>101</sup> Anthony Langat. March, 2020. "Partnerships Aim to Rebuild Kenya's Agriculture Extension Services." Devex. March 11, 2020. <https://www.devex.com/news/partnerships-aim-to-rebuild-kenya-s-agriculture-extension-services-96716>.



Reliance on unelected technocrats and a lack of coordination among county departments lead to inconsistent approaches from incumbent governments and subsequent ones, hindering efforts to improve agricultural productivity and sustainability using CSA practices.<sup>102</sup>

### **Gender Division of Assets and Labor**

The lack of female-owned assets, decision-making power, access to information, access to finance and purchasing inhibits Kenyan women smallholder farmers' from expressing their opinions and actively engaging in business activities.<sup>103</sup> Male farmers tend to own most assets, including land, and control the household's money, despite female farmers contributing more to agricultural and farming activities than men. Women's access to land is also variable based on their marital status; women who are married own more land than widowed and single women.<sup>104</sup> Furthermore, entrepreneurship for female farmers is hampered by the necessary involvement and consent of male in decision-making. Women smallholder farmers also lack sufficient access to finance, with issues such as collateral requirements acting as significant barriers.

### **Limited Youth Engagement on Agriculture**

There is a significant hurdle to engaging youth within the agricultural sector of Kenya due to a general lack of interest and incentives arising from the lack of land ownership, access to finance, and negative image associated with the industry. On the supply side, youth prefer to work on the market and sales end rather than the production side. Youth have too few resources to engage in production and have low ownership of productive agriculture assets. This is undercut by youth attitudes towards farming; many think it's a profession for the elderly.<sup>105</sup> Broadly, the SIPA team gains the sentiment that what inhibits CSA practice dissemination and uptake in Kenya are the general constraints on productivity and innovation that may also apply to other forms of agricultural activity; such as barriers to financial access, youth and gender-based limitations.

## **D. Recommendations**

The following section outlines our **recommendations** based on key findings and identified challenges: **improving financial and technology access**, capacity building of **government extension services**, **reviving indigenous CSA practices**, **flexible funding** and **digital-based opportunities for local and youth-led solutions**, and **better knowledge sharing from researchers to farmers**.

### **Cross-Sector Partnerships to Improve Extension Services**

There is a dire need for investment in Kenya's agricultural extension services to educate and train smallholder farmers on the benefits and operation of CSA technologies. Considering the

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<sup>102</sup> Interview with Science For Africa, March 12, 2024.

<sup>103</sup> Interview with Busara, March 14, 2024; Interview with WFP, March 12, 2024; Interview with Sunculture, March 14, 2024; Interview with University of Nairobi, March 8, 2024; Interview with KCIC, March 14, 2024.

<sup>104</sup> Interview with Technical University of Kenya, March 8, 2024.

<sup>105</sup> Interview with WFP, March 12, 2024; Interview with Busara, March 14, 2024; Interview with Technical University of Kenya, March 8, 2024.



budget constraints and inability of the country's existing governments to develop and expand its extension services, private support may be a viable solution to improve and expand this service. This may be achieved through collaborations between public and private organizations. Increasing and monitoring proper use of Kenya's national budget for extension service activities at the devolved county-level may also help increase the number of extension officers per farmer.

### **Involve Youth in Digital and Market-Facing CSA Roles**

Increasing the number of digital-focused and market-facing agriculture roles, providing training, and highlighting the entrepreneurial opportunities in the agricultural sector can help entice a growing number of young people to remain working in food-systems and agriculture in Kenya. Emphasizing innovation and creating opportunities that resonate with the interests and aspirations of the younger generation will highlight the potential opportunities within the agricultural sector. Leadership training, mentorship opportunities, or skills-building facilitated by NGOs or private companies can also help achieve this goal.

### **Revive Indigenous CSA practices for Climate Adaptation**

CSA technologies including drought-resistant crops, improved seed varieties, irrigation technologies, and other technologies that focus on adaptation of climate change's effects demand greater investment in Kenya. Moreover, smallholder farmers need access to high quality inputs since they often cannot afford them. Increased public subsidies coupled with funding from multilateral organizations to provide these inputs and CSA tools may help increase their uptake amongst vulnerable smallholder farmers, while also focusing on the fact that many of the CSA practices have been used before by local farmers. Reviving these indigenous CSA methods - many of which are misclassified as 'new' innovations, but have been in existence for long periods of times - can increase adaptations without requiring any new 'learning' or education.

### **Improve Smallholder Farmer Access to Finance and Tech**

Governments, financial institutions, and organizations can provide access to affordable credit, insurance, and risk management tools specifically designed to address climate-related risks for helping Kenya's smallholder farmers to recover from climate-change fuelled losses and invest in climate-resilient practices. Private sector firms or multilateral organizations could help facilitate this process, ideally by employing a "human centered design" approach to involve beneficiary perspectives at all stages of development.<sup>106</sup> This means conducting a needs assessment, household surveys, pilot projects, or other approaches to ensure that the financial product is easily accessible to low-income, and often low-educated, smallholder farmers.

While fintech products like M-KOPA and MPESA dominate Kenya's urban markets, overall uptake of related agritech and fintech products amongst rural smallholder farmers is still low. Education interventions to improve smallholder farmer's understanding of digital financial services may go a long way to increase uptake of these. Further, bundling digital products with

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<sup>106</sup>Interview with WFP, March 11, 2024.



non-digital tools could be another potential avenue to increase uptake of adaptive technologies amongst skeptical smallholder farmer groups. A case of this is Pula's crop insurance, wherein insurance policies are strategically bundled with products that farmers are already using.<sup>107</sup>

Further, improving market access and information flow for smallholder farmers is essential in Kenya. Interviewees highlight the success of entrepreneurship in providing climate-resilient solutions, outlining a limitation in funding support for local actors, particularly at seed stages.<sup>108</sup> Investments to support marginalized local entrepreneurship and cutting-edge innovations can help bridge gaps between local and international contributions to Kenya's CSA technologies, noting the greater sustainability that comes with developing home-grown solutions. While some progress has been made, development finance institutions (DFIs) can provide much-needed additional support to de-risk loans and credit provision for smallholder farmers. Ideally, DFIs will collaborate with Kenya's local financial institutions and fintechs to provide guarantees for farmers to access micro-loans and credit. This can simultaneously develop local institutional capacity while enabling increased financial access for smallholder farmers by leveraging innovative cross-sector partnerships. For example, startups like FarmDrive use mobile technology to offer credit scoring and financial services for smallholder farmers, enhancing their access to institutional loans and financial products.<sup>109</sup> One Acre Fund's microfinance model has also had success, providing smallholder farmers with a bundle that includes training, inputs, credit, storage, and insurance.<sup>110</sup>

### **Knowledge Sharing between Researchers, Implementers and Farmers**

There is a dire need for greater collaboration and dialogue across implementers and beneficiaries including from academia, development agencies, multilateral institutions, and the private sector. Farmer-to-farmer platforms like the World Bank's One Million Farmer Platform serve as a resource for farmers to communicate and learn about different techniques and technologies from farmers across Kenya, leading to greater knowledge sharing and transfer. Similar platforms, which are easy to use and accessible to all farmers with a smartphone, can facilitate inclusive access to climate information and better decision-making for Kenya's smallholder farmers. The creation of 'satellite farms' where representatives, such as leaders of farmer associations, are invited from different farms across the country to learn about organic farming, to promote greater dissemination of organic farming practices back to local communities.<sup>111</sup> Additionally, a farmer association like Kenya National Farmers' Federation (KENAFF) provides an important convening body for farmers across counties and the country to meet and exchange knowledge. Continuing to build KENAFF's membership and grow other smaller farmer cooperatives could help enable more farmer-to-farmer exchanges of climate-smart agriculture practices and

<sup>107</sup> MIT SOLVE. "Pula: Insurance for Smallholder Farmers." Accessed April 17, 2024. <https://solve.mit.edu/challenges/elevateprize/solutions/26221>.

<sup>108</sup> Interview with KCIC, March 14, 2024.

<sup>109</sup> WSA. "About WSA | WSA," n.d. <https://wsa-global.org/about/>.

<sup>110</sup> One Acre Fund. "Impact in Detail." Accessed April 17, 2024.

<https://oneacrefund.org/our-impact/how-we-measure-impact/impact-detail>.

<sup>111</sup> Interview with G-BIACK, March 15, 2024.



techniques. Enabling farmers to understand both the risks and rewards of CSA tools may also empower them to make informed farming decisions and build climate-resilience.

## VI. Country Study 2: Madagascar

### A. Background

#### Overview

Madagascar is an island country off the southeastern coast of SSA with a population of 29.6 million people and a GDP of 15.3 billion. Despite substantial natural resources, the country has experienced low economic growth and one of the world's highest poverty rates at 80% (2023).<sup>112</sup> The country is ranked 173<sup>rd</sup> out of 191 countries in terms of HDI and chronic malnutrition is estimated to affect almost half of all children under five.<sup>113</sup> Madagascar is also one of the most vulnerable countries to climate change, as it is exposed to a number of climate hazards, such as cyclones, droughts and floods, which are predicted to increase in severity and frequency in the coming years.<sup>114</sup> In Southern Madagascar, the Grand Sud region is particularly vulnerable to climate change, and in recent years has faced periods of prolonged droughts that have worsened food insecurity and malnutrition.<sup>115</sup>

#### Agriculture

Agriculture has a vital role in Madagascar's economy, comprising 30% of the country's GDP.<sup>116</sup> While this proportion is sizable, it still does not reflect the amount of work that agriculture provides in Madagascar. In fact, the combination of farming, fishing, and forestry makes up 70% of total employment.<sup>117</sup> This disconnect comes from the heavy reality of subsistence farming in the country: 4 out of 5 people in Madagascar rely on agriculture for their livelihoods and incomes, but most of them are rural subsistence farmers who lack sufficient access to markets. Promoting mechanisms for market inclusion, along with techniques and tools that increase farm yields from subsistence have the potential to improve the majority of Malagasy people's lives. The current landscape of agriculture in Madagascar is thus one of vulnerability and small-scale farms. Madagascar's agriculture sector is built upon roughly 2.5 million smallholder farms, most

<sup>112</sup> World Bank. "The World Bank in Madagascar." Accessed April 13, 2024.

<https://www.worldbank.org/en/country/madagascar/overview>.

<sup>113</sup> WFP. "Madagascar: World Food Programme." UN World Food Programme. Accessed April 13, 2024.

<https://www.wfp.org/countries/madagascar>.

<sup>114</sup> International Monetary Fund. Fiscal Affairs Dept. "Republic of Madagascar: Technical Assistance Report-Climate Macroeconomic Assessment Program", IMF Staff Country Reports 2022, 342 (2022), A001, accessed Apr 13, 2024,

<https://doi.org/10.5089/9798400226212.002.A001>

<sup>115</sup> IPC. "Madagascar: Grand Sud & Grand Sud-Est IPC Food Security & Nutrition Snapshot, June 2023-April 2024." ReliefWeb.

Accessed accessed Apr 13, 2024.

<https://reliefweb.int/report/madagascar/madagascar-grand-sud-grand-sud-est-ipc-food-security-nutrition-snapshot-june-2023-april-2024>.

<sup>116</sup> World Bank. "Madagascar: \$227 Million to Increase Productivity and Strengthen the Resilience of Rural Livelihoods." World Bank, April 7, 2023. Accessed April 13, 2024.

<https://www.worldbank.org/en/news/press-release/2023/04/07/madagascar-afe-227-million-to-increase-productivity-and-strengthen-the-resilience-of-rural-livelihoods>.

<sup>117</sup> Ibid.



of which are significantly smaller than 10 hectares.<sup>118, 119</sup> Most of this land is dedicated to rice, and almost 90% of households grow rice.<sup>120</sup> Some of this rice makes it to market, but most households grow it for their own consumption. Despite this, rice is not the most stable or productive crop. The rice market is not prospering; the annual average growth rate of the rice sector is only 1.5 percent.<sup>121</sup> Rice is vulnerable to change in rainfall patterns and increasing temperature, which has meant crop's productivity has fallen in the face of climate change.<sup>122</sup>

While most of its arable land is dedicated to rice, Madagascar has a few cash crops including maize, peanuts, cloves, and vanilla, which make up over 20% of the foreign currency inflow.<sup>123</sup> Of these, cloves and vanilla are the most valuable, representing 85% of agricultural exports.<sup>124</sup> Despite the crops' high economic value, almost 4 out of 5 smallholder farmers in Madagascar live below the poverty line of \$1.90 per day.<sup>125</sup> The agricultural sector still is mostly dedicated to subsistence farming, not exports. Importantly, this delineation between subsistence and cash farming is regional: cash crops are mostly grown in the country's Eastern and North-Eastern regions.

Madagascar is made up of ten agro-ecological regions, so the implications of agricultural activities vary for its population.<sup>126</sup> In the most basic identification of factors, there are 6 different zones, but analysis can be even more detailed leading to 10 zones (see Image 3 below) or even up to 15.<sup>127</sup> The Northern & North Eastern region of Madagascar is marked with abundant rainfall, and depending on the subregion, has productive volcanic soils. As such, this region produces mostly cash crops. In fact, 90% of the country's vanilla and 50% of its clove production can be found in the North-Eastern agro-region of Madagascar. There are preserved forests, high numbers of cattle, rice production, sugar cane, cacao, and even essential oil plants across this region. The country's Eastern coast also is a place of abundant rainfall, and temperature remains mild throughout the year. However, the coastal land is particularly vulnerable to cyclones and subsequent flooding, which also affects market access of farmers. Just

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<sup>118</sup> IFAD. "Madagascar." International Fund for Agricultural Development. Accessed April 13, 2024.

[www.ifad.org/en/web/operations/w/country/madagascar](http://www.ifad.org/en/web/operations/w/country/madagascar).

<sup>119</sup> FAO. "Madagascar: Background." Food and Agriculture Organization of the United Nations. Accessed April 13, 2024.

[www.fao.org/in-action/water-for-poverty-in-africa/countries/madagascar/background/en/](http://www.fao.org/in-action/water-for-poverty-in-africa/countries/madagascar/background/en/).

<sup>120</sup> IFAD. "Madagascar." International Fund for Agricultural Development.

<sup>121</sup> Ibid

<sup>122</sup> Harvey, C. A., Rakotobe, Z. L., Rao, N. S., Dave, R., Razafimahatratra, H., Rabarijohn, R. H., Rajaofara, H., & Mackinnon, J. L. (2014). Extreme vulnerability of smallholder farmers to agricultural risks and climate change in Madagascar. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*, 369(1639), 20130089.

<https://doi.org/10.1098/rstb.2013.0089>

<sup>123</sup> UNICEF. "Impact Analysis of Agroindustry and Cash Crop Sector Activities on Children's Rights in Madagascar." UNICEF Madagascar, 2020. Accessed April 13, 2024.

[www.unicef.org/madagascar/en/reports/impact-analysis-agroindustry-and-cash-crop-sector-activities-childrens-rights-madagascar](http://www.unicef.org/madagascar/en/reports/impact-analysis-agroindustry-and-cash-crop-sector-activities-childrens-rights-madagascar).

<sup>124</sup> Ibid

<sup>125</sup> FAO. "Madagascar: Background."

<sup>126</sup> Randrianarisoa, Jean Claude, and Bart Minten. "Agricultural Production, Agricultural Land and Rural Poverty in Madagascar." Cornell Food and Nutrition Policy Program Working Paper No. 112, September 2001. Accessed April 13, 2024.

<https://ssrn.com/abstract=439101> or <http://dx.doi.org/10.2139/ssrn.439101>.

<sup>127</sup> FAO & WFP. "Mission Fao/Pam D'évaluation Des Récoltes Et De La Sécurité Alimentaire À Madagascar." FAO. October, 2016. Accessed April 17, 2024. <https://www.fao.org/3/i6335f/i6335f.pdf>



in 2024, two tropical cyclones made landfall in Madagascar: TC Alvaro on January 1st in the central western part of the country, and TC Gamane on March 27th in the northeastern part of the country, with over 90,000 affected<sup>128, 129</sup>. Infrastructure, including Madagascar's major ports, regional roads and railroads, is equally vulnerable to cyclones, which disrupts the food system.

Notably, Madagascar's Southern & South-Western Regions are the country's most food-insecure. There is very minimal rainfall and the soil is generally ill-equipped for agriculture. Tubers are the most common crop in this region, which means these regions have the lowest total value product compared to other regions. This region's poverty is also marked by low education levels. The Littoral Western region produces mostly rice, since this region's topography allows for large alluvial plains which are compatible with growing rice. Rainfall is usually sufficient except for a long dry season, which is sometimes exacerbated by high temperatures and climate change.<sup>130</sup>

Madagascar's most densely populated region is the Highlands. Within this region, there are the three large urban areas including the country's capital city, Antanairvo. This region has some of the country's best access to institutions, including schools and agriculture extension services. There is a long history of growing rice and more recently maize, beans, potatoes and cassava in the Highlands. There are even sub-regions where wheat, barley, and temperate fruit is grown. However, soil erosion is increasingly becoming an issue for farm productivity in this region.

Madagascar's final agro-ecological region is its Midwest, where precipitation varies throughout the region and mostly across the different altitudes. Soils in this region are usually quite poor for agriculture growth, and erosion remains a vulnerability. This region predominantly grows rice, but also produces cassava and maize. This region is the least secure, with theft occurring often, though on average it is, relatively, highly educated.<sup>131</sup>

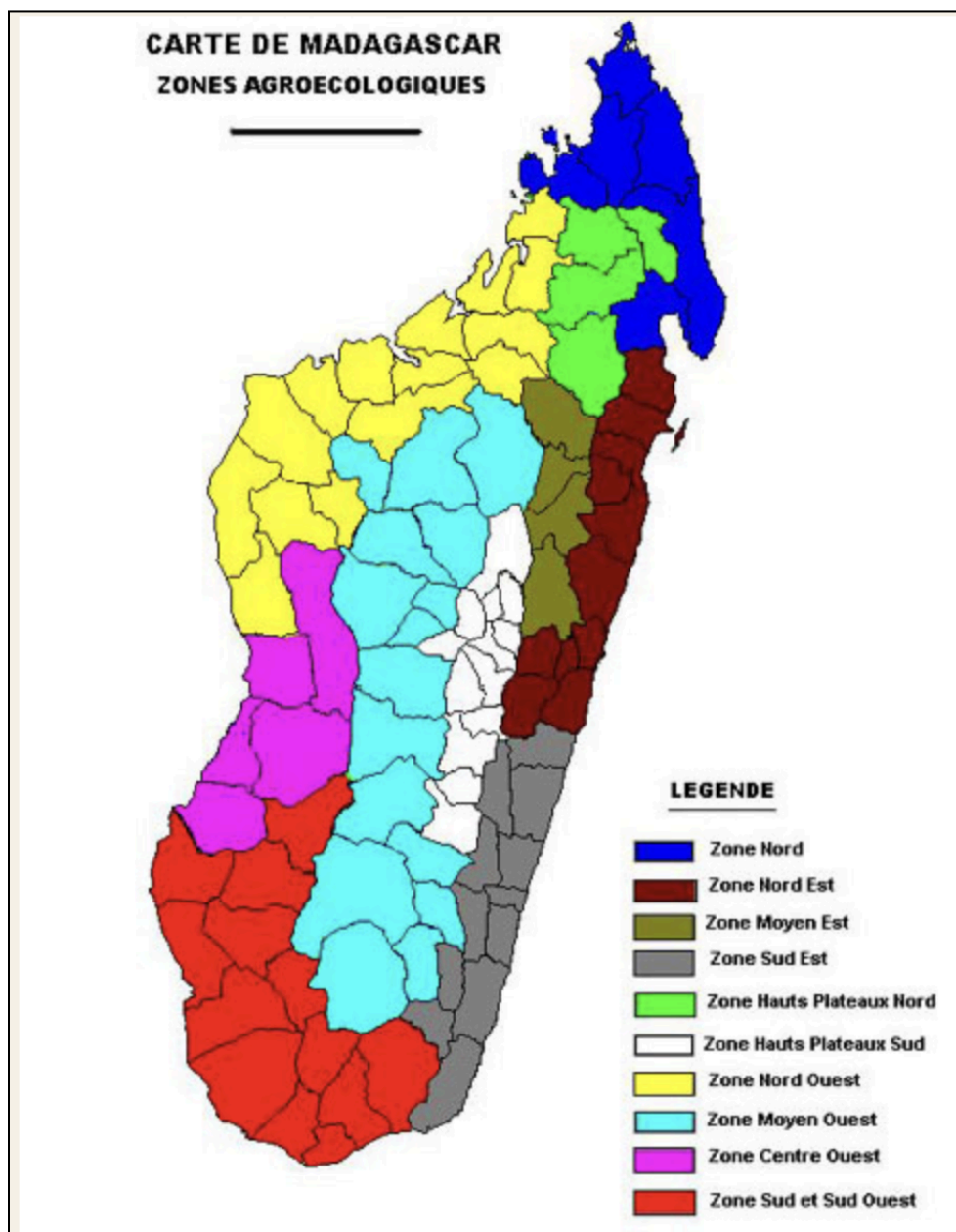
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<sup>128</sup> Reliefweb. "Madagascar - Tropical Cyclone ALVARO". Report. Accessed April 25, 2024. <https://reliefweb.int/report/madagascar/madagascar-tropical-cyclone-alvaro-gdacs-bnrc-meteo-madagascar-echo-daily-flash-3-january-2024>.

<sup>129</sup> Reliefweb. "Madagascar - Tropical Cyclone Gamane". Report. Accessed April 25, 2024. <https://reliefweb.int/disaster/tc-2024-000042-mdg>

<sup>130</sup> Ibid.

<sup>131</sup> Ibid.



**Figure 3. Madagascar's Agro-Ecological Zones<sup>132</sup>**

<sup>132</sup> FAO & WFP. "Mission Fao/Pam D'évaluation Des Récoltes Et De La Sécurité Alimentaire À Madagascar." FAO. October, 2016. Accessed April 17, 2024. <https://www.fao.org/3/i6335f/i6335f.pdf>



## Overview of CSA Practices and Technologies

While Madagascar operates under a constitutional democracy, its governance exhibits characteristics of a hybrid regime. This is in part due to its fragile institutional framework and historical political instability.<sup>133, 134</sup> The mission of Madagascar's Ministry of Agriculture and Livestock (Ministère de l'Agriculture et de l'Élevage/MINAE) is to direct the state's policies on agriculture and livestock, including overseeing agricultural research and ensuring food security. Notably, its third mission includes the achievement of self-sufficiency in rice production. The MINAE is structured to implement policies at a regional level through the Regional Departments of Agriculture and Livestock. Affiliated with the ministry are several key institutions focused on agricultural development and research, such as FOFIFA (National Center for Applied Research in Rural Development), the FDA (Agricultural Development Fund), as well as capacity-building institutions for the agricultural sector.<sup>135</sup>

Historically, public investment in Madagascar's agriculture sector has been modest, with limited funds directed towards building the country's essential infrastructure, particularly roads for the rural areas. Additionally, the centralization of government institutions, with a significant portion of the budget allocated to entities in Antananarivo, and the uneven distribution of funds to decentralized governmental bodies are recognized as relevant issues. Furthermore, farmers' organizations face challenges due to inadequate structure and capacities, as well as limited access to financial services, technologies, information, and markets.<sup>136</sup> Security issues around rural areas also persist. The government has selected the agricultural sector as a priority area for economic development for the country's post-Covid recovery efforts.<sup>137</sup> As part of the Emerging Madagascar Plan (PEM) 2019-2023, the MINAE is focusing on the following areas: (i) expanding irrigated areas, (ii) supporting vulnerable HHs in settling on new land, (iii) promoting high-value export crops, (iv) promoting poultry and dairy farming, (v) strengthening the governance of the fisheries subsector, and (vi) boosting value addition".<sup>138</sup> The National Climate Change Adaptation Plan of Madagascar presents the priority areas of intervention for the agricultural sector (Box 2).<sup>139</sup>

<sup>133</sup> Economist Intelligence Unit, *Democracy Index 2023: Final Report* (2023), last accessed April 12, 2024, [www.eiu.com/n/campaigns/democracy-index-2023/](http://www.eiu.com/n/campaigns/democracy-index-2023/)

<sup>134</sup> Brookings Institution, *Back to the Brink: Madagascar's Polarizing Presidential Elections*, last modified 2023, accessed April 12, 2024, [www.brookings.edu/articles/back-to-the-brink-madagascars-polarizing-presidential-elections/](http://www.brookings.edu/articles/back-to-the-brink-madagascars-polarizing-presidential-elections/)

<sup>135</sup> Ministère de l'Agriculture et de l'Élevage, *Fixant les attributions du Ministre de l'Agriculture et de l'Élevage ainsi que l'organisation générale de son Ministère*, (2021), accessed April 12, 2024, <https://faolex.fao.org/docs/pdf/mad220383.pdf>

<sup>136</sup> Comments by WFP Madagascar, April 24, 2024.

<sup>137</sup> IFAD, *Republic of Madagascar Country Strategic Opportunities Programme 2022-2026* (2021), accessed April 12, 2024, <https://webapps.ifad.org/members/eb/133/docs/EB-2021-133-R-21.pdf?attach=1>

<sup>138</sup> <https://webapps.ifad.org/members/eb/133/docs/EB-2021-133-R-21.pdf?attach=1>

<sup>139</sup> Ministère de l'Environnement et du Développement Durable, *Plan National d'Adaptation au Changement Climatique (PNA) Madagascar* (2021), accessed April 12, 2024, <https://faolex.fao.org/docs/pdf/mad217126.pdf>

### Box 2: The National Climate Change Adaptation Plan of Madagascar Priority Areas

**Promote Resilient Agricultural Systems:** i) Use inputs that respect the environment and are resilient to climate change; ii) Scale-up research of varieties adapted to future climatic conditions; iii) Promote the Intensive and Improved Rice Growing Systems; iv) Develop pilot initiatives for the application of Integrated Models of Resilient Farming; v) Scale-up the spread of conservation and "climate-smart" agriculture

**Secure Land Tenure:** i) Deploy Decentralized and Deconcentrated Land Services; ii) Improve the Legal Framework for Land Ownership; iii) Rationally Manage Space; iv) Modernize Land Services.

**Support the development of resilient crops with national and/or international outlets, in particular through support for agribusiness activities:** i) Restructure and Reorganize Agricultural Sectors; ii) Enhance the Value of By-products and Develop Income-generating Sectors to Improve Farm Profitability; iii) Design Regulatory Texts for Global Competitive Compliance; iv) Support a Climate Insurance Offer Adapted to Farmers' Needs and Future Climate Changes

**Set up an early warning and disaster management system adapted to agricultural systems:** i) Promote the Use and Sharing of Climate Information and ii) Support an Improved Response to Locust Control.

**Better manage and save water resources water:** i) Implement/Update Integrated Water Resource Management and Development Plans Considering Climate Change; ii) Invest in Water Management (Irrigation, Storage, and Drainage); iii) Develop sustainable solution to drought caused by prolonged or irregular rainfall

**Supporting sustainable livestock practices:** i) Apply Large-Scale Integrated Models of Resilient Agriculture for Extensive Livestock Areas and ii) Diversify Forage Plants.

**Improving livestock resilience:** i) Prioritize and Preserve Local Breeds by Increasing the Number of Animals Adapted to Climatic Stress and Disease Resistance and ii) Strengthen Livestock Health Security.

**Promoting better soil and land management:** i) Conserve and Secure Agropastoral Zones; ii) Preserve Soil, Water, and Biodiversity Capital by Focusing on Reducing the Water Depletion Rate.

**Promote scientific and technological research to better understand the impact of climate change on livestock farming:** i) Promote the Use and Sharing of Climate Information and ii) Encourage Research on the Evolution of Pastoralism, Including its Socio-economic Implications, Under Climate Change.<sup>140</sup>

## B. Key Findings

The SIPA team traveled to Madagascar to conduct in-person research and interviews, where they met with 25 people representing 12 different organizations. With virtual meetings that took place before travel, the total number of interviews climbed to 32 and total organizations climbed to 19. The sector breakdown of these organizations is as follows: 5 government offices, including 2 national ministry officials, 1 mayor, 1 district leader, and 1 governmental researcher; 4 NGOs, including 2 local organizations and 2 international NGOs; 5 research organizations such as 2 local research organizations and 3 international research organizations.

<sup>140</sup> Ministère de l'Environnement et du Développement Durable, Plan National d'Adaptation au Changement Climatique (PNA) Madagascar (2021), accessed April 12, 2024, <https://faolex.fao.org/docs/pdf/mad217126.pdf>.



These interviews yielded crucial insights and information that allowed us to better understand the Madagascar context. Each interviewee revealed outcomes and difficulties of their projects, while commenting on CSA in Madagascar. Despite the diversity of responses, there were a few common themes. The section below elaborates on four **key findings** based on consensus from research and KIIs: **climate change vulnerability** and its effects, **diverse scaling needs** of beneficiaries, a **CSA knowledge-practice gap**, and a **fragmented agency ecosystem**.

### **Climate Change Vulnerability and Effects**

The people of Madagascar are familiar with intense and unpredictable weather. Each agro-ecological zone has its own climate, several of which are susceptible to drought. Additionally, from 2000-2020, 39 significant cyclones hit Madagascar.<sup>141</sup> Given the regional diversity and vulnerability to such intense storms, Madagascar ranks as the world's fourth most vulnerable country to climate change.<sup>142</sup> Already, rising temperatures and increasing frequency of droughts in southern Madagascar have made the region one of the poorest and exacerbated malnutrition rates, which are now at crisis levels. In addition, increasing deforestation and slash-and-burn practices have driven land erosion and soil degradation.<sup>143</sup> Increasing climate crises paired with unsustainable practices mutually exacerbate one another, with disastrous effects on agricultural productivity and food security.

Though climate change as a concept is prolific in Madagascar, most people are more concerned with the immediate consequences of changing climate conditions. About 30% mention drought specifically as one of their top issues, while 12% mention intense wind, particularly in the context of the southern regions. An additional 8% cite floods as a worrying consequence of climate change. Climate change and these extreme weather events come in tandem with other environmental factors. Respondents are quick to include concerns about soil and deforestation, 30% and 15% respectively.

### **Diverse Scaling Needs**

The island of Madagascar has six agro-ecological zones with distinct climate and terrain features. While this diversity may provide opportunities for different crops and species, it does present issues when scaling up national projects. Often, donors choose one zone at a time for CSA interventions, which makes sense given how specific details need to be in farming interventions. However, this presents a problem when trying to scale at a national level. Many program choices and strategies need to change in order to address a neighboring district and its specific context.

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<sup>141</sup> Zy Misa Harivelo Rakotoarimanana, Zy Harifidy Rakotoarimanana, Moses Pandin, and Christrijogo Sumartono. "Analysis of Tropical Cyclones 2000-2020 in Madagascar." *Disaster Advances* 15 (2022): 13-20. Accessed April 13, 2024. <https://doi.org/10.25303/1503da1320>

<sup>142</sup> UN News. "Climate-affected Madagascar adapts to new reality: A UN Resident Coordinator blog." *United Nations News*, February 20, 2024. Accessed April 13, 2024. <https://news.un.org/en/story/2024/02/1146737>.

<sup>143</sup> Megan Clark. "Deforestation in Madagascar: Consequences of Population Growth and Unsustainable Agricultural Processes." *Global Majority E-Journal*, Vol. 3, No. 1. June, 2012. [www.american.edu/cas/economics/ejournal/upload/clark\\_accessible.pdf](http://www.american.edu/cas/economics/ejournal/upload/clark_accessible.pdf)



Though precision is important to agriculture, systemic and structural change has to unfold at a national level. Madagascar's population of near 30 million represents 18 official ethnic groups, which live throughout the country.<sup>144</sup> There are not large-scale structural disputes between groups, but respondents do mention that social hierarchies, however misguided, exist between these ethnic groups. This social dynamic sometimes makes national interventions at a local level difficult for a few reasons. One is that the officials in Antananarivo may not have much social or political sway over a local group. Another appears to be that national officials may not prioritize the needs of smaller, more rural ethnic groups. All projects, including agricultural ones, in Madagascar need to make sure they have the mechanisms to approach diversity, both geographically and culturally. Otherwise people, usually the most vulnerable, will be left behind.

### **Knowledge-Practice Gap**

Smallholder farmers in Madagascar suffer from low yield and immense vulnerability to weather. While this reality may suggest that CSA practices are not well known in the country, this is not the case; every level of stakeholder in Madagascar is familiar with CSA. The country has a long history of using conservation tools to protect its ecological diversity, which includes using protective farming practices like agro-forestry. Despite this well-founded indigenous knowledge, smallholder farmers still struggle to feed their households and create income, suggesting that there is a clear CSA knowledge-practice gap among the people working in this sector.

The KIIs yield a few reasons why this CSA knowledge gap exists. Many respondents cited farmer attrition in projects as the biggest reason for this. Farmers are not using the information in their fields after the programs are completed, despite being aware of CSA tools and usage. On a local scale, many stakeholders interviewed attributed this phenomenon to the time-consuming realities of farming. Many of these programs require training and then change in practices. This is not a small time efficient endeavor, especially because many CSA practices, like no till, are quite labor intensive, and farmers have to be willing and able to adopt new technologies. The tradeoff between a new practice and a comfortable one is risky: farmers constantly have to question whether the investment will actually pay off, or whether the time and money associated with new practices does not actually end with a higher yield. This uncertainty can be crippling for the smallholder farmers to the point that they abandon new CSA practices when they no longer have direct support from an intervention.

From a national government policy perspective, Madagascar's CSA knowledge-practice gap is attributed to lack of national governmental reach. When direct investment leaves when a project ends, there is no way for anyone at a national level to reach farmers to stress the importance of continuation in practices. The breakdown between national to regional to local level officials means that the government is not effectively leading on climate-smart agriculture.

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<sup>144</sup> MRC. "Madagascar." Minority Rights Group International. April, 2018. Accessed April 13, 2024. <https://minorityrights.org/country/madagascar/#:~:text=Census%20data%20divide%20the%20population,traditionally%20lived%20in%20Madagascar's%20highlands.>



### **Fragmented Agency Ecosystem**

Several of Madagascar's NGOs and researchers mentioned the lack of interagency cooperation and fragmented agency ecosystem. As partners to the government, they find that there is a lot of overlap between big development projects and stress that this system is wasteful and will not push Madagascar's development further. Instead, lots of money will be wasted just to come to the same conclusions. If any great strides are to be made then development agencies and their funds need to work in tandem, building upon others projects. In this way, there could be a unified push towards shared priorities and goals.

Parallel to this lack of coordination is frustration with the government. 44% of respondents specifically mentioned the government's funds and structure as a major hurdle to sustainable development. Before the coup in 2009, Madagascar had a well operating National Environmental Action Plan. This was a prime example of government-led oversight and accountability. The country's Ministry of Environment could use this plan and steer development projects towards their goals. Various actors attribute the current fragmentation to the weakness of the government. There is a high level of personnel turnover in both the Ministry of Agriculture and the Ministry of Environment. This constant change makes project continuity almost impossible.<sup>145</sup>

Additionally, mismatched priorities at different levels of government, for instance between local and national officials, drive fragmentation, coordination challenges, and inconsistent policy implementation. Similarly, competing priorities between ministries hinder collaboration and threaten initiatives operating across several fields.<sup>146</sup> CSA in particular can fall under the purview of both the Ministry of Environment and Ministry of Agriculture. However, with different and occasionally competing priorities, if these ministries operate in silos and do not emphasize coordination and integration this can harm efforts to scale up CSA projects, particularly those operating at their nexus. For instance, forest communities are key to invest in when it comes to CSA tools as these can both prevent deforestation and also improve agricultural production.<sup>147</sup> In addition, high government staff turnover rates pose a challenge for program continuity and consolidation of priorities. Misuse of government funds can further hinder programs and drive inefficiencies.

### **C. Challenges**

Across Madagascar, there is both awareness and uptake of climate-smart practices. However, several challenges remain that hinder their wider adoption and effectiveness. These include a weak enabling environment, poor infrastructure, limited rural energy access, and insufficient financing. In a context of high climate change vulnerability and food insecurity, addressing these challenges is crucial for strengthening the food system's resilience to climate change shocks.

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<sup>145</sup> Interview with USAID/Tetra Tech, March 6, 2024

<sup>146</sup> Interview with Madagascar Ministry of Agriculture and Livestock, March 15, 2024

<sup>147</sup> Interview with Ecole Supérieure des Sciences Agronomiques, February 25, 2024

### **Enabling Conditions for Human Development**

One of the primary challenges to CSA adoption but also agriculture more broadly in Madagascar are the enabling conditions for human development. Madagascar is among the poorest countries of the world, with per capita income declining by 45% since independence, despite being largely free of violent conflict, a unique case globally.<sup>148</sup> Poverty has profound effects on agriculture, limiting access to resources, lowering productivity, driving food insecurity, worsening health and education outcomes, and enhancing vulnerability to shocks. This also comes hand in hand with illiteracy, which remains a widespread challenge particularly in rural areas.

### **Poor and Underfunded Infrastructure**

Weak investment in basic infrastructure also remains a significant challenge. Madagascar has the lowest road density in the world, with 5.4 km per every 100 km<sup>2</sup>. Many roads also become inoperable during the rainy season.<sup>149</sup> Rural transport costs therefore remain prohibitively high, shaping market access, increasing transaction costs, and driving agricultural market inefficiencies and non-competitiveness.<sup>150</sup> In addition, rural communities have remained difficult to reach with government extension services as well as new tools, technologies, and policies.<sup>151</sup>

### **Lack of Rural Energy Access**

Rural electrification is another major challenge, with an estimated 11% of the rural population that has access to electricity.<sup>152</sup> Access to electricity allows farmers to use efficiency and yield-enhancing tools such as irrigation pumps and grain mills. It also enables post-harvest processing to preserve food for future consumption and/or sell on the market; facilitates communication and information technologies; and helps establish off-farm businesses to diversify livelihoods.

### **Reliance on International Funding**

Funding remains a major impediment to scaling up CSA practices and tools in Madagascar. Most projects rely on international funding either from bilateral development agencies, international organizations, or foreign NGOs. This holds true both for smaller organizations in Madagascar, as well as government ministries. This not only limits the sorts of projects and initiatives that are funded, but also increases the country's vulnerability to fluctuations in funding and changes in donor priorities. For CSA practices, upfront costs may be quite high and benefits may only be evident in the middle or long term therefore requiring sustained and ongoing investment which may not align well with international funding timelines.<sup>153</sup>

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<sup>148</sup> Marie-chantal Uwanyiligira, Marcelle Ayo and Francis Muamba, "How Madagascar Can Break a Vicious Cycle of Poverty." World Bank. May 2023.

<https://blogs.worldbank.org/en/african/how-madagascar-can-break-vicious-cycle-poverty#:~:text=But%20Madagascar%20is%20also%20unfortunately,such%20instance%20in%20the%20world.>

<sup>149</sup> IFAD. "Republic of Madagascar Country Strategic Opportunities Programme 2022-2026." 2021.

<https://webapps.ifad.org/members/eb/133/docs/EB-2021-133-R-21.pdf?attach=1>

<sup>150</sup> Ibid.

<sup>151</sup> Interview with FIFAMANOR, March 16, 2024

<sup>152</sup> World Bank. "Access to Electricity." 2021. <https://data.worldbank.org/indicator/EG.ELC.ACCS.RU.ZS?locations=MG>

<sup>153</sup> Interview with UNDP, March 14, 2024



## D. Recommendations

In Madagascar, adopting and implementing CSA practices is essential for mitigating the adverse effects of climate change on agriculture and enhancing the effectiveness of future food security interventions. However, the implementation of these practices faces significant structural challenges that impact all actors involved in the agricultural sector. To promote effective adoption and implementation of CSA, the following are key **recommendations** that should be addressed: improving the **dissemination of existing CSA knowledge** to farmers, adopting a **systems approach**, coordinating **governmental interagency action**, promoting **long-term resilience planning and programming for CSA**.

### **Better Dissemination of Existing CSA Knowledge to Farmers**

In Madagascar, institutions, experts, and governmental bodies are aware of the importance of CSA. Stakeholders across the country have access to information on CSA and demonstrate interest in implementing its practices to mitigate the adverse effects of climate change on agriculture. However, despite this awareness and interest, the implementation of CSA practices encounters substantial barriers due to the lack of adequate organizational structures. These barriers include insufficient training programs, limited resources, inadequate access to farming technologies, minimal governmental outreach, and poor market access, which could otherwise finance or encourage the adoption of these practices. This deficiency hampers the widespread dissemination of CSA knowledge and technologies to the farmers who need them most. Moreover, the absence of a national social registry significantly challenges efforts to collect comprehensive data about farmers, further hindering effective outreach.<sup>154</sup> Additionally, the previously mentioned infrastructural inadequacies exacerbate the difficulty of ensuring a smooth flow of knowledge and goods between urban centers and rural smallholder farmers.<sup>155</sup>

Given this context, establishing the fundamental enabling conditions for the adoption of CSA practices becomes urgent. This effort should begin with the development and enhancement of institutional frameworks capable of supporting the widespread dissemination and effective implementation of these practices. A primary focus should be on strengthening organizational structures. This includes securing regular budgets for government institutions that enable the creation of a permanent network of services. Essential components of this network would be decentralized public institutions able to offer expanded agricultural extension services, which can provide accessible and continuous support to farmers. Additionally, it is crucial to establish clear guidelines and robust support systems that can effectively reach and assist farmers in transitioning to CSA practices.

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<sup>154</sup>Interview with IMF, March 21, 2024

<sup>155</sup>Interview with FIFAMANOR, March 16, 2024



Namely, the current preference for agroecology means that the main efforts are directed towards these practices rather than CSA<sup>156</sup>. If the intention is to shift the emphasis towards CSA, it would require additional efforts to persuade experts and stakeholders currently focused on agroecology.

### **Adopt a Systems Approach for Specific Agricultural Practices**

Focusing on specific agricultural practices often fails to yield substantial results due to the complex nature of agricultural systems and local cultures. This approach does not necessarily consider the interconnectedness of soil health, crop diversity, water management, and local climatic conditions. Moreover, these practices frequently overlook local agricultural traditions and the realities of subsistence farming, where the risk of adopting new methods is high. If a new practice fails, subsistence farmers, who rely entirely on their crop yields for food and livelihoods, face the immediate risk of food insecurity. Consequently, there is a reluctance to adopt new CSA techniques without assured outcomes, as these practices do not always align with their existing knowledge and cultural practices.<sup>157</sup>

Therefore, using a systemic approach to understand the smallholder farmers holistically would be preferential. This approach would encompass not only the ecosystem and agricultural practices but also social dynamics, cultural views, and the unique and specific challenges and needs of the community. In this context, the adoption of a systems approach would integrate various sustainable practices, mindful of cultural specificities, into a cohesive strategy that usually includes a participatory component. This method actively involves farmers in the decision-making process, enabling the tailoring of solutions that are both practical and suited to their specific circumstances.<sup>158</sup> A systems approach would go beyond training in agricultural practices to incorporate elements that could be considered external to agriculture but at the end are necessary for the wellbeing of the community and that have an effect on productivity and sustainability, such as financial services, nutrition, schooling, and other enabling conditions.

### **Ensure Coordinated Governmental Interagency Action**

A lack of coordination between different agencies and levels of government, as well as international bodies, often leads to inefficient use of resources, conflicting policies, and fragmented efforts that diminish the overall effectiveness of agricultural interventions in Madagascar. There is a need to enhance interagency and cross-sectoral coordination to streamline efforts and resources towards common goals.<sup>159</sup> This should include establishing shared objectives, aligning policies and programs, and fostering communication strategies to enhance collaboration. This could be done by setting up a formal interagency task force dedicated to climate-smart agriculture that includes representatives from agricultural,

<sup>156</sup>FAO, "Overview of Agroecology," accessed April 17, 2024, <https://www.fao.org/agroecology/overview/en/#:~:text=Agroecology%20is%20a%20holistic%20and,sustainable%20agriculture%20and%20food%20systems>; FAO, "Climate-Smart Agriculture," accessed April 17, 2024, <https://www.fao.org/climate-smart-agriculture/en/>.

<sup>157</sup>Interview with FIFAMANOR, March 16, 2024

<sup>158</sup>Interview with Conservation International, March 7, 2024

<sup>159</sup>Interview with IMF, March 21, 2024



environmental, financial, and planning departments. There is a national strategy for CSA led by the Ministry of Environment that aligns with international climate goals and frameworks; although it needs to be empowered and assigned a regular budget to ensure its implementation by the Ministry, it could be a suitable institution to direct interagency efforts.

### **Promote Long-Term Resilience Planning and Programming for CSA**

Many agricultural projects are designed as short-term interventions, which are not sufficient to address the long-term impacts of climate change or to allow for the sustainable development of agricultural practices that require cultural shifts. The short duration of the projects hinders the ability to achieve lasting change and adapt to ongoing climatic shifts. Moreover, many projects seem to begin, achieve some of their results, and then end, without establishing lasting structures that would allow for the results to continue.<sup>160</sup> Focusing on more long-term projects that seek to invest in climate resilience for communities could lead to long-term results beyond the completion of a program. This involves securing funding and support for extended periods, beyond typical funding cycles, to ensure the longevity and sustainability of projects. It is crucial for projects to have sustainable financing sources and clear exit strategies that enable them to keep delivering results even after the intervention is over.

## **VII. Country Study 3: Namibia**

### **A. Background**

Namibia is an upper middle-income country in South-Western SSA with an annual GDP of \$12.6 billion and a population of 3.02 million according to the 2023 census,<sup>161</sup> concentrated in the northern regions of Omusati, Oshana, Ohangwena, Oshikoto, Kavango East, Kavango West, and Zambezi. The Ministry of Agriculture projects a population surge in rural areas, which is likely to intensify pressure on agricultural land, resulting in reduced farm sizes and agricultural output per household.<sup>162</sup> Namibia's multidimensional poverty rate is 40.9%, while the vulnerability to multidimensional poverty rate is 19.2% of the population.<sup>163</sup> With a 2015 Gini coefficient of 59.1, it is among the most unequal countries in the world, ranked second only to South Africa, a scenario that translates into a huge portion of the population being vulnerable to poverty and

<sup>160</sup> Interview with Ecole Supérieure des Sciences Agronomiques, February 25, 2024

<sup>161</sup> Namibia Statistics Agency (2023). "2023 Population & Housing Census". Available at: <https://nsa.nsa.org.na/wp-content/uploads/2024/03/Preliminary-Report-doc-fn.pdf> Accessed April 30, 2024

<sup>162</sup> Ministry of Agriculture of the Republic of Namibia. (2015, October). Comprehensive Conservation Agriculture Programme for Namibia (Version 1.00) [Brochure]. Retrieved from [www.meft.gov.na/files/files/Comprehensive%20Conservation%20Agriculture%20Programme%20for%20Namibia%202015-2019;%20Ministry%20of%20Agriculture,%20Water%20and%20Forestry.pdf](http://www.meft.gov.na/files/files/Comprehensive%20Conservation%20Agriculture%20Programme%20for%20Namibia%202015-2019;%20Ministry%20of%20Agriculture,%20Water%20and%20Forestry.pdf)

<sup>163</sup> UNDP. (2023). Briefing note for countries on the 2023 Multidimensional Poverty Index: Namibia. Available: <https://hdr.undp.org/sites/default/files/Country-Profiles/MPI/NAM.pdf> Accessed April 17, 2024



food insecurity.<sup>164, 165</sup> According to the 2023 Global Hunger Index, Namibia ranks 78th out of 116 countries with a moderate level of hunger.<sup>166</sup> With a range of 19% to 26% of the population suffering from high levels of acute food insecurity from 2023 to 2024, malnutrition is a serious concern for the country.<sup>167</sup>

Namibia's key economic sectors include mining, agriculture and fisheries.<sup>168</sup> The agriculture industry continues to play a key role in most people's lives, despite its marginal contribution to GDP.<sup>169</sup> Regarding employment, export revenue, and GDP contribution, Namibia's commercial fishing and fish processing industry is expanding at the quickest rate.<sup>170</sup> Geographically, Namibia is one of the largest and driest countries in SSA, and the country is mostly made up of sparsely vegetated steppe-like regions in the southwest and south, the Namib Desert along the Atlantic Ocean in the west, the Kalahari Desert in the southeast, vast savannah and woodlands in the center and northeast, and subtropical forests in the far northeast.<sup>171</sup> It is characterized by a high degree of climatic variability, including recurrent droughts, erratic and varied rainfall patterns, temperature fluctuations, and a shortage of water.<sup>172</sup>

Additionally, evaporation rates in Namibia are extremely high, ranging from 3,800 mm per year in the south to 2,600 mm yearly in the north due to high temperatures, low humidity, and intense sun radiation. Potential evaporation is five times larger than average rainfall over most of the country.<sup>173</sup> In this context, climate change projections indicate that atmospheric temperatures are expected to rise, with conservative estimates suggesting a mean annual temperature increase of 2.5°C to 3°C for Southern Africa by 2050. This warming trend is also anticipated to lead to greater variability in rainfall, potentially causing more frequent and intense extreme weather events, such as droughts and floods.<sup>174</sup>

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<sup>164</sup> World Bank. "Namibia."

<https://thedocs.worldbank.org/en/doc/bae48ff2f2efc5a869546775b3f010735-0500062021/related/mpo-nam.pdf> Accessed February 26, 2024

<sup>165</sup> Vhumbunu, C. H., & Adetiba, T. C. (2023). Climate-smart Agriculture in Urban Farming: Experiences from Selected Suburbs in Windhoek, Namibia. *African Journal of Development Studies (AJDS)*, 13(4), 347-366. <https://doi.org/10.31920/2634-3649/2023/v13n4a17>

<sup>166</sup> Global Hunger Index Report. (2023). Available: <https://www.globalhungerindex.org/pdf/en/2023.pdf>. Accessed April 17, 2024.

<sup>167</sup> Integrated Food Security Phase Classification (2023). Namibia. Available at:

[https://www.ipcinfo.org/fileadmin/user\\_upload/ipcinfo/docs/IPC\\_Namibia\\_Acute\\_Food\\_Insecurity\\_Jul2023\\_Jun2024\\_report.pdf](https://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC_Namibia_Acute_Food_Insecurity_Jul2023_Jun2024_report.pdf) Accessed April 30, 2024.

<sup>168</sup> International Trade Administration U.S. Department of Commerce. Namibia: Country Commercial Guide. Available at: [www.trade.gov/country-commercial-guides/namibia-market-overview](http://www.trade.gov/country-commercial-guides/namibia-market-overview) Accessed February 26, 2024.

<sup>169</sup> FAO (2024). "Namibia at a Glance". Available at: [www.fao.org/namibia/fao-in-namibia/namibia-at-a-glance/en/](http://www.fao.org/namibia/fao-in-namibia/namibia-at-a-glance/en/). Accessed February 26, 2024.

<sup>170</sup> Chiripanura, B. and Teweldemedhin, M. (2016) "An analysis of the fishing industry in Namibia". Available at: [www.ifpri.org/publication/analysis-fishing-industry-namibia-structure-performance-challenges-and-prospects-growth](http://www.ifpri.org/publication/analysis-fishing-industry-namibia-structure-performance-challenges-and-prospects-growth). Accessed February 26, 2024.

<sup>171</sup> FAO (2024). "Namibia at a Glance". Available at: [www.fao.org/namibia/fao-in-namibia/namibia-at-a-glance/en/](http://www.fao.org/namibia/fao-in-namibia/namibia-at-a-glance/en/). Accessed February 26, 2024.

<sup>172</sup> The World Bank (2024). "Climate Change Knowledge Portal (2024). "Namibia". Available at: <https://climateknowledgeportal.worldbank.org/country/namibia/climate-data-historical#:~:text=Namibia%20is%20one%20of%20the,with%20sparse%20and%20erratic%20rainfall>. Accessed February 26, 2024.

<sup>173</sup> Ibid.

<sup>174</sup> Ministry of Agriculture of the Republic of Namibia. (2015). Comprehensive Conservation Agriculture Programme for Namibia. Retrieved from:



## Agriculture

Agriculture comprises only 5% of Namibia's GDP. Yet, it is crucial for almost 70% of its population who, directly or indirectly, depend on it for their livelihood.<sup>175</sup> About 48% of Namibia's rural households rely on subsistence farming.<sup>176</sup> With only 2% of Namibia's land being cultivable and 46% suitable for natural perennial pastures, agriculture – particularly livestock, meat, and grape exports—plays a vital role in the nation's export economy. Fishing and agricultural goods trade is also crucial in Namibia, with exports accounting for 77% of the sector's overall value and imports making up 23%. However, the country generates just 43% of its required food supply, which makes Namibia a net importer of several consumable products.<sup>177</sup>

Namibia's agricultural landscape is predominantly defined by its extensive livestock farming: approximately 66% of agricultural output in Namibia comes from livestock, with crop cultivation and forestry accounting for the rest.<sup>178</sup> This distribution largely results from the nation's dry climate and scarce fertile land and frequently exacerbated periodic droughts. While commercial farms are larger and more technologically sophisticated, most farmers operate on a smaller scale within communal lands, facing numerous challenges, including limited market access, water scarcity, and land degradation.<sup>179</sup> Additionally, significant urbanization in recent years has led many city residents to engage in both formal and informal urban agriculture. Currently, more than 70 percent of Windhoek's (Namibia's capital city) residents practice urban and peri-urban agriculture as a means to bolster household food security, enhance livelihoods, and generate income for the predominantly vulnerable urban population.<sup>180</sup>

As the driest nation in Sub-Saharan Africa, Namibia's reliance on groundwater is paramount. Only a small fraction (about 2%) of the country's surface area gets enough rain to support crop cultivation.<sup>181</sup> Moreover, Namibia's geographic position is not conducive to cultivating crops with high yields. Around 97% of the soil in the country contains less than 5% clay, leading to a

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[www.meft.gov.na/files/files/Comprehensive%20Conservation%20Agriculture%20Programme%20for%20Namibia%202015-2019;%20Ministry%20of%20Agriculture,%20Water%20and%20Forestry.pdf](http://www.meft.gov.na/files/files/Comprehensive%20Conservation%20Agriculture%20Programme%20for%20Namibia%202015-2019;%20Ministry%20of%20Agriculture,%20Water%20and%20Forestry.pdf).

<sup>175</sup> German Agency for International Cooperation (GIZ) (2022). "Sector Brief Namibia: Agriculture". Available at: <https://www.giz.de/en/downloads/giz2022-en-namibia-agriculture.pdf>. Accessed February 26, 2024.

<sup>176</sup> The World Bank (2021). "Climate Risk Profile: Namibia (2021)". Available at: [climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/15931-WB\\_Namibia%20Country%20Profile-WEB.pdf](https://climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/15931-WB_Namibia%20Country%20Profile-WEB.pdf). Accessed February 26, 2024.

<sup>177</sup> International Trade Administration U.S. Department of Commerce. Namibia: Country Commercial Guide. Available at: [www.trade.gov/country-commercial-guides/namibia-agricultural-sector](http://www.trade.gov/country-commercial-guides/namibia-agricultural-sector) Accessed February 26, 2024.

<sup>178</sup> German Agency for International Cooperation (GIZ) (2022). "Sector Brief Namibia: Agriculture". Available at: <https://www.giz.de/en/downloads/giz2022-en-namibia-agriculture.pdf> Accessed February 26, 2024.

<sup>179</sup> International Trade Administration U.S. Department of Commerce. Namibia: Country Commercial Guide. Available at: [www.trade.gov/country-commercial-guides/namibia-agricultural-sector](http://www.trade.gov/country-commercial-guides/namibia-agricultural-sector) Accessed February 26, 2024

<sup>180</sup> Vhumbunu, C. H., & Adetiba, T. C. (2023). Climate-smart Agriculture in Urban Farming: Experiences from Selected Suburbs in Windhoek, Namibia. *African Journal of Development Studies (AJDS)*, 13(4), 347-366.

<https://doi.org/10.31920/2634-3649/2023/v13n4a17>

<sup>181</sup> Ibid.



significantly low capacity for retaining water.<sup>182</sup> The combination of limited rainfall along suboptimal soil conditions presents significant barriers to achieving the desired agricultural output.<sup>183</sup> Irrigation efforts are limited to areas along the Orange, Kunene, and Okavango rivers, given the ephemeral nature of inland rivers. This leaves less than 1% of the land as arable, suitable for farming activities.<sup>184</sup>

Crop farming in Namibia is concentrated in the northern regions, where conditions are somewhat more favorable, and in pockets of land where irrigation is feasible. However, the scope for rain-fed crop agriculture is limited due to the low and erratic rainfall. Major crops in Namibia include maize, millet, and sorghum, with most production aimed at self-sufficiency rather than the market.<sup>185</sup> Due to the arid conditions that favor the growth of drought-resistant perennial grasses, crop farming is secondary to livestock farming in terms of significance (Image 4).<sup>186</sup>

The vulnerability of Namibia's agriculture to climate variability and change is a significant concern, with recurring droughts severely impacting both livestock and crop production. Additionally, factors unique to rural regions encompass persistent droughts leading to water scarcity, which in turn causes livestock mortality and crop loss, prevalent soil erosion and deterioration of land, insufficient agricultural space and detachment from marketplaces, scarce opportunities for earning income, barriers faced by women in accessing land and resources, and a failure to enact relevant policies.<sup>187</sup> Food insecurity has been exacerbated by the diminishing presence of traditional foods and the loss of indigenous knowledge regarding their preparation.

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<sup>182</sup> Seidle, M. Namibia: Developing and encouraging sustainable agricultural practices. Available at: [www.worldfoodprize.org/documents/filelibrary/images/youth\\_programs/research\\_papers/2014\\_papers/MedsteadCentral\\_MSeidle\\_CANADA\\_6180135B468A8.pdf](http://www.worldfoodprize.org/documents/filelibrary/images/youth_programs/research_papers/2014_papers/MedsteadCentral_MSeidle_CANADA_6180135B468A8.pdf) Accessed April 9, 2024.

<sup>183</sup> FAO (2024). Namibia at a Glance. Available at: [www.fao.org/namibia/fao-in-namibia/namibia-at-a-glance/en/](http://www.fao.org/namibia/fao-in-namibia/namibia-at-a-glance/en/) Accessed February 26, 2024

<sup>184</sup> Fortunato, A., & Enciso, S. (2023). Food for Growth: A Diagnostics of Namibia's Agriculture Sector (Working Paper No. 154). The Growth Lab at Harvard University.

<sup>185</sup> Ibid.

<sup>186</sup> The World Bank (2021). "Climate Risk Profile: Namibia (2021): The World Bank Group". Available at [https://climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/15931-WB\\_Namibia%20Country%20Profile-WEB.pdf](https://climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/15931-WB_Namibia%20Country%20Profile-WEB.pdf) Accessed February 26, 2024.

<sup>187</sup> FAO (2024). "Namibia at a Glance". Available at: [www.fao.org/namibia/fao-in-namibia/namibia-at-a-glance/en/](http://www.fao.org/namibia/fao-in-namibia/namibia-at-a-glance/en/) Accessed February 26, 2024.





Women and girls are also responsible for caring for their sick family members, adding to their already heavy load.<sup>190</sup> Such distressing experiences underscore the urgency to expedite agricultural reforms, reduce reliance on external sources, and enhance resilience to future crises.

In addition to the pandemic, the 2019 drought emerged as a prominent topic among stakeholders interviewed by the SIPA team. The Namibian government has declared national emergencies due to extreme drought events in 1992/1993, 1995/1996, 2012/2013, 2013/2014, 2015/2016, and 2019, with the latter being the worst in 90 years.<sup>191</sup> As of 2019, almost 100,000 livestock had succumbed to the harsh conditions, agriculture output had plummeted significantly, and numerous households had their fundamental means of survival disrupted. The most severely impacted regions, notably the drought-stricken areas of Kunene, Erongo, Omusati, and Omaheke in the northern parts, are in dire need of immediate humanitarian assistance. Moreover, these regions anticipate heightened conflicts between humans and wildlife due to heightened competition for scarce water and grazing resources.<sup>192</sup> Hence, the prevailing arid conditions in the region, coupled with a growing recognition of the repercussions of external shocks, underscore the imperative for an innovative paradigm shift.

Despite these challenges, the agriculture and CSA sector has potential growth areas, particularly in high-value niche markets such as organic meat, game farming, and horticulture.<sup>193</sup> Namibia beef exports to lucrative global markets, including the United States, are a testament to the quality of its livestock farming and the potential for expanding into international markets. The Namibian government has also established various policies, programs, and strategies to harness the communal sector's potential. Initiatives like the Communal Land Reform Act, the Namibia Agricultural Policy, the Dry Land Crop Production Program, the Resettlement Policy, the Green Scheme Policy, and the Rangeland Policy have been introduced. Moreover, the country's diverse agro-ecological zones, from the central plateau to the Kalahari Desert, present both challenges and opportunities for agriculture. The government's efforts to promote conservation agriculture, enhance livestock management practices, and improve infrastructure could pave the way for a more resilient and productive agricultural sector.<sup>194, 195</sup>

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<sup>190</sup> The New Humanitarian. 2020. "The Female Face of Southern Africa's Climate Crisis." Opinion, January 14. Accessed 20 March 2024. Retrieved from: [www.thenewhumanitarian.org/opinion/2020/1/14/gender-Southern-Africa-climate-crisis](http://www.thenewhumanitarian.org/opinion/2020/1/14/gender-Southern-Africa-climate-crisis)

<sup>191</sup> International Federation of Red Cross and Red Crescent Societies. 2022. Namibia Drought Assessment Report. Pretoria. Available at: [www.ifrc.org/sites/default/files/2022-08/Namibia-drought-assessment-report-2022.pdf](http://www.ifrc.org/sites/default/files/2022-08/Namibia-drought-assessment-report-2022.pdf)

<sup>192</sup> Ibid.

<sup>193</sup> German Agency for International Cooperation (GIZ) (2022). "Sector Brief Namibia: Agriculture". Available at: [www.giz.de/en/downloads/giz2022-en-namibia-agriculture.pdf](http://www.giz.de/en/downloads/giz2022-en-namibia-agriculture.pdf) Accessed February 26, 2024.

<sup>194</sup> Act 5 of 2002.

<sup>195</sup> FAO, Family Farming Knowledge Platform (2024). Accessed February 26, 2024.: [www.fao.org/family-farming/countries/nam/en/](http://www.fao.org/family-farming/countries/nam/en/)



## Overview of CSA Practices and Technologies in Namibia

### Conservation Agriculture in Namibia

In 2015, the Republic of Namibia's Ministry of Agriculture, Water, and Forestry (MAWF), in partnership with FAO, launched a Comprehensive Conservation Agriculture Programme for Namibia to educate and assist subsistence crop farmers with novel farming practices, to tackle food insecurity and minimize the impacts of climate change. The plan was aligned with Namibia's Fourth National Development Plan, which has identified Conservation Agriculture as a central element of its strategy for enhancing sustainable agriculture production and delivering ecosystem services.<sup>196</sup> By analyzing the Conservation Agriculture Programme for Namibia, it is possible to divide CA practices into six categories that have been identified by MAWF as promising in the Namibian context: (i) Land preparation: Ripping, minimum/zero tillage, planting basins, plowing across the slope, direct seeding, walking tractor rippers; (ii) Fertility management: manure and fertilizer application, legume cover crops, and agroforestry; (iii) Soil moisture conservation: mulching, cover crops, drip, irrigation; (iv) Land degradation control: ripping, minimum/zero tillage, plowing across the slope; (v) Crop associations: crop rotations, intercropping, agroforestry; and (vi) Use of appropriate seed varieties: develop appropriate varieties for Namibia and evaluate them across various agro-ecological zones.<sup>197</sup>

According to the Ministry's projections, following the initial five-year period, the principles of CA would have gained widespread recognition among Namibia's involved actors. The Ministry anticipated that a considerable proportion of farmers would adopt CA either fully or partially across their farms, implementing diverse technologies tailored to their specific farming systems, land attributes, and available human and financial resources. Following the conclusion of the program in 2019, these projections may require third-party evaluation to verify their accuracy.

### CSA Practices

Responding to the necessity for enhanced coping mechanisms, Namibia exhibits promising CSA practices, notwithstanding the impediments hindering their widespread adoption and farmer awareness. The interconnected network of local organizations engaged in climate and agriculture demonstrates a mutual familiarity, actively solicits feedback, and operates in a relatively integrated manner, representing a positive aspect of the Namibian ecosystem. It is worth noting that most stakeholders reported that CSA practices are currently in the implementation or pilot stages, meaning that gathering quantitative data regarding their impact has proven challenging.

<sup>196</sup> Ministry of Agriculture of the Republic of Namibia. 2015. "Comprehensive Conservation Agriculture Programme for Namibia (Version 1.00) [Brochure]." Accessed October. Retrieved from [www.meft.gov.na/files/files/Comprehensive%20Conservation%20Agriculture%20Programme%20for%20Namibia%202015-2019;%20Ministry%20of%20Agriculture,%20Water%20and%20Forestry.pdf](http://www.meft.gov.na/files/files/Comprehensive%20Conservation%20Agriculture%20Programme%20for%20Namibia%202015-2019;%20Ministry%20of%20Agriculture,%20Water%20and%20Forestry.pdf)

<sup>197</sup> Ibid.



## B. Key Findings

The SIPA team conducted desk research and interviews both virtual and in-person in Namibia with a total of 22 interviews from 22 different organizations. The sector breakdown of these stakeholders is as follows: 7 government offices, including 1 office of Prime Minister, 2 national ministry officials, 4 local government representatives; 7 NGOs, including 3 international NGOs and 4 national organizations; 3 development agencies, including regional development bank and 2 global development agencies; 2 private companies in renewable energy and e-commerce areas; 2 research organizations including universities; 1 farmer association.

**Key findings** from desk research and KIIs include **WFP's role to address food insecurity** in Namibia, while emphasizing the **need to reduce community dependency**; a call for **integrated approaches to sustainable agriculture solutions**; challenges related to **subsistence farming, value aggregation, and market access**; **leading CSA practices in Namibia**; and a **financing gap resulting from Namibia's classification as an upper-middle-income country**.

### **Integrated Approach to Sustainable Agricultural Solutions**

The first finding is the positive correlation between CSA and other development goals. Sustainable agriculture can gain better traction when associated with more target areas, such as health, energy access, poverty alleviation, effective job creation, and education. For example, in the projects visited, stakeholders reported that integrating agriculture solutions with cooking, training, and health interventions through a holistic approach that looks at broad development needs has proven to be more effective in engaging communities than implementing isolated agriculture projects.

This finding aligns with the UN SDGs and underscores the importance of a global framework in steering local policy decisions. According to the FAO, a well-designed CSA approach can significantly contribute to various priority goals, including gender and social equality, rural and urban development, education, and employment, to mention a few. The 17 overarching SDGs and their associated targets outlined in the 2030 Agenda are viewed as “integrated and indivisible,” emphasizing that issues such as food security, poverty alleviation, and environmental sustainability are interconnected and must not be addressed in isolation.<sup>198</sup> The team's visit to the Epako Clinic Integrated Food System Project in the Omaheke region, where nutrition and healthcare serve as entry points for adopting community gardens, illustrated that point. Confronted with a surge in malnutrition cases, officials recalled a pivotal moment of reflection: "Can this project merely be a hospital, or must it encompass more? Perhaps a kitchen? But where would the food provisions for this kitchen come from?"<sup>199</sup>.

<sup>198</sup> FAO. 2019. Climate-smart agriculture and the Sustainable Development Goals: Mapping interlinkages, synergies and trade-offs and guidelines for integrated implementation. Rome.

<sup>199</sup> Interview with government officials in Omaheke, March 12, 2024.



In this sense, the project was designed to address a wide range of issues, targeting local children with stunted growth, adults with HIV and tuberculosis, and pregnant and breastfeeding women facing acute food insecurity. Its comprehensive approach, which includes various activities such as installing 20 x 30m shade nets for vegetable cultivation, establishing a drip irrigation system, and strengthening local food markets, aims to reduce levels of stunting and malnutrition and increase access to healthy diets. The project, implemented by WFP with donations from the Federative Republic of Brazil, also plans to strengthen capacity for irrigation, food safety, food loss reduction, and nutritional education.

When individuals lack access to basic needs, leveraging climate change as an argument to promote more sustainable practices often falls short in securing buy-in. Namibia's KIIs revealed that a significant portion of the country's community comprises job-seekers and the unemployment rate forecasted to 20.69% by 2024<sup>200</sup>. Inquiries into their coping mechanisms to mitigate food insecurity unveiled practices such as preparing porridge and water for the entire family, along with the recurring habit of resorting to alcohol consumption "just to fill the stomach."<sup>201</sup> Consequently, the primary motivation behind community engagement with new, innovative practices aligned with CSA methods lies in addressing their own nutritional deficiencies. This observation underscores that while tackling climate change may not always be the foremost motivation for behavioral change, it can indeed become a significant factor when intertwined with broader socio-economic goals.

By integrating agricultural interventions such as enhanced production and market accessibility with health-oriented initiatives aimed at vulnerable demographics, the WFP project adopts a comprehensive strategy to combat malnutrition within the Epako community. This approach entails active involvement and shared ownership among the project team, government authorities, and the local community, fostering a sense of collective responsibility toward finding long-term, holistic solutions. This operational framework appears particularly suited to the contextual challenges at hand.

### **Triple Challenge in the Food System: Subsistence, Value Aggregation, and Market Access**

Namibia's smallholder farmers face significant constraints stemming from low productivity and a scarcity of resources necessary for advancing CSA practices. During the KIIs, 55% of respondents highlighted that while certain communities express interest and possess spare time for home gardening or subsistence farming, they encounter obstacles due to a lack of essential and affordable inputs. These include limited exposure to innovation, insufficient training and monitoring, and restricted access to tools, seeds, and other inputs, all in addition to the climate constraints.

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<sup>200</sup> Statista, Socioeconomic Indicators. Available at: <https://fr.statista.com/outlook/co/socioeconomic-indicators/namibia> Accessed April 30, 2024

<sup>201</sup> Interview, March 2024.



Amidst challenges faced by Namibia's smallholder farmers, interviewees have highlighted the enduring reliance on outdated technologies due to financial constraints, leading to suboptimal efficiency and productivity in food production. In parallel, an interlocutor from the Ongwediva Rural Development Center, associated with the Ministry of Urban and Rural Development, has acknowledged delays in procurement and delivery of subsidized machinery, further impeding the sector's efficiency. Consequently, despite the evident demand for modern agricultural equipment, manufacturing inefficiencies continue to obstruct timely access to these resources. Public officials have underscored the significance of re-engaging with and promoting awareness of indigenous knowledge to wider audiences as an alternative to mechanization and modernization since this has demonstrated remarkable resilience across varied contexts.

Additionally, smallholder farmers who surpass these barriers and manage to generate surpluses may still encounter difficulties in securing local market demand. Stakeholders interviewed by the research team expressed significant concerns regarding market access policies and the imperative to integrate farmers into markets. Local implementers, such as GIZ, underscored the necessity of redirecting future development endeavors toward optimizing the procurement and food processing processes. For instance, they provided insights into the complex dynamics of Namibia's food trade, shedding light on the inherent inefficiencies within the current system.

Notably, Namibia exports its fish to South Africa, where value is added through processes such as canning the fish with South African tomato sauce, only to re-import it back to Namibia for consumption.<sup>202</sup> These intertwined elements underscore the need for a comprehensive approach to address issues within the food value chain. In parallel, actors trying to bridge the gap between smallholder farmers and markets reported that it is very hard to collect data from farmers since, in some places, they cannot count on internet, electricity, or phone connectivity. The demand for groceries is often high, and the target group of farmers only have small gardens, meaning that the supply is not always guaranteed.<sup>203</sup>

The SIPA team's location out of Windhoek facilitated better access to local stakeholders' perspectives on urban agriculture's transformative potential. Interviews conducted with the Kambashu Institute, Namibia Nature Foundation, and the Ongwediva Rural Development Center emphasized that urban agriculture holds significant promise for Namibia, particularly in reducing the country's reliance on food imports. Given Namibia's relatively small population and moderate consumption levels, investing in urban agriculture could yield substantial benefits by diminishing the need to import food, especially from neighboring South Africa.

Reducing food imports would likely help Namibia's commitments to reduce greenhouse gas emissions and support its adaptation efforts.<sup>204</sup> In fact, Namibia indirectly approaches this topic in its UN Nationally Determined Contributions via goals of promoting innovations in food

<sup>202</sup> Interview with GIZ, March 14, 2024.

<sup>203</sup> Interview with Tololi, March 15, 2024.

<sup>204</sup> Interview with University of Zululand, March 4, 2024.



processing, food losses, and waste, together with other food security interventions, also highlighting the link between food security and GEE removals.<sup>205</sup> Furthermore, by lowering heavy import expenditures and transportation demands, urban agriculture contributes to both economic and environmental objectives. The rise and expansion of urban agriculture in Namibia are closely intertwined with migration patterns, particularly from countries like Zimbabwe, where individuals aim to enhance food security and crop yields through urban farming practices. Consequently, the cultural transition towards urban agriculture reflects a response to local food requirements and broader socioeconomic dynamics and migration influences within the region.

### Financing Gaps

While finance has emerged as a central concern in various meetings, the primary issue stems from Namibia being classified as an upper-middle-income country, which diminishes its capacity to attract aid. Almost 40% of respondents mentioned that access to finance was limited. Organizations such as the Global Donor Platform for Rural Development, comprising a network of 40 bilateral and multilateral donors, international financial institutions, intergovernmental organizations, foundations, and development agencies, scrutinize each donor's policy to identify common interests. The pursuit of commonalities fosters uniformity and harmonization towards rural development goals. KIIs with such mobilizers reveal a prevailing sentiment that "Namibia is perceived as too wealthy to merit focus and also very small in terms of the population."<sup>206</sup>

Since gaining independence in 1990, Namibia has experienced significant economic expansion driven by foreign direct investment and facilitated by careful economic management.<sup>207</sup> This sustained progress has been propelled by substantial private capital injections into mining and governmental investments in infrastructure, supported by judicious fiscal and monetary strategies, a stable political and commercial climate, and a robust financial sector. In 2008, Namibia ascended from a lower middle-income status to an upper-middle-income status, with per capita incomes peaking at US\$6,370 in 2015. However, starting in 2016, the country's growth began to diminish steadily, culminating in an economic downturn and revealing the susceptibility of Namibia's economic model to external factors and climatic events.<sup>208</sup>

Nonetheless, a historical pattern predating 1990, characterized by the systematic marginalization of the Black majority from comprehensive engagement in economic endeavors, continues to influence both societal and economic realms, impeding the nation's economic and social advancement up to the present. Economic privileges remain concentrated within a comparatively limited portion of the populace, perpetuating substantial disparities.<sup>209</sup> The absence of inclusivity and the extensive rifts within society have given rise to a dichotomous economic structure

<sup>205</sup> Namibia's Nationally Determined Contribution. 2023. Second Update.

<sup>206</sup> Interview with Global Donor Platform for Rural Development, March 13, 2024.

<sup>207</sup> African Development Bank. 2020. "Republic of Namibia Country Strategy Paper (CSP) 2020-2024." Available at: [www.afdb.org/en/documents/namibia-country-strategy-paper-csp-2020-2024](http://www.afdb.org/en/documents/namibia-country-strategy-paper-csp-2020-2024)

<sup>208</sup> International Finance Corporation. 2022. "Creating Markets in Namibia: Creating Resilient and Inclusive Markets." Available at: [www.ifc.org/content/dam/ifc/doc/mgrt/namibia-cpsd-hi-res-final.pdf](http://www.ifc.org/content/dam/ifc/doc/mgrt/namibia-cpsd-hi-res-final.pdf)

<sup>209</sup> World Bank. 2024. The World Bank in Namibia. Available at: [www.worldbank.org/en/country/namibia/overview](http://www.worldbank.org/en/country/namibia/overview)



marked by a highly developed contemporary sector coexisting alongside an informal, subsistence-focused one.<sup>210</sup> This context illustrates the reason why some interviewees, advocating for increased financial flows towards the development of Namibia's landscape of climate-smart practices in agriculture, highlighted the need to “look at other indexes, such as Human Development, GINI, and other income distribution databases” in considering Namibia's case for continued development assistance<sup>211</sup>

### **World Food Programme and Development Organizations' Dual Role/Dependency Risk**

The SIPA research team began its work in Windhoek by meeting with the WFP Namibia CO (Country Office) team. During discussions with WFP staff, it became evident that their mandate encompasses at least two roles. Firstly, the agency has a strong developmental profile, engaging in strategic interventions to foster sustainable rural development and enhance resilience within Namibia's agricultural policy landscape. For instance, the WFP Namibia CO is currently developing a Rapid Rural Transformation (RRT) project in Ben Hur Rural Development Centre, establishing solar-powered hubs, a sustainable water source and information and communications technology allowing for the provision of essential services such as energy, water, and digital platforms to people living in Omahake regions. The hub, which is managed by the Ministry of Urban and Rural Development, enables various partners to establish integrated community services such as training centers for women and youth on food production and business skills, as well as digital classrooms, while increasing agricultural production through solar-powered drip irrigation and hydroponics.

Secondly, the government in Namibia, with the technical support of the World Food Programme, plays a crucial humanitarian role by providing aid in regions facing high levels of food insecurity and acute nutritional deficiencies. It plays a crucial humanitarian role by providing food assistance in regions facing high levels of food insecurity and acute nutritional deficiencies. This dual role affects how WFP and analogous entities within the sustainable agriculture ecosystem locally integrate strategies to mitigate the risk of perpetuating a reliance pattern. During a briefing session in Windhoek, the WFP team underscored the significance of conducting key informant interviews with tact and sensitivity to prevent fostering a dependency mindset among interviewees.

During the SIPA team's field visit, an illustration of this concern arose when one interlocutor spontaneously suggested, "Ask the World Food Program to install an internet antenna here."<sup>212</sup> This demand serves as a poignant reflection of the community's perception regarding the providers of essential services and underscores the potential risk associated with overreliance on external assistance rather than fostering self-sustainable, community-driven approaches, which also arose as a concern from other development agencies and partners.

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<sup>210</sup> Ibid.

<sup>211</sup> Interview with GIZ, March 14, 2024.

<sup>212</sup> Interaction with local community representative in Gobabis, March 12, 2024.



Additionally, government officials overseeing projects in the region emphasized the challenge of maintaining a balance between promoting self-sufficiency through the provision of training and resources and extending support to individuals repeatedly finding themselves in vulnerable nutritional circumstances.<sup>213</sup>

### C. Challenges

Challenges hindering the broader implementation of CSA practices in Namibia were elucidated through interviews with local stakeholders. The arid climate is perceived as a significant obstacle to sustainable agriculture in Namibia, with 95% of the respondents mentioning droughts and water scarcity as the main issues affecting the increase of CSA practices in the country. On the other hand, some stakeholders highlighted the underappreciated advantages of a dry ecosystem, such as reduced susceptibility to pests.<sup>214</sup> Recognizing the potential to draw lessons from successful experiences in other countries with similar biomes, the SIPA team directed its attention towards non-climatic challenges, particularly policy and cooperation gaps. Consequently, the following section addresses deficiencies in capacity building, fluctuations in official development assistance (ODA) inflows, governmental coordination, private sector involvement, and a lack of data for informed decision-making. These findings can be categorized into four **key challenges**, which are the presence of **resource and knowledge gaps**; **financial instability issues**; **institutional barriers to implementation**; and **poor availability of data**.

#### Knowledge Gaps and Resource Limitations

When it comes to capacity building, the focus is on the critical need to elevate training and skill development initiatives. Stakeholders have reported that to “*Put it simply, Namibia’s farmers lack sustainable climate-smart agriculture knowledge; they have not been exposed to it; they try to cope with droughts using their existing skills.*”<sup>215</sup> Others have said that small-scale farmers still lack basic knowledge about smart irrigation, even knowing that droughts will affect them periodically. During KIIs, the framework of the agriculture, urban, and rural development Ministries, particularly their extension offices, stood out because of their potential to be built upon and extended. The notable aspect of these offices is their strategic placement within the outskirts of rural communities, ensuring that government officials are physically accessible and integrated with these localities’ dynamics. This proximity allows for a more organic understanding of local challenges, facilitating the development of effective policies and initiatives, which fosters community recognition and buy-in for the construction of localized solutions.

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<sup>213</sup> Interview with the Ministry of Rural and Urban Transformation, March 12, 2024.

<sup>214</sup> Interview with Namibia Nature Foundation, March 14, 2024.

<sup>215</sup> Interview with Namafa, March 15, 2024.



The Ben-Hur extension office of the Ministry of Urban and Rural Development in the Gobabis region is a prime example. Their endeavors highlight the significance of bolstering capacity and fostering better coordination between governmental bodies, local farming associations, as well as regional organizations.<sup>216</sup> However, these branches often face limitations in accessing human and financial resources.<sup>217</sup> Thus, a key challenge in advancing CSA adoption and community understanding of CSA tools lies in addressing extension offices' requirements for improved resources, training, and collaboration with farming associations and regional organizations.

### **Unstable Financial Flows**

Secondly, the volatility of ODA inflows to Namibia since 2009, consequent to the country's reclassification to an upper middle-income status, has posed challenges to attracting more funding. This reclassification has engendered assumptions regarding diminished aid requirements for Namibia, notwithstanding the persistence of socio-economic challenges such as high unemployment, income disparity, and poverty.<sup>218</sup> Consequently, local partners such as GIZ encounter difficulties when advocating for bolstered competitiveness vis-à-vis other countries that garner greater international attention.

### **Limited Policy Coordination**

Moreover, while the decentralization of policy implementation is crucial, as demonstrated through community-centric development approaches, it is equally essential for policy formulation to be more strategically coordinated at the federal level. In Namibia, opportunities for enhanced inter-ministerial coordination are apparent, albeit within the context of typical dynamics observed in other countries. When it comes to addressing food insecurity, the Office of the Prime Minister, the ministries of Urban and Rural Development, Agriculture, Water and Land Reform, Environment and Tourism, Gender, Equality, Poverty Eradication and Social Welfare, Education, Arts and Culture and Health and Social Services are dedicated to different policies and projects. Some of these, like the Climate Change Mitigation Initiatives<sup>219</sup>, the Disaster Risk Management Act, and the Food Security Policy<sup>220</sup> are supervised by different government bodies. For this reason, some stakeholders have reported that the Ministries seem to be working in silos.<sup>221</sup>

### **Limited Private Sector Engagement in CSA Initiatives**

Another noteworthy concern concerns the underexplored potential of private sector engagement through corporate social responsibility endeavors. In Namibia, the private sector's presence as a central player in debates on implementing and funding climate-resilient initiatives has been more

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<sup>216</sup> Interview with the Ministry of Urban and Rural Development, March 12, 2024.

<sup>217</sup> Ibid.

<sup>218</sup> Interviews with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (March 14, 2024) and the Ministry of Agriculture, Water and Land Reform (March 15, 2024).

<sup>219</sup> Interview with the Ministry of Agriculture, Water and Land Reform, March 15, 2024.

<sup>220</sup> Interview with the Office of the Prime Minister, March 15, 2024.

<sup>221</sup> Interviews with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (March 14, 2024), Namibia Nature Foundation (March 14, 2024)



common in critical moments of environmental climate disasters but not in the long-term support to policy implementation or development strategies.<sup>222</sup> Whenever asked about the role of the private sector in supporting local projects or which private sector actors were behind the best practices, most stakeholders either did not have an answer or stated that the private sector in Namibia is not extensively involved in supporting social development initiatives.

Such absence is an issue because financing more robust CSAs becomes unfeasible without significant private sector engagement. Moreover, due to the challenges imposed by climate conditions on agriculture, Namibia has a streamlined ecosystem of players involved in implementing CSA practices. While this small network might limit funding sources and the diversity of projects in a country, it can also enhance the speed and efficiency of communication and collaboration among involved stakeholders. This dynamic has the potential to ensure a cohesive policy execution and more adherence to common standards.

### **Lack of Data Collection and Management**

Lastly, Namibia is at a decisive crossroads in its journey towards sustainable development, with a robust policy framework that is constantly updated to align with international conventions and best practices.<sup>223 224</sup> However, data collection and management remains a significant challenge across the country.<sup>225</sup> Overall, quantitative reports on CSA projects in Namibia are scarce, with anecdotal success narratives predominating, highlighting the need to incorporate robust Monitoring, Evaluation, and Learning mechanisms from the outset.

A dearth of agricultural statistics and data impedes evidence-based policymaking and informed decision-making processes in policy renewal, particularly concerning the Comprehensive Conservation Agriculture Programme, with quantitative impact assessments remaining elusive, notwithstanding governmental endeavors to enlist a cohort of PhD students for this purpose.<sup>226</sup> <sup>227</sup>Ultimately, the lack of available and transparent impact data are not only prejudicial in refining practices and supporting evidence-based policy-making and program implementation but also affects the country's capacity to attract additional funding and support.

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<sup>222</sup> Interviews with the Ministry of Urban and Rural Development (March 12, 2024), Ministry of Health and Epako Clinic (March 13, 2024).

<sup>223</sup> Interview with the Nutrition and Food Security Alliance in Namibia, February 27, 2024.

<sup>224</sup> Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Namibia Agriculture (2022). Available at: [www.giz.de/en/downloads/giz2022-en-namibia-agriculture.pdf](http://www.giz.de/en/downloads/giz2022-en-namibia-agriculture.pdf). Accessed April 9, 2024.

<sup>225</sup> Interview with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), March 14, 2024.

<sup>226</sup> Interview with the Aspiring Farmers Association Of Namibia (NamAfa) (March 15, 2024).

<sup>227</sup> Ministry of Agriculture, Water and Forestry. "Comprehensive Conservation Agriculture Programme for Namibia 2015-2019" (2015). Available at: <https://shorturl.at/cgoDW> Accessed April 10, 2024.



## D. Recommendations

Several recommendations emerged after reflecting on interactions with stakeholders in Namibia, which, if implemented, could potentially enhance the effectiveness of future food security interventions and increase the adoption of CSA practices in the country. These **recommendations** are pertinent to government officials and NGOs, project implementers, and other actors engaged in the local ecosystem by focusing on the following key areas: **enhancing development finance, boosting institutional capacity and resource access, and integrating solutions across disciplines.**

### **Strengthen Approach to Attract Development Finance**

Namibia's contribution to climate change, mainly through agricultural practices, is minimal. However, as previously mentioned, Namibia is labeled as an upper-middle-income country, which disguises underlying economic disparities and social inequities in the nation.<sup>228</sup> At the same time, international platforms increasingly approach multilateral development finance agendas such as Adaptation, Loss and Damage, and reforming the Multilateral Development Banks (MDBs). In this context, Namibia is positioned to significantly enhance its visibility and attract much-needed financial resources by articulating a compelling narrative about its vulnerability to climate change. A more nuanced approach, emphasizing metrics like the GINI coefficient<sup>229</sup>, or other inequality-related indexes, such as the World Inequality Lab (WIL), the Commitment to Reducing Inequality (CRI), and the Inequality-adjusted Human Development Index (IHDI), could provide a clearer picture of the economic challenges faced by Namibians and target international aid and investment.<sup>230</sup> Drawing inspiration from Caribbean nations, which have successfully positioned themselves as severely impacted by climate-related events, Namibia could potentially highlight its CSA practices as indispensable to the country's food security in the face of escalating climate challenges.

### **Improve Smallholder Farmers' Institutional Capacity and Access to CSA Resources**

The adoption of CSA practices remains a critical area for development, necessitating a coordinated effort to elevate awareness and training among smallholder farmers. Even though interactions with implementation partners reveal the enthusiasm for innovative CSA practices among local communities, indicating a willingness to adopt new technologies, a lack of exposure and access to such technologies limits their widespread implementation.<sup>231</sup> Namibia currently faces a general primary stage of technological familiarity and a gradual evolution in local mindsets towards more sustainable practices. Yet, the challenges of accessing essential agricultural inputs, financial resources, and markets persist, underscoring the need for enhanced

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<sup>228</sup> Interviews with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (March 14, 2024) and the Ministry of Agriculture, Water and Land Reform (March 15, 2024).

<sup>229</sup> Interview with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), March 14, 2024.

<sup>230</sup> Idem.

<sup>231</sup> Interview with the Aspiring Farmers Association Of Namibia (NamAfa) (March 15, 2024).



training, skill development, and coordination of farming activities to bridge the existing food security gap without succumbing to the pitfalls of the “*tall poppy syndrome*.”<sup>232 233</sup>

Moreover, while technological advancements have their place, the reality on the ground often highlights the importance of practical training over introducing sophisticated technologies. There is a sentiment among implementing stakeholders that communities can only adopt the most sophisticated technologies if they build on existing knowledge (including from indigenous communities) and skills and improve institutional capacity.<sup>234</sup> This approach ensures the sustainability of solutions and respects and integrates local wisdom and expertise. Additionally, the availability of financial resources that are both accessible and cost-effective can play a significant role in enhancing the productivity, earnings, spending capacity, and nutritional status of farmers.<sup>235</sup> This is why Namibia should create and advocate for financial solutions designed specifically for smallholder farmers to facilitate their adoption of climate-resilient technologies. This effort could include the implementation of subsidies such as the one already given by the Ministry of Agriculture or low-interest loans provided by government bodies or international organizations.

### **Leveraging Female Farmers' Adaptability for CSA and Food Security**

Women play a pivotal role in subsistence agriculture, as they tend to adopt and adapt to new methods more readily and undergo quicker shifts in mindset after training.<sup>236</sup> Nonetheless, they still face significant barriers to accessing finance, land ownership, and training.<sup>237</sup> Hence, investing in women is crucial for transforming agricultural practices into Climate-Smart Agriculture and ensuring food security. Collaborative efforts with entities such as the Consultative Group on International Agricultural Research could prove beneficial in embedding a "gender-smart agriculture" approach within national policies, ensuring that interventions are both inclusive and effective. This necessitates a departure from siloed operations among ministries, urging a more cohesive collaboration, notably with the Ministry of Gender.<sup>238</sup>

Further, 27% of stakeholders reported that the projects they oversee promote community engagement by establishing membership associations or clubs, with women playing central roles as collaborators. These initiatives offer symbolic rewards in exchange for results, thereby nurturing a sense of belonging and providing rewarding experiences for participants. Scaling

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<sup>232</sup> Interviews with the Ministry of Urban and Rural Development (March 12, 2024), the Namibia Nature Foundation (March 14, 2024), the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (March 14, 2024), and the Aspiring Farmers Association Of Namibia (NamAfa) (March 15, 2024).

<sup>233</sup> Interview with the Namibia Nature Foundation, March 14, 2024.

<sup>234</sup> Interview with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (March 14, 2024) and the African Development Bank (March 19, 2024).

<sup>235</sup> Fortunato, A., Enciso, S. (2023). "Food for Growth: A Diagnostics of Namibia's Agriculture Sector." CID (Center for International Development) Fellows Working Paper Series No. 154, Harvard Kennedy School Growth Lab, October 2023. Available at: <https://shorturl.at/ckOX2> Accessed April 10, 2024.

<sup>236</sup> According to interviews conducted with the Ministry of Agriculture (March 15, 2024), the Namibia Nature Foundation and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (March 14, 2024).

<sup>237</sup> Ibid.

<sup>238</sup> Interviews with the Ministry of Agriculture, March 15, 2024.



incentives like this - through non-financial rewards, if in the context of constraints - could amplify community involvement. In addition, increasing representation of women officials in extension offices can help to encourage women's participation in sustainable agriculture and establish a more inclusive and supportive environment within extension services, where the specific needs and viewpoints of female farmers are acknowledged and addressed efficiently. Women officials can serve as relatable role models and mentors for other women by offering support, guidance, and encouragement to actively participate in agricultural practices. By fostering greater gender diversity within extension offices, gender equality can be promoted in agriculture and harness the full potential of women as key drivers of sustainable development in rural communities.

### **Empowering Youth Through Technology**

Multiple stakeholders emphasized the disenchantment among youth in rural areas, primarily due to the lack of recognition and employment opportunities. The issue calls for an urgent need to reinvigorate their interest in agriculture as a viable livelihood, which can initially be done through religious and local leaderships that play an essential role and level of engagement with youth in rural communities. The lack of personal and professional development opportunities also hinders their ability to contribute effectively to their communities and the broader development agenda, even though the increase in youth participation in subsistence agriculture, observed notably during the COVID-19 pandemic, signals a potential that can be harnessed through targeted initiatives and access to recreational markets.<sup>239</sup> Addressing these challenges also requires providing youth access to education, vocational training, and platforms for exchanging ideas and experiences.<sup>240</sup> Such initiatives enhance their skills and knowledge and empower them to become active community change agents.

Meanwhile, engaging youth from the inception point of CSA initiatives is crucial for the long-term sustainability of project implementation. It can be achieved through educational programs, internships, and entrepreneurship opportunities in the agricultural sector, specifically tailored to young people's interests and needs. Apart from that, while the Ministry of Environment and other governmental bodies have roles, there is a need for greater inclusion of youth and community voices in the decision-making processes.<sup>241</sup> Enhancing collaboration between these stakeholders and providing platforms for community input can ensure that policies and initiatives are grounded in local realities and needs. Luckily, the emergence of youth-led organizations dedicated to advancing CSA, such as Tololi Online, NamAfa, and Youth 4 Climate Action Namibia (Youth4Cam), presents a promising avenue for revitalizing agricultural engagement among this demographic. Another recommendation that might fit the goal of engaging the youth is to provide micro-loans without collaterals to this targeted group to reduce unemployment while increasing food production.

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<sup>239</sup> Interview with NamAfa, March 15, 2024.

<sup>240</sup> Interview with Tololi Online, March 14, 2024.

<sup>241</sup> Interview with Youth4Can, March 14, 2024.



### **Search for Integrated Solutions and Multidisciplinary Approaches**

Finally, to further enhance Namibia's trajectory towards sustainable development, an integrated approach that encompasses a variety of solutions proves to be most effective. This integrated agenda for development should prioritize initiatives that contribute to solving interconnected challenges across various sectors, with CSA practices serving as a pivotal component.<sup>242</sup> For instance, initiatives that combine education, health, and agricultural practices have shown promising outcomes, such as the case of the Epako Clinic, where health agents were able to decrease medication default rates in hospitalizations for children and women by fighting malnutrition through their community garden and soup kitchen.<sup>243</sup>

Examples of CSA practices that explore the climate-energy-water nexus, such as the Sustainable Use of Agrivoltaics designed by GIZ, improve productivity, energy sustainability, and the resilience of the agriculture sector against climate change by establishing agrivoltaic systems that provide food and electricity for the green transition, drip irrigation, and post-harvest management systems while creating energy-based agroforestry to diversify from livestock.<sup>244</sup> The multifaceted benefits include addressing several challenges simultaneously, especially the consistent lack of access to sources of water. The approach increases the practice's appeal to smallholder farmers, also potentially attracting more governmental and international support. Finally, there is widespread recognition of the significance of creating a high-level committee or utilizing the Prime Minister's Office as a central hub to promote cohesive policy alignment, thereby fostering improved communication among ministries. The primary objective of such a central inter-ministerial committee would be to oversee the implementation of initiatives and public policies aimed at advancing CSA and other cross-cutting climate policies.

In conclusion, to enhance the adoption and efficiency of CSA in Namibia, a comprehensive strategy that includes improving data management, implementing region-specific agricultural practices, expanding access to innovative technologies, engaging youth, enhancing stakeholder collaboration, and constructing a climate finance strategy for improved funding access is essential. With these targeted recommendations, Namibia would make significant progress towards sustainable agriculture systems, improved food security, and greater resilience to climate change.

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<sup>242</sup> See practices in Annex 1.

<sup>243</sup> Interview with the Ministry of Health and Epako Clinic, March 13, 2024.

<sup>244</sup> Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). "INSPIRED – Agri-PV: Sustainable Use of Agrivoltaics in Namibia" Available at: <https://shorturl.at/hinK7>. Accessed April 10, 2024



## VIII. Potential Good Practices

As previously outlined, the primary objective of our research is to identify effective practices that significantly enhance food security and nutritional outcomes in Sub-Saharan Africa. This effort adheres to CERFAM's **rigorous criteria for good practices** (ref. *Section IV*). The SIPA team was able to identify these potential good practices following extensive research and analysis including 57 in-country and virtual KIIs. This robust methodology ensures that the practices highlighted have proven efficacy in real-world applications, having been tested in the field.

Following an analysis based on CERFAM's aforementioned criteria, the three potential good practices - and the countries in which they operate - as recommended by this study are the **Commercial Agriculture for Smallholders & Agribusinesses (Ethiopia, Malawi, Rwanda)**; **Sustainable Landscapes for Eastern Madagascar (Madagascar)**; and **Permaculture Food Circles (Namibia)**. The below section provides a detailed description of these practices.

### A. Commercial Agriculture for Smallholder & Agribusinesses

Regional Scope: Ethiopia, Malawi, Rwanda

#### 1. Overview

The Commercial Agriculture for Smallholders & Agribusinesses (CASA) program, established in 2019 under the UK Foreign, Commonwealth & Development Office (FCDO) and funded by the UK International Climate Finance (ICF) since 2022, is designed to create sustainable agricultural growth by better incorporating smallholder farmers into the commercial sector. Specifically, CASA aims to enhance smallholder farmer income, food security, nutrition and climate-resilience via better market access and integration into national agricultural value chains. To achieve this goal, CASA equips small and medium-sized (SME) agri-businesses to strengthen pre-existing relationships with smallholder farmers in the countries where it operates. Within the African subcontinent, the program is currently operational in Rwanda, Ethiopia, and Malawi; and some components are implemented by NIRAS, Swisscontact, and Technoserve in other regions. CASA project focuses on specific value chains depending on the country. In Rwanda, on vegetables, aquaculture, poultry; Ethiopia, tomatoes, wheat; and Malawi, poultry, agriculture. Specific details about CASA's implementation are elaborated on in the Description section (b).<sup>245</sup>

#### a) Context

Although operating in SSA, the program emphasizes global protections for smallholder farmers at risk to loss of life, livelihoods, incomes, competition over resources and related conflict. CASA therefore aspires to improve the resilience and adaptive capacity of both smallholders and agribusinesses in the global countries where it operates, while remaining conscious of the fact

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<sup>245</sup> Mahmud, Shaila, Jack Covey, and Raphaël Hébert (2024). "Adapting Agriculture Programmes to Address Climate Change: A Case Study from the CASA Programme." CASA.

that the agri-food sector represents 31% of global anthropogenic greenhouse gas emissions. In addition, there is also a \$106 billion gap in agribusiness investments across Sub-Saharan Africa and South-East Asia, making CASA’s investment readiness goals for SMEs truly imperative.<sup>246</sup> Along with facilitating integration of smallholder farmers into value chains via agribusinesses, CASA focuses on climate mitigation to reduce emissions and environmental harm of partners.<sup>247</sup>

The UK FCDO stressed, since the program’s inception, defining and embedding key terms into CASA’s logic model. These include climate adaptation; *“the process of adjustment to actual or expected climate and its effects”*; and a 3A framework on climate resilience to *“conceptualize [climate] resilience across dimensions of adaptive, anticipatory and absorptive capacity.”*<sup>248, 249</sup>

### b) Description

CASA is implemented based on three primary components of SME agri-business investment, technical assistance facility (TAF), and knowledge-sharing for greater replicability and scaling.

Component	Implementer	Description
Market systems development	NIRAS & Swisscontact	<ul style="list-style-type: none"> <li>● Mobilize investments for partner agribusinesses</li> <li>● Improve income, food and nutrition security and climate resilience of smallholders</li> </ul>
Research, communications, events	NIRAS & CABI	<ul style="list-style-type: none"> <li>● Foster knowledge-sharing for upscaling and replicating</li> <li>● Collate evidence &amp; learning from other CASA components</li> </ul>
TAF	Technoserve	<ul style="list-style-type: none"> <li>● Deploy inclusive technical assistance to strengthens upstream and downstream supply chains of partner SMEs</li> <li>● Promote returns, impact, resilience</li> <li>● Collaborate with investors.</li> </ul>

**Table 2. Core components of CASA**

During implementation, CASA focuses on developing its program’s and beneficiaries’ **climate resilience, food security, self-sustenance, gender equality and social inclusion**, and overall **replicability** of its efforts. Moreover, CASA emphasizes buy-in from local **governments** and

<sup>246</sup> Tubiello et al., (2022), Pre- and post-production processes increasingly dominate greenhouse gas emissions from agri-food systems, Earth System Science Data, 14(4).

<sup>247</sup> ICAI. “UK Aid to Agriculture in a Time of Climate Change.” Accessed April 14, 2024.

<https://icai.independent.gov.uk/html-version/uk-aid-to-agriculture-in-a-time-of-climate-change-2/>.

<sup>248</sup> “AR5 Synthesis Report: Climate Change 2014 — IPCC.” Accessed April 14, 2024. <https://www.ipcc.ch/report/ar5/syr/>.

<sup>249</sup> UK Government (2024), ICF KPI 4 Methodology Note,

adaptability of its own policies to the national context where the program is implemented. In countries where they currently operate, interviewees stated that the **policy environment** has allowed favorable development of its cross-sector partnerships and overall business model.<sup>250</sup> Some themes are discussed below, noting the definition of replicability above:

- **Climate resilience:** CASA conducts a climate-risk screening to understand the business' climate-risk and address its potential for improving climate resilience while selecting agri-business SMEs.
- **Self-sustenance/business sustainability:** SME agribusiness partners are expected to independently hone business relationships with smallholder farmers and simultaneously rely less on donor/grant funding under CASA's guidance. In this way, sustainability is included in selection criteria for the SMEs included in CASA's partners, from the start.<sup>251</sup>
- **Gender equality and social inclusion:** CASA has an inclusive growth focus wherein they actively track outcome indicators to include marginalized women in the value chain for smallholder farmers.

### Climate adaptation focus

The inclusion of climate adaptation as a core component of CASA's implementation model has extended beyond the theoretical and design framework, to implementation from 2022 onwards.

Component A in Malawi
<p><b>Aquaculture Value Chain</b></p> <ul style="list-style-type: none"> <li>● Integrated Farming used by smallholder aquaculture farmers by planting fruit trees, bananas, and vegetables around their fishponds. These plants are watered with pondwater (naturally rich in nutrients) and protect the pond walls from damage caused by heavy rainfall and floods.</li> <li>● Smallholders planted pine trees on the slopes surrounding the fish farm, which aids in land restoration and sustainable environmental management through afforestation to stabilise the soil and also generates climate positive impacts of tree planting.</li> <li>● Smallholders constructed dykes and overflows using vetiver grass and sugarcanes to prevent damage caused by heavy runoff, increasing resilience to flood events.</li> <li>● During colder seasons, which are increasing (likely due to climate change), some farmers built over-the-pond greenhouses to raise the water temperature and extend the breeding window.</li> </ul>

**Figure 6. Climate impact analysis (Poultry VC, 2019)<sup>252</sup>**

<sup>250</sup> Interview with NIRAS, March 14, 2024.

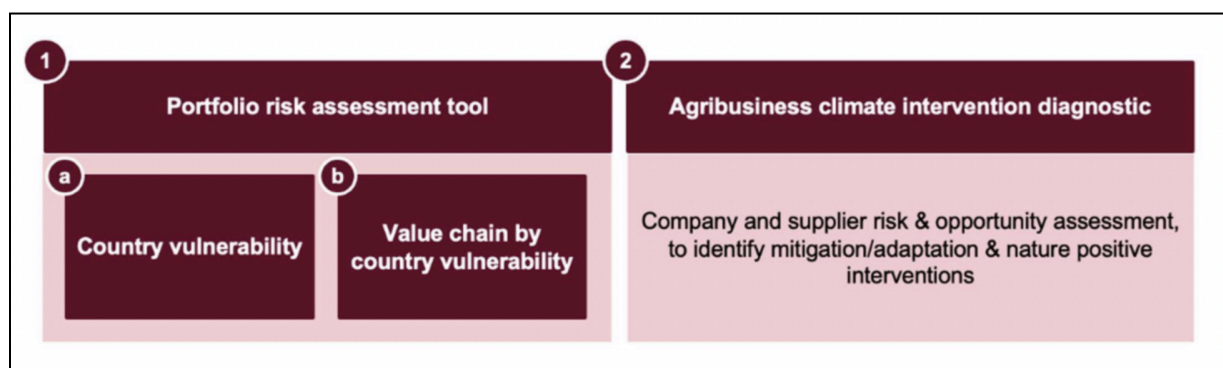
<sup>251</sup> Ibid.

<sup>252</sup> Mahmud, Shaila, Jack Covey, and Raphaël Hébert (2024). "Adapting Agriculture Programmes to Address Climate Change: A Case Study from the CASA Programme." CASA.

Specifically, CASA had outlined a Climate Change and Environment (CCE) framework in 2019, which analyzed two value chains (VCs) for its project countries: for example, in Malawi, risks and improvement areas for the country’s aquaculture and poultry VCs were documented; along with a recommendation for four CCEs, along its **Market systems development** component:

- **CCE Trainings** to sensitize country teams and partner SMEs on CCE issues
- **Monitoring and evaluation** to analyze CCE mainstreaming avenues, including gaps, issues, good practices and CCE outcomes.
- **Manuals and guides** to facilitate CCE mainstreaming in CASA programming, based on a CARAT tool developed by a USAID Feed the Future program.
- **Research studies** for addressing CCE questions and results from M&E programs above.

CASA has also always considered climate while selecting investors and partner SMEs, along its **TAF** component. Investors are selected by CASA’s TAF facilities based on the following criteria: basic environmental, social and governance (ESG) compliance; agriculture portfolio size; investments in FCDO priority countries; alignment of impact objectives with those of CASA; potential for commercial growth; and demand for the intervention from investors. Moreover, CASA selects partner agribusiness reviewing investor databases to identify companies with the highest potential for inclusive growth related to commercial performance, smallholder impact, gender inclusivity, and contributions to climate adaptation, mitigation, and circularity (Image 7).



**Figure 7. TAF approach to intervention design<sup>253</sup>**

Following initial selection and landscape analysis of country VCs using national data available, TAF applies specific CCE tools for conducting micro-level analysis to assess climate-level objectives; helping investors to identify investment opportunities and provide partner SME agribusinesses with potential climate activities, which align with both business and farmer empowerment objectives, in an ‘opportunity assessment. CASA’s TAF helps partners and investors to deliver the specific climate activities which they prefer from the assessment. TAF

<sup>253</sup> Ibid.



achieves this through its comprehensive service which includes feasibility assessments, project development, and impact measurement to support implementation of climate-related solutions. Thus, by integrating climate assistance into its TAF modules; CASA emphasises the commercial potential of these agribusinesses while demonstrating climate-proof bankable investments.<sup>254</sup>

### c) Impact / Outcomes

Through its project activities, CASA aims to reach nearly 600,000 smallholder farmers, of which at-least half are female, uplift incomes of participating farmers by at least \$115 USD annually, and mobilize over \$5.5 million USD in investments from third-parties for the benefit of its farmers; while achieving positive developments in food security, nutrition, climate-resilience and female empowerment of smallholder farmers and business owners.<sup>255</sup> As of 2024, CASA has achieved the below outcomes along its core components.

- **Market systems development:**
  - Supported 334,440 smallholder producers; of which 220,000 through new or improved off-taker or aggregation arrangements, and 47,200 through Covid-19 or global food crisis responses
  - Leveraged approximately USD \$3.5 million in commercial investment into supported agri-food SMEs<sup>256</sup>
- **Research, communications, events:**
  - 44 events where CASA exchanged information with policymakers, donors, agribusinesses and capital providers
  - 27 research outputs and 17 additional publications
  - 20 policy decisions by governments, investors and investor networks influenced in favor of SME investing and climate finance for adaptation<sup>257</sup>
- **TAF:**
  - Delivered 60 projects to improve smallholder markets access, climate resilience
  - Provided 30 agri-food SMEs technical assistance for investment readiness<sup>258</sup>
  - Proven interest from investors to sourcing from smallholders, due to greater supply volumes, lower costs, and higher sales prices<sup>259</sup>

### a) Limitations

Key challenges to CASA include aligning the value propositions for both farmers and SMEs, addressing poor SMEs, governance and high SME taxation leading to resistance to social value investing and business restructuring. The program's sustainability is contingent on its ability to foster independence among its SME partners, reducing their reliance on donor or grant funding -

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<sup>254</sup> Ibid.

<sup>255</sup> Home. "CASA." Accessed April 14, 2024. <https://www.swisscontact.org/en/projects/casa>.

<sup>256</sup> Jennings, Aaron. "CASA Programme Approach: Blending Market Systems and Investment Promotion." CASA, June 18, 2020. <https://casaprogramme.com/casa-programme-approach-blending-market-systems-and-investment-promotion/>.

<sup>257</sup> CABI.org. "CASA Programme 'Investing in Growth.'" Accessed April 14, 2024. <https://www.cabi.org/projects/casa-programme/>.

<sup>258</sup> Jennings, Aaron. "CASA Programme Approach: Blending Market Systems and Investment Promotion." CASA, June 18, 2020. <https://casaprogramme.com/casa-programme-approach-blending-market-systems-and-investment-promotion/>.

<sup>259</sup> TechnoServe. "Sourcing from Smallholders: Complex Challenge or Commercial Opportunity?" Accessed April 14, 2024. <https://www.technoserve.org/resources/sourcing-from-smallholders-complex-challenge-or-commercial-opportunity/>



a challenging prospect in contexts where government services and policy support are lacking. Additionally, CASA only shifted its focus more towards achieving climate outcomes since receiving 100% ICF funding in 2022. Prior to this, CASA's model included several climate-related programming objectives even prior to receiving the ICF funding; however, these focused more on increasing smallholder income, food security, and nutrition outcomes. Elements of climate adaptation, resilience, and mitigation were less of a priority. Since 2022; CASA provides climate audits and climate strategies, better climate diagnostic tools, and updated their program logframe to include climate-related impact, outcome, and input indicators.<sup>260</sup>

## 2. Recommendation for Knowledge Diffusion

CASA is a complex program which targets two distinct beneficiaries, agribusiness SMEs and smallholder farmers, who also require multifaceted communication channels and solutions. Knowledge diffusion of the business strategies, climate-resilient approaches, food security and nutrition, and gender-sensitive elements of CASA would warrant multiple rounds of training and content developed for varied audiences: i.e., not just high-level technical experts, but also smallholder farmers and novice business leaders. Adaptation to local languages and cultures would also benefit greater access and uptake of the CASA principles related to greater smallholder farmer integration into agricultural value chains vis-a-vis agribusiness SMEs.

## 3. Challenges to Diffusion & Implementation

Considering the highly technical nature of CASA's components, particularly related to SME development and integration into smallholder value chains, it may only be feasible for similarly technical experts to gather, organize and distribute relevant learnings to SME partner businesses. This imposes constraints in terms of costs and diversity of implementing stakeholders.

## 4. Replicability and Opportunities for Scaling-up

CASA's strength lies in its **adaptability to specific country contexts** in which it operates, based on its inclusion of **local government** stakeholders and **policies**, farmer associations, and strong reliance on gathering an evidence base in potential country regions before designing and implementing its different components. Moreover, CASA emphasizes building the **sustainability** of its SME agribusiness partners, encouraging them to identify **non-donor funding** avenues and also **transferring capital gains** to smallholder farmers for improving food security and nutrition through farmer's income generation. This means that CASA is a highly replicable program which aims to equip beneficiaries with the tools and financial resources to continue generating their own income, remain financially independent, and become more resilient to climate change.

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<sup>260</sup> Mahmud, Shaila, Jack Covey, and Raphaël Hébert (2024). "Adapting Agriculture Programmes to Address Climate Change: A Case Study from the CASA Programme." CASA.



## **B. The Sustainable Landscapes for Eastern Madagascar**

### Regional Scope: Madagascar

#### **5. Overview**

Conservation International Madagascar, with support from U.S. headquarters, launched the Sustainable Landscapes for Eastern Madagascar (SLEM) project in 2017, which is expected to conclude in 2026. Funded by the Green Climate Fund, SLEM focuses on enhancing the resilience of smallholder farmers in the Ankeniheny-Zahamena (CAZ) and Ambositra-Vondrozo (COFAV) Forest Corridors through sustainable landscape practices. Emphasizing climate adaptation and mitigation, the project channels private finance into climate-smart agricultural investments to reduce greenhouse gas emissions and combat deforestation.

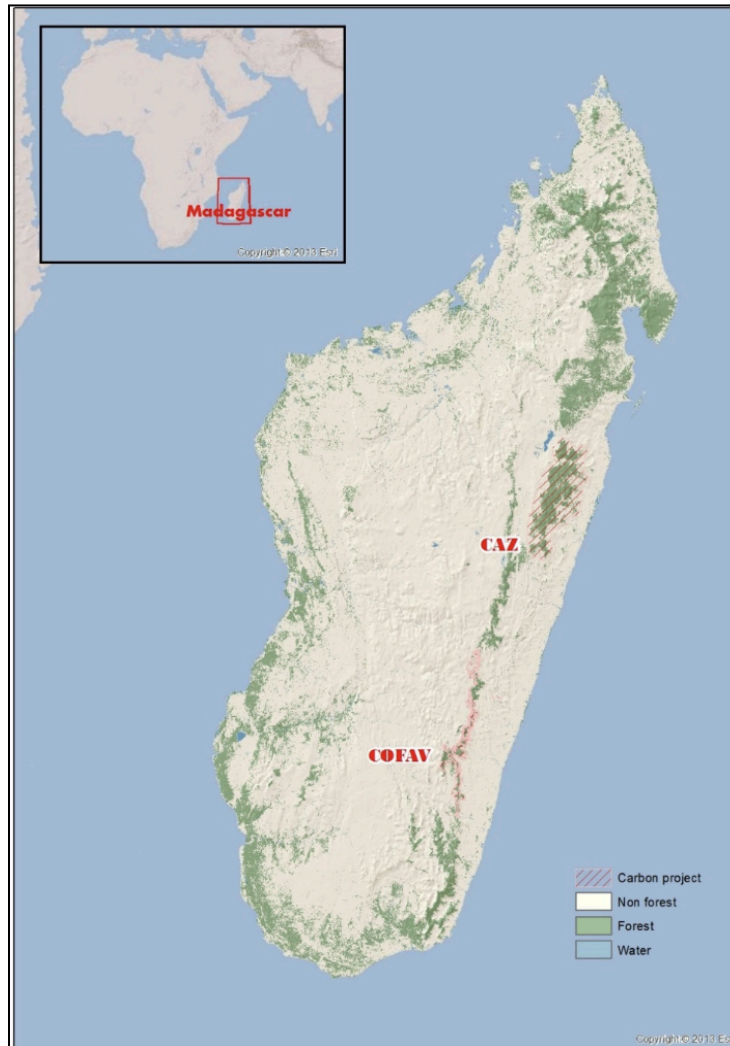
##### **a) Context**

The SLEM project was designed in response to critical environmental and socio-economic issues within the CAZ and COFAV regions of Eastern Madagascar, which are characterized by extensive deforestation, land degradation, and biodiversity loss (Image 5). These challenges are aggravated by the socio-economic vulnerabilities of local communities who rely heavily on natural resources for their livelihoods. Local communities make extensive use of the forest resources in an unsustainable way, and the government lacks to manage forest conservation.<sup>261</sup> SLEM's vision is to implement sustainable land management practices to mitigate these issues by enhancing ecosystem resilience and reducing reliance on traditional agricultural and forestry practices (Image 6).

This initiative is positioned within national and global frameworks addressing climate change and environmental degradation. It aligns with Madagascar's National Action Plan for Climate Change Adaptation and the REDD+, focusing on adaptation to protect against climate variability and mitigation to manage forest resources sustainably. The SLEM project's strategic importance is underscored by its potential to influence policy, direct future conservation efforts, and provide a replicable model for similar ecosystems globally threatened by environmental pressures and climate change. It also reflects a growing recognition of the need for integrated approaches that address the intersection of environmental health and community wellbeing.

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<sup>261</sup> Interview Conservation International, March 7, 2024



**Figure 8. SLEM intervention area (in red)<sup>262</sup>**

**b) Description**

The SLEM project has a total budget of USD 69.8 million and a 10 year lifespan, and it has several strategic actions aligned under two main components:

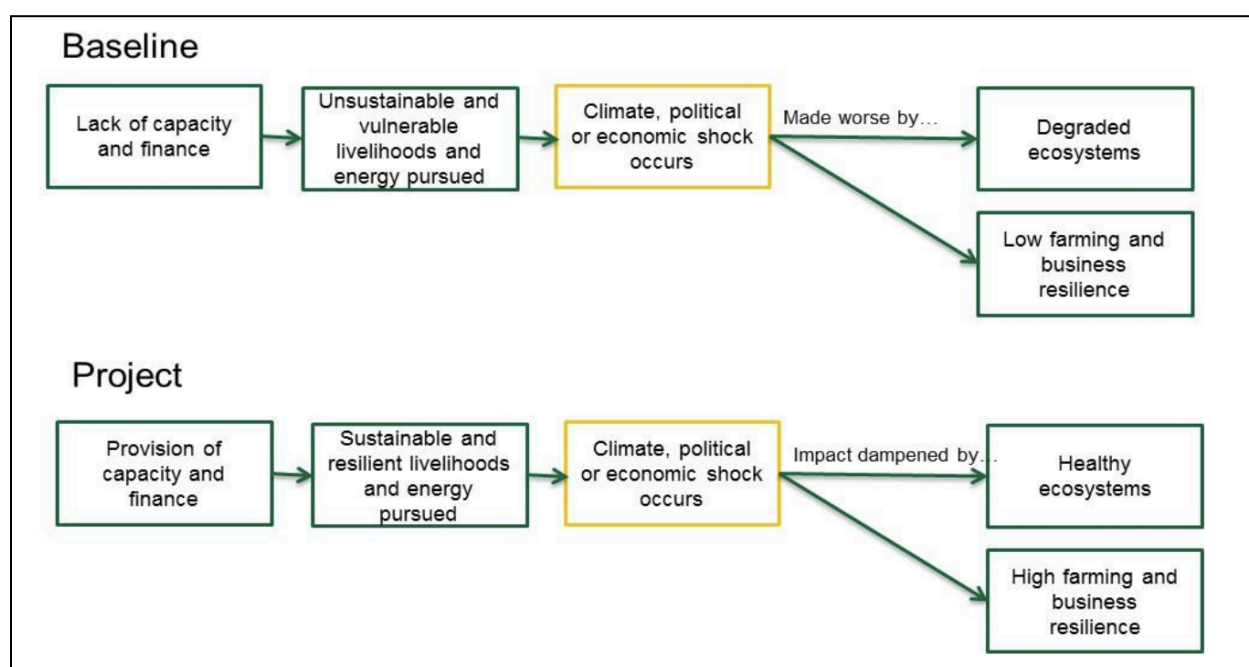
- **Component 1 - Climate Adaptation Activities:** The climate adaptation component of the SLEM project focuses on increasing agricultural resilience and sustainability among smallholder farmers in the CAZ and COFAV regions. This component is structured to implement several key activities:

<sup>262</sup> Conservation International. Environmental and Social Management Plan (English), page 24, [https://www.conservation.org/docs/default-source/publication-pdfs/ci\\_gcf-esmp-eastern-madagascar\\_en.pdf?sfvrsn=e2421ca7\\_2](https://www.conservation.org/docs/default-source/publication-pdfs/ci_gcf-esmp-eastern-madagascar_en.pdf?sfvrsn=e2421ca7_2)

- **Training and capacity building:** Smallholder farmers receive training in sustainable agricultural practices designed to increase productivity and sustainability. Training modules cover the topics “agroforestry and tree planting, micro-irrigation and drainage canals, intercropping and multi-cropping systems, off-season rice cultivation, mulching, no-tillage agriculture and terracing”.<sup>263</sup>
- **Provision of inputs and technical assistance:** Farmers are provided with seeds, seedlings of food and cash crops, livestock, juvenile fish, and small agricultural equipment. This is supplemented by ongoing technical assistance to help implement the practices taught in training sessions.
- **Conservation agriculture implementation:** Includes the introduction of agroforestry practices through the establishment of demonstration plots and the training of lead farmers to showcase sustainable farming techniques.
- **Support for alternative livelihoods:** Efforts are made to connect farmers with markets and to promote alternative sources of income beyond traditional farming to reduce pressure on natural resources.
- **Weather and market information dissemination:** Distribution of weather bulletins and market information to community leaders and lead farmers, who are expected to share this knowledge within their communities to aid in planning and risk management.
- **Component 2 - Climate Mitigation Activities:** The climate mitigation component aims to reduce greenhouse gas emissions from deforestation and enhance forest management within the protected areas of CAZ and COFAV. This component includes:
  - **Forest patrols:** Local patrollers are trained and equipped to monitor and protect forest boundaries. Stipends and equipment, such as GPS devices and drones, are provided to support their activities.
  - **Demarcation of protected areas:** Physical demarcation of the boundaries of protected areas to prevent encroachment and illegal activities. This involves the active participation of local communities and the use of visible markers to delineate these zones clearly.
  - **Capacity building for sustainable forest management:** Local associations and individual patrollers receive training on the technical, and management aspects necessary for effective forest restoration and protection. This also includes training in forest legislation to enhance legal compliance.
  - **Development of tree nurseries:** Supports the establishment of nurseries for forest and agroforestry seedlings, which are critical for reforestation efforts and sustainable forest management.
  - **Community engagement in reforestation:** Encourages local community involvement in tree planting activities to restore forest cover and promote community stewardship of natural resources.

<sup>263</sup> Green Climate Fund Independent Evaluation Unit, *Impact evaluation midline report for FP026 (2024)*, page 7, <https://ieu.greenclimate.fund/sites/default/files/document/240215-lorta-midline-report-madagascar-top.pdf>

Additionally, the project has an entire private sector strategy based on the establishment of an Investment Fund, supported by the European Investment Bank and implemented by Althelia, which will provide funding to develop commercially viable sustainable agriculture and renewable energy sectors that hadn't been able to grow due to the high risk investment environment. These components are designed to work together, ensuring that efforts to enhance agricultural sustainability are complemented by robust measures to protect and manage forest resources sustainably. Together, they form a comprehensive approach to tackling the environmental challenges facing Eastern Madagascar, aiming for improvements in both ecosystem health and local livelihoods.



**Figure 9. SLEM Vision<sup>264</sup>**

### c) Impact / Outcomes

The project targets 23,800 households across the CAZ and COFAV regions, involving numerous local associations and community-based organizations. These efforts extend to a significant portion of the population in these areas, directly working to increase the resiliency of around 114,000 expected beneficiaries through sustainable agricultural support and/or job creation. The fund promoting renewable energies seeks to impact 448,000 people through access to low emissions energy, and an additional one million indirect beneficiaries through the sustainable management of forests and agricultural land. The project's specific outcomes are listed below:

<sup>264</sup> Green Climate Fund, FP026: Sustainable Landscapes in Eastern Madagascar, (2016), page 13, <https://www.greenclimate.fund/sites/default/files/document/funding-proposal-fp026-ci-and-eib-madagascar.pdf>

- **Outcome 1:** Strengthened adaptive capacity and reduced exposure to climate risks
- **Outcome 2:** Strengthened awareness of climate threats and risk-reduction processes
- **Outcome 3:** Strengthened institutional and regulatory systems for climate-responsive planning and development
- **Outcome 4:** Increased number of low-emission power suppliers
- **Outcome 5:** Improved management of land and forest or improved management contributing to emissions reduction <sup>265</sup>

#### d) Limitations

Despite its successes, the SLEM project has faced several challenges that could impact its long-term efficacy and scalability. The COVID-19 pandemic notably disrupted implementation and greatly impacted the economic wellbeing of local populations, with many communities illegally clearing forested areas to obtain access to additional food and income sources, as well as a significant reduction in trade between towns and access to markets. All factors that affected the results of the project. In terms of monitoring of the project, methodological issues in data collection and evaluation for midterm reports also presented obstacles, including difficulties in accessing households and ensuring the accuracy of environmental impact assessments. Finally, the government's resources are limited and insufficient to assist everyone. Although Conservation International contributes additional resources to bridge these gaps, significant challenges persist in reaching all farmers and protecting forests due to resource constraints. <sup>266</sup>

### 6. Recommendation for Knowledge Diffusion

Strong technical knowledge of sustainable landscape practices is needed as well as experienced trainers to disseminate this knowledge. The SLEM project's reliance on local participation also means that knowledge sharing must be adapted to a wide range of audiences.

### 7. Replicability and Opportunities for Scaling-up

This model can be replicated and scaled up to other regions and countries but is particularly suited for high biodiversity-value landscapes with high climate risk. In this context, this project has shown that public finance like that of the Green Climate Fund can be used to leverage private sector finance for projects that meet both impact and financial criterias.<sup>267</sup> Outside of Madagascar, this practice is well suited for climate-vulnerable countries where unsustainable agriculture takes up a growing proportion of available land and drives deforestation, soil degradation, and a non-resilient agricultural sector. The SLEM project prioritizes implementation in cases where there are multiple effective practices that are easiest to adopt, can be widely used, require fewer inputs, lower labor needs, match local practices, and are low-cost.

<sup>265</sup> Green Climate Fund, *FP026: Sustainable Landscapes in Eastern Madagascar*, (2016), page 17, <https://www.greenclimate.fund/sites/default/files/document/funding-proposal-fp026-ci-and-eib-madagascar.pdf>

<sup>266</sup> Interview Conservation International, March 7, 2024

<sup>267</sup> Green Climate Fund, *FP026: Sustainable Landscapes in Eastern Madagascar*, (2016), page 34, <https://www.greenclimate.fund/sites/default/files/document/funding-proposal-fp026-ci-and-eib-madagascar.pdf>



As such, the project has employed a range of practices that are easier to roll out to other areas both in Madagascar and other countries.

## 8. Challenges to Diffusion & Implementation

The SLEM project has had demonstrable effects in Eastern Madagascar. However, there will be some issues; the same challenges that SLEM faces for scale-up will be the same problems for diffusion and implementation. This intervention has been proven successful in a very specific way in the forest corridors in Eastern Madagascar. As to implementation in other places in Madagascar or any other place in the world, environmental context will have to be greatly considered. There is no reason the strategy of SLEM could not work for other countries: climate adaptation and mitigation activities with local communities and farmers. But what the specific activities look like will have to thoughtfully and strategically change in order to address specific environmental challenges.

The challenge with diffusion comes from the project's theme. This project targets agriculture as it's clearly linked to the environment, but its outcomes are focused on the environment. As such, when diffusing SLEM as a climate-smart agricultural project, the link between farming and the environment will have to be stressed. This project helps farmers as they become more climate resilient. However, when an agricultural project does not have impact on yields or something else tangible to farmers, there may be issues with take up. An important amount of education will have to take place for both funders and implementers so that the environmental benefits also become highlighted as agricultural benefits as well.

### C. Permaculture Food Circles

#### Regional Scope: Namibia

## 9. Overview

The Permaculture Food Circles initiative, led by the Kambashu Institute, based in Namibia, was launched on the outskirts of Windhoek in 2021. Following a comprehensive approach, the project starts by offering a specialized 2-day course tailored for residents of informal settlements. The institute supplies compost and diverse seed varieties, laying the foundation for participants to cultivate their own food circles. This hands-on approach enables community members to consume the food produced for subsistence and generate income from the production surplus. Key project components include education on practices that enhance crop diversity, thereby bolstering biodiversity, and resilience to extreme climate conditions and pests. Additionally, participants gain insights into the nutritional benefits of various crops, contributing to food security and improved health outcomes within the community. The Kambashu Institute is funded by the World Future Council and other small German foundations, such as the Liselotte Stiftung, the Permaculture Food Circles embody a collaborative effort to drive positive social and environmental change.



**Figure 10. Food Circles Training in Windhoek, Namibia<sup>268</sup>**

### a) Context

In Namibia, where 2.6 million people reside, approximately 900,000 individuals inhabit informal settlements. Much of Namibia's population depends heavily on subsistence agriculture, which relies heavily on rainfall and water storage resources. Integrating agroforestry techniques into subsistence farming methods holds the potential for significant economic and environmental advantages, leading to increased productivity.<sup>269</sup> Namibia is also characterized by an arid to semi-arid climate, with low and highly variable rainfall patterns, posing significant challenges to agricultural productivity and water resource management. In response to this condition, the food circles utilize gray water as a resource for irrigation and fertilization. Instead of being wasted by disposal into sewage systems, greywater is redirected to permaculture gardens, where it nourishes plants and replenishes soil nutrients, reducing the demand for fresh water and contributing to sustainable water management practices. Additionally, incorporating greywater into permaculture systems promotes resource efficiency and minimizes environmental impact by closing the loop on water usage within the ecosystem.

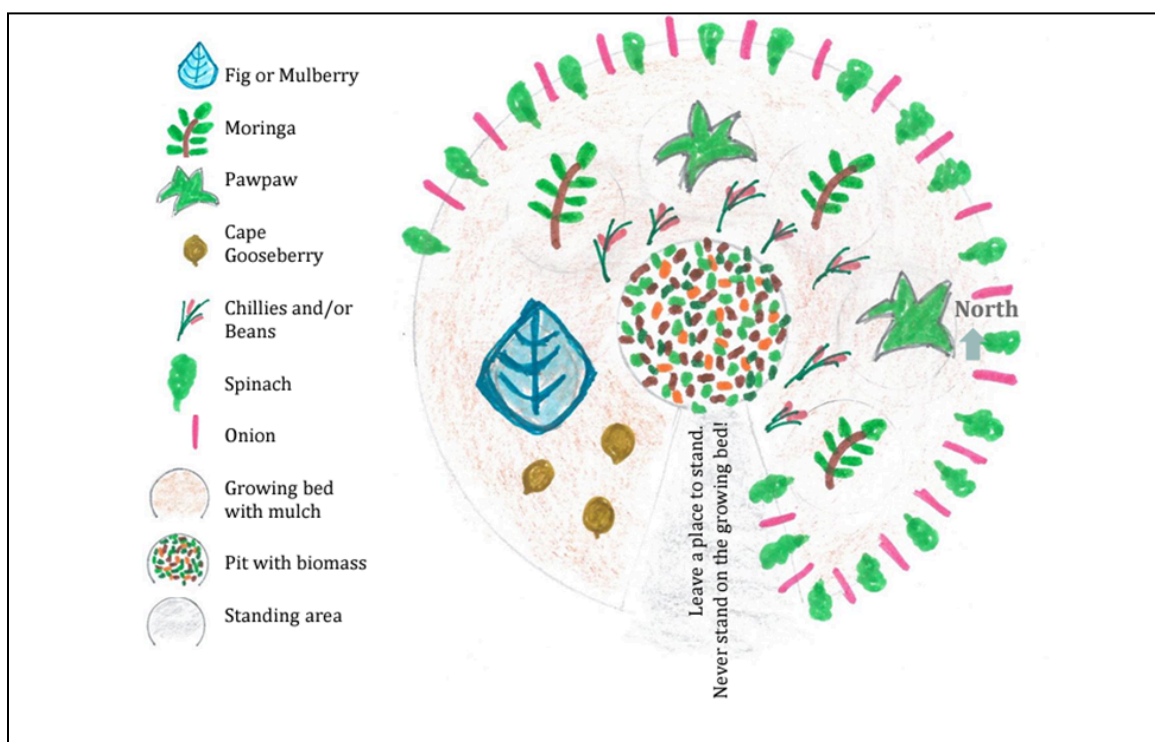
### b) Description

The innovative project by the Kambashu Institute prepares communities to implement permaculture food circles. This novel approach involves planting trees around a central pit,

<sup>268</sup> Source: Kambashu Institute

<sup>269</sup> Think Namibia. (2024). Fact Sheet on Agroforestry. Available at: [www.thinknamibia.org.na/images/projects/forest/DRFN\\_Fact%20Sheet\\_No7\\_ENG\\_final%20screen.pdf](http://www.thinknamibia.org.na/images/projects/forest/DRFN_Fact%20Sheet_No7_ENG_final%20screen.pdf)

where household wastewater, kitchen waste, dry grass, and cardboard create a nutrient-rich environment. Participants are guided in selecting optimal tree species like mulberry or fig, alongside closely spaced rows of plants such as moringa and papaya, interspersed with spinach, onions, and pumpkins to ensure biodiversity and resilience. Households are trained about the nutritional benefits of the crops, their versatile uses, and their medicinal properties. Planting diverse species together is advantageous as each plant requires different nutrients, aids in pest control, attracts beneficial insects, optimizes vertical space, and enhances fertilization. Beneficiaries receive complimentary seeds and compost to kickstart their food circles, promoting self-sufficiency and cultivating nutritious crops.



**Figure 11. Planting plan from the Kambashu Institute's Food Circle handout<sup>270</sup>**

### c) Impact / Outcomes

Kambashu Institute's Food Circles impact has been significant, reaching communities grappling with extreme food insecurity in Windhoek's informal settlements. Through 12 organized courses and the dedication of local trainers, over 140 participants - nearly 70% being women residing in zinc shacks - have been equipped with resources to cultivate their own food circles. The institute reports that graduates' enthusiasm is palpable, with many successfully implementing the learned techniques to establish Food Circles in their homes. With the assistance of seven trainers residing

<sup>270</sup> Elaborated by Kambashu Institute. Food Circles Handout (2024). Available at: <https://acrobat.adobe.com/link/review?uri=urn:aaid:scds:US:693f0c9e-771c-3324-8139-d143db431045>

within the settlements, the project's participatory design has facilitated the growth of over 90 food circles since its inception in September 2021. Regular monitoring, including satellite surveillance, ensures the ongoing success of these initiatives, with the team providing essential support such as consultancy, seeds, seedlings, and compost. Participants who sustain their food circles for over a year are celebrated as members of the 'star club,' gaining access to further training and events, thus fostering a sense of achievement and community ownership.

Moreover, the project's social impact extends beyond mere food production, touching on aspects of self-esteem, well-being, and economic empowerment. This aspect aligns with the findings of country studies regarding the importance of integrated approaches that incorporate CSA within broader developmental efforts. Participants have reported increased access to nutritious food and the ability to sell surplus produce, contributing to household incomes. By actively engaging communities in the cultivation and maintenance of Food Circles, the project addresses immediate food insecurity and empowers individuals to take control of their nutritional needs, bolstering resilience and fostering a sense of agency within marginalized communities.



**Figure 12. Food Circles Training in Windhoek, Namibia<sup>271</sup>**

<sup>271</sup> Source: Kambashu Institute



#### **d) Limitations**

The project is relatively new, and the interim evaluations show that its impact is still restricted to a couple hundred families, despite its very promising theory of change. Kambashu is also further developing technical partnerships with universities and NGOs to solidify its framework, which is yet to scale to other regions in the country. According to the project's director, the institute is a “learning center” due to the required ability to adapt given the constant new challenges that emerge - soil conditions, extreme weather events, and specific social dynamics of each community. Additionally, the success of Food Circles hinges on active community participation and sustained engagement, which may be influenced by factors such as cultural attitudes towards agriculture, competing livelihood priorities, and access to resources. Furthermore, the project's decision not to seek further buy-in from Namibia's government, at least for a while, could be a limitation as it may limit opportunities for policy support, institutional collaboration, and the long-term sustainability of the initiative.

#### **10. Recommendation for Knowledge Diffusion**

To facilitate the widespread dissemination of knowledge about Permaculture Food Circles, it is recommended to develop comprehensive training modules and manuals that encapsulate the core principles and practical aspects of establishing and maintaining food circles. These modules could be tailored for various stakeholders, including community members, local NGOs, government agencies, and potential funders. Utilizing digital platforms and mobile technologies could enhance accessibility to these resources, especially in remote or underserved areas. Moreover, establishing community-led learning hubs or demonstration sites in different regions can serve as centers for knowledge exchange and hands-on training, fostering peer-to-peer learning and collaboration. Partnerships with educational institutions, agricultural extension services, and community-based organizations should be strengthened to integrate permaculture principles into existing training programs and outreach initiatives. Additionally, leveraging social media channels and traditional communication channels like radio broadcasts and community meetings could help raise awareness and stimulate interest in adopting permaculture practices. Many of these suggestions are already being implemented by Kambashu Institute.

#### **11. Challenges to Diffusion & Implementation**

One significant challenge is the need for tailored approaches to accommodate diverse socio-economic and environmental contexts across different regions. While the project's design emphasizes simplicity and affordability, variations in cultural practices, land tenure systems, and resource access may require customized adaptation strategies. Limited access to technical expertise and agricultural inputs, particularly in remote rural areas, can hinder food circles' successful establishment and maintenance. Moreover, changing attitudes and behavior towards conventional farming practices and embracing permaculture principles may encounter resistance or skepticism from communities accustomed to traditional methods.

Ensuring sustained community engagement and ownership throughout the implementation process is crucial but can be challenging due to competing livelihood priorities, seasonal migration patterns, and socio-political dynamics.

### 12. Replicability and Opportunities for Scaling up

Due to its design allowing households to utilize tools readily available at home for pit construction, the project is gaining recognition among local stakeholders for adopting a model that is described as 'easy, affordable, and replicable'. The methodology involves a phase of testing and subsequent expansion to other regions in Namibia. This approach holds promise as a viable solution for contexts across Sub-Saharan Africa where communities encounter comparable climates and water management restrictions. Furthermore, securing long-term funding and institutional support beyond initial pilot phases is essential for scaling-up and mainstreaming permaculture initiatives within national agricultural policies and programs. Addressing these steps requires collaborative efforts involving multi-sectoral partnerships, capacity-building initiatives, and participatory approaches.



**Figure 13.** Households use the tools at home to build food circles<sup>272</sup>

<sup>272</sup> Source: Kambashu Institute



## IX. Conclusion

Around the world, climate-smart agriculture (CSA) has emerged as a leading solution for fighting climate change, including Sub-Saharan Africa; as it integrates climate adaptation, mitigation, and resilience-building measures. Specifically, the CSA approaches which prioritize certain socio-economic dimensions, like benefit-sharing and gender equality, further contribute to short and long-term prosperity of the communities they affect. The task of identifying leading cutting-edge, scalable CSA practices for food and agriculture systems in the African continent, while daunting, has been an extremely enriching experience for this SIPA student team of ten, buttressed by in-depth literature reviews, **57 stakeholder interviews**, and **in-country visits**; facilitated by the excellent support from the Regional Centre of Excellence against Hunger and Malnutrition (CERFAM), the World Food Programme Regional Bureau for Southern Africa, and country offices in Namibia and Madagascar, as well as leading faculty at Columbia SIPA.

At the outset, the scope of this research presents the following challenge: the 30 million km<sup>2</sup> landmass of the African continent, with its population of nearly 1.5 billion people, comprises a rich diversity of geographic terrains, cultures, socioeconomic and political institutions.<sup>273</sup> The regional variability within the African continent is further reflected in its agricultural and food systems, which are heavily shaped by local conditions. As a result, a range of different CSA techniques have been developed or adapted to specific countries, each supported by structures that have evolved over time in response to local needs. This SIPA-CERFAM collaboration opted to focus on **Kenya, Madagascar, and Namibia**, hoping that the distinct characteristics of these countries might represent the African continent's broad diversity. In this sense, the project was successful in capturing a diversity of practices, allowing to derive conclusions that are broadly applicable to the continent, as well as others that address specific peculiarities of each country. The key findings of this research, which are detailed in the following paragraphs, include certain insights which are fundamentally unique to each country studied for this research; and which reflect specific social, economic, and environmental conditions of that particular African country. This is followed by **cross-cutting** insights that recur for all the countries of study, indicating potential replicability across Sub-Saharan Africa. However, the SIPA team wishes to affirm that **careful contextual consideration** is essential to assess relevance and applicability of insights.

First, **Kenya's** holistic approach to climate resilience and agricultural sustainability blends indigenous farming with the country's unique availability of cutting-edge digital innovations. About 40% of SIPA team interviewees stated that digital platforms and big data are key to successfully distributing CSA initiatives. This finding underscores a collective understanding, within Kenya, of the urgent need to adapt to currently shifting weather patterns while bolstering food production and resilience. Through the integration of CSA technologies and traditional practices like the cultivation of African Indigenous Vegetables - with 30% of the respondents

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<sup>273</sup> Desjardins, Jeff. "Mapped: Visualizing the True Size of Africa." Visual Capitalist, February 19, 2020. <https://www.visualcapitalist.com/map-true-size-of-africa/>.



mentioning a trend of returning to traditional and indigenous farming techniques - and agroforestry, Kenya is witnessing significant progress towards more adaptive agriculture systems. Youth and female-led entrepreneurship are also critical in driving this transformation, as well as improving availability of extension services and financial access for smallholder farmers.

In **Madagascar**, while national and local institutions, and academic experts demonstrate a widespread awareness of climate change, there is a CSA knowledge-gap exists among farmers. Implementing CSA practices faces significant barriers also due to insufficient long-term planning and organizational structures - 44% of respondents specifically mentioned the government's funds and structure as a major hurdle to sustainable development. Moreover, infrastructural inadequacies exacerbate the challenge of facilitating seamless knowledge and resource transfer between urban centers and rural farming communities. There is simultaneously a clear understanding of the threats posed by climate change - roughly 30% of the interviewees cite drought as a top concern, 12% mention intense wind in southern regions, and an additional 8% highlight floods as worrisome. These events, along with other environmental factors like soil degradation and deforestation, are of concern to respondents, with 30% and 15% mentioning them, respectively. Madagascar's diverse terrain further complicates the scaling of national CSA projects, necessitating nuanced approaches to each of the country's agro-ecological zones.

Third, **Namibia's** landscape presents complex inherent challenges, with 95% of the respondents stating that droughts and water scarcity prevent the country's proper uptake of CSA practices. The SIPA team observed encouraging progress towards CSA systems, driven by an engaged ecosystem of federal government ministries, multilateral agencies, technical assistance bodies, and NGOs; these entities are also actively sharing successful experiences and aligning with Namibian policy. These entities also simultaneously balance the task of tackling food insecurity while providing necessary humanitarian assistance and fostering self-sufficiency for farmers. Challenges such as low productivity and input availability - with 55% of respondents citing the lack of it as an obstacle - as well as market inefficiencies, hinder smallholder farmer's efforts to advance an ambitious CSA strategy and implementation. Moreover, financing gaps exacerbated by Namibia's upper-middle-income classification affect the country's efforts to attract sufficient climate finance, calling for innovative approaches to secure the necessary funding assistance.

Amongst all three countries, there is a growing acknowledgment of the interplay between CSA practices and broader development agendas. While a unique intention and approach to CSA integration seems apparent for each nation, they collectively recognize the potential to facilitate international knowledge-sharing in response to collective crises that precipitate systemic shifts. The COVID-19 pandemic and recurrent extreme weather events function as reminders of the imperative to expedite agricultural reforms and fortify resilience to future adversities. The promising CSA practices documented in this study, thus offer effective and scalable solutions to the challenges delineated above. Increasing awareness, data collection, and documentation regarding successful CSA strategies for African food and agriculture systems is paramount to inform evidence-based policymaking and catalyze sustainable development initiatives.



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## Appendices

### Appendix 1

List of Stakeholder Organizations Interviewed		
<i>Kenya</i>		
Interview	Organization	Date
1	Alliance for a Green Revolution in Africa (AGRA)	03/15/24
2	Busara	03/14/24
3	Fairways Green Markets	03/11/24
4	G-BIACK	03/15/24
5	IFAD	03/13/24
6	Kenya Climate Innovation Center (KCIC)	03/14/24
7	Kenya National Farmers' Federation (KENAFF)	03/07/24
8	NIRAS Consulting	03/14/24
9	Pula Advisors	03/13/24
10	Science for Africa	03/12/24
11	SunCulture	03/14/24
12	Technical University of Kenya	03/08/24
13	University of Nairobi	03/08/24
14	United States Agency for International Development (USAID)	03/13/24
15	United States Agency for International Development (USAID)	03/14/24
16	World Bank	03/13/24
17	WFP Kenya, Office of Innovation	03/11/24

18	WFP Kenya	03/12/24
<b><i>Madagascar</i></b>		
1	Aga Khan Development Network Madagascar	3/04/24
2	Bôndy - NGO Madagascar	03/14/24
3	Centre de Recherche et de Formation pour le Développement Intégré de Madagascar (FIFAMANOR)	03/16/24
4	Conservation International - Madagascar	03/15/24
5	Conservation International - USA	03/07/24
6	Ecole Supérieure des Sciences Agronomiques, Université d'Antananarivo	02/25/24
7	Food and Agriculture Organization (FAO) Madagascar country office	03/11/24
8	French Agricultural Research Centre for International Development (CIRAD)	03/15/24
9	Institut Malgache de Vaccins Vétérinaires (IMAVET)	03/12/24
10	International Monetary Fund	03/21/24
11	International Research Institute for Climate and Society (IRI)	02/27/24
12	Kansas State University Sorghum Innovation Lab	03/06/24
13	Local government committee of Fenoaivo (southern Madagascar locality)	03/13/24
14	Madagascar Health and Environmental Research	03/07/24
15	Ministère de l'agriculture, de l'élevage et de la pêche, Madagascar	03/15/24
16	Tetra Tech	03/06/24
17	The National Cooperative Business Association CLUSA International (NCBA CLUSA)	03/08/24
18	United Nations Development Programme	03/11/24
19	United States Agency for International Development (USAID)	03/12/24
<b><i>Namibia</i></b>		

1	African Development Bank	03/19/24
2	Aspiring Farmers Association of Namibia	02/27/24
3	Epako Clinic	03/13/24
4	GIZ	03/14/24
5	Global Donor Platform for Rural Development	03/04/24
6	Greenpeace Africa	03/05/24
7	International Atomic Energy Agency	03/01/24
8	Kambashu Institute	04/05/24
9	Ministry of Agriculture, Water & Land Reform	03/15/24
10	Ministry of Environment and Tourism, Department of Environmental Affairs	03/14/24
11	Ministry of Health	03/13/24
12	Ministry of Urban and Rural Development	03/12/24
13	Namibia Nature Foundation	03/14/24
14	Nutrition and Food Security Alliance in Namibia	02/27/24
15	Office of the Prime Minister	03/15/24
16	Ongwediva Rural Development Center	03/05/24
17	Solera	03/15/24
18	The National Youth Climate Action Network of Namibia	03/15/24
19	Tololi	03/14/24
20	University of Namibia	02/29/24
21	University of Zululand	03/04/24
22	WFP Namibia	03/11/24

## Appendix 2

Other Potential Good Practices				
<i>Kenya</i>				
Organization	CSA	Description	Impact	Contact
IFAD	KCEP-CRAL	<p>The Kenya Cereal Enhancement Programme (KCEP) was launched in 2014 with the aim of contributing to national food security and smallholder income generation by increasing the productivity of key cereals. The KCEP — Climate Resilient Agricultural Livelihoods (KCEP-CRAL) initiative is an expansion of the programme to cover the arid and semi-arid lands (ASALs) of Kenya with the aim to graduate ASAL smallholder farmers to market-oriented and commercial farming. The programme is implemented by the Government of Kenya and co-funded by the International Fund for Agricultural Development (IFAD),</p>	<p>Overall, a total of 107k farmers have been insured over 6 seasons in 8 ASAL counties. A total of 51,327 farmers or 52% of farmers in KCEP have received claim payments across 5 seasons. The average claim payment per farmer was 2855 Ksh per farmer or roughly 1.5 times the premium paid. On average over the 5 seasons for all counties, every farmer has received 76 cents in claims for every dollar of insurance premium paid.</p>	<p>Robert Delve  <a href="mailto:r.delve@ifad.org">&lt;r.delve@ifad.org&gt;</a></p> <p>Daniel Higgins  <a href="mailto:d.higgins@ifad.org">&lt;d.higgins@ifad.org&gt;</a></p> <p><i>IFAD, Kenya</i></p>

		the European Union and other partners.		
USAID	PREG	PREG targeted 9 ASAL counties in Kenya brings together humanitarian and development partners to build resilience in these vulnerable pastoralist communities in northern Kenya. USAID worked with county governments, as well as the Kenya National Drought Management Authority to coordinate resilience and economic growth activities.	PREG's multi-sectoral partnership that sought to enhance food and nutrition security, increase agriculture-led economic growth and build resilience among people and systems in Northern Kenya. The PREG model of collaboration has enabled partners to minimize redundancies, promote synergies, and achieve multi-partner collaboration and coordination.	Jennifer Maurer <a href="mailto:jmaurer@usaid.gov">&lt;jmaurer@usaid.gov&gt;</a> <i>PREG lead, USAID</i>
WFP	H2Grow	H2Grow is WFP's hydroponics initiative that brings low tech, locally adapted, and affordable hydroponics farming to communities around the world. In Kenya, the technique is a valuable space and water saving means of producing vegetables and animal fodder all year round.  The goals of the	Through this initiative, 60 farmers (300 households) have been provided with 30 hydroponic units, allowing them to participate in commercial farming and selling their vegetables in the market.	Federico Naccarato <i>Head of Innovation, WFP Kenya</i> <a href="mailto:federico.naccarato@wfp.org">&lt;federico.naccarato@wfp.org&gt;</a>



		program were to establish a sustainable business model with partners and farmers; develop and test conditions and processes for farmers to repay business loans; and collaborate with the private sector to decrease cost of hydroponics units.		
World Bank	One Million Farmers Platform	The One Million Farmers Platform was a joint project with the Kenyan Ministry of Agriculture, World Bank, agtechs, and county governments Provided farmers with access to high-resolution geospatial agro-meteorological data, agronomic advisories and customized advice	The results were quite impressive: The platform linked 1.1 million farmers to these platforms; five million messages were sent in the years 2020-2022. 900 technologies, innovations, and efficient management practices across 19 value chains have been digitized and are being disseminated across Kenya.	Beryl Winnie Atieno Agengo  <i>Digital Agriculture Specialist, World Bank</i>  <bagengo@worldbank.org>
<b>Madagascar</b>				
Organization	CSA	Description	Impact	Contact
Aga Khan Foundation	<a href="#">Zanatany Rice Cultivation System</a>	Co-developed with smallholder rice farmers in Madagascar and the Aga Khan Foundation, Zanatany is an innovative regenerative	The Zanatany System has reached 116,233 community members, 55% of them women. Has prompted saving among farmers in the	<b>Gregoire Imberty</b> <i>CEO</i> <gregoire.

		<p>rice cultivation system that seeks to address the constraints of other rice cultivation systems with high rates of attrition. The system is built off seven interconnected regenerative farming principles that farmers adopt at their own pace. These include direct seeding, mix cropping and rotation, self-made inputs to reduce costs, and direct seeding to reduce labor.</p>	<p>range of 20% and and regenerated 101.4 hectares of soil.</p>	<p>imberty@akdn.org&gt;</p>
GIZ	<p><a href="#">Adaptation of Agricultural Value Chains to Climate Change (PrAda)</a></p>	<p>This project works to adapt agricultural value chains to climate change in the dry Southern regions of Madagascar. PrAda runs climate field schools to teach farmers sustainable and climate-adapted techniques while also providing weather data, climate-adapted seeds, and access to financial services.</p>	<p>Given the success of the first phase of the project, PrAda II is now scaling up to other regions across the country. This latest iteration aims to reach over 374,800 direct beneficiaries.</p>	<p><b>Karin Neck</b> <i>GIZ</i> &lt;karin.neck@giz.de&gt;</p>
USAID Feed the Future & Sorghum Innovation Lab	<p><a href="#">Seedballs</a></p>	<p>Made of a collection of materials, including soil, clay, seeds, urine, and fertilizer, seedballs create micro-ecosystems in dry, sandy soil.</p>	<p>Seedballs have been tested in Niger and parts of Senegal. These experiments showed farmers having an 18% increase in income using seedballs. Women benefited the</p>	<p><b>Tim Dalton</b> <i>KSU</i> &lt;tdalton@ksu.edu&gt;</p>

			most. Pilot is coming to Madagascar this coming year.	
WFP	<a href="#">Rapid Rural Transformation</a>	WFP and the Government of Madagascar recently launched this innovative project to develop rural areas in Southern Madagascar via solar-powered hubs, a sustainable water source and ICT. Through the provision of energy, water, and digital platforms communities can enhance agricultural production through solar-powered drip irrigation and hydroponics as well as diversify their livelihoods to better withstand climate shocks.	Project is in its pilot phase in Madagascar. WFP and local officials are excited about what it's done in just a year. Scaling-up opportunities are being explored now.	<b>Rinah Andriamifidisoa</b> <i>WFP</i> <rinah.andriamifidiso@wfp.org>
NCBA CLUSA	<a href="#">Farmer Led Peanut Demo Plots</a>	Co-op organized lead farmers are given abandoned land outside of protected areas. This encourages work outside of illegal deforestation. Lead farmers are given climate resilient peanut seeds to grow and demonstrate good practices.	The results for peanuts showed an average increase in yield of around 44% (57% for basins and 31% for furrows) compared to traditional practices.	<b>Abel Rakotonirainy</b> <i>NCBA CLUSA</i> <arakotonirainy@ncbaclusa.net>
<i>Namibia</i>				

Organization	CSA	Description	Impact	Contact
GIZ	Bush biomass for economic and ecological benefits	From 2014 to 2024, GIZ collaborated with the Ministry of Environment, Forestry, and Tourism to rehabilitate degraded lands by selectively thinning out bush overgrowth. The initiative evolved to also capitalize on the harvested bush as biomass, creating a source of economic value from the reclaimed areas.	From 2015 to 2024, the biomass sector's rural employment witnessed a significant rise, with job numbers increasing from 6,000 to over 11,000. Particularly, employment related to bush harvesting and processing saw a doubling from 6,000 to 12,000 jobs. Additionally, the charcoal industry experienced a sixfold increase in revenue. Moreover, the sector began producing animal feed from milled encroacher bush on farms, reducing the dependence on imported commercial feeds.	<b>Johannes Laufs</b>  <i>Team Leader, Bush Control and Biomass Utilisation (BCBU)</i>  < <a href="mailto:johannes.laufs@giz.de">johannes.laufs@giz.de</a> >
GIZ	<a href="#">INSPIRED – Agri-PV: Sustainable Use of Agrivoltaics</a>	The Agri-PV project focuses on boosting agricultural output and promoting sustainable value chains for smallholder farmers in isolated regions. It integrates agrivoltaic systems to enhance productivity, energy	In Namibia, agrivoltaic systems offer dual benefits: shielding crops from harsh sun and extreme weather, and generating solar power for various agricultural processes, including irrigation,	<b>Josef Barnabas</b>  <i>Renewable Energy Advisor</i>  < <a href="mailto:josef.barnabas@giz.de">josef.barnabas@giz.de</a> >

		<p>sustainability, and climate resilience, providing essential resources like food, water, and electricity. The initiative introduces an energy-based agroforestry approach, aiming to broaden agricultural diversity beyond livestock, offering plant protection, renewable energy generation, and supporting essential farming operations like irrigation and post-harvest management.</p>	<p>and cooling for better crop preservation. This innovation has led to up to a 20% yield increase due to enhanced water management, protection, and soil health. <b>Other Expected outcomes:</b> (i) 3 Agri-PV demonstration systems are operational; (ii) productivity of Agri-PV sites increases by 20%; (iii) at least 6 different crops tested; (iv) Agri-PV project results shared with relevant stakeholders; (v) 1000 people participate in Agri-PV-related trainings or events</p>	
GIZ	<a href="#">Farming4Resilience</a>	<p>The Farming for Resilience (F4R) project, a joint effort by GIZ and the Namibian Ministry of Agriculture, Water and Land Reform (MAWLR), aims to fortify Namibia's agricultural and food sectors against climate change and various external factors. This initiative, spanning from 2020 to 2025, targets</p>	<p>Since its launch in 2020, the F4R initiative has made significant strides in enhancing the well-being and food security of more than 82,200 individuals. The project has organized over 630 training sessions across 13 regions, benefiting more than 14,000 participants.</p>	<p><b>Tino Hess</b> <i>Project Manager</i> &lt;<a href="mailto:tino.hess@giz.de">tino.hess@giz.de</a>&gt;</p>



		<p>small-scale farmers, agricultural groups, and entrepreneurs, including educational institutions in communal regions, prioritizing the empowerment of women and the youth. F4R provides expertise and support in essential areas such as seed production, climate-smart agriculture, value addition, and food security. Moreover, the project engages with diverse stakeholders across governmental, educational, financial, and commercial sectors to bolster the agricultural sector's resilience in Namibia.</p>	<p>These sessions, focused on horticulture and nutrition, have led to noticeable improvements in the living conditions, dietary habits, and food availability within the communities involved.</p>	
<p>Joint Centre International Atomic Energy Agency (IAEA) / FAO</p>	<p><a href="#">Atoms4Climate: Water-Saving and Nuclear Techniques</a></p>	<p>Use of real-time data on soil moisture collected by cosmic ray neutron sensors to deliver small but precise amounts of water directly to the plants' roots.</p>	<p>Through the project, participating farmers managed to cut their water usage by an impressive 80% while still achieving higher crop yields. Additionally, there was a notable decrease in fertilizer usage, thanks to updated soil nitrogen data, leading to a minimum of 30% savings on fertilizer costs. Moreover, In</p>	<p><b>Dongxing Feng</b> <i>Acting Director, Centre of Nuclear Techniques in Food &amp; Agriculture</i> <a href="mailto:D.Feng@iaea.org">&lt;D.Feng@iaea.org&gt;</a></p>

			Namibia, farmers have boosted their crop yields by up to 70% for various crops including maize, tomatoes, and peppers, thanks to enhanced soil and water management techniques.	
Ministry of Agriculture, Water and Land Reform (MAWLR)	<a href="#">Comprehensive Conservation Agriculture Programme</a>	Adopting sustainable farming techniques is key to combating land degradation and adapting to climate variations, enhancing food security for both nations and individual smallholder farmers. Conservation Agriculture (CA) plays a crucial role in this, potentially boosting and stabilizing yields, conserving natural resources, and equipping farmers to handle climate-related challenges.	The Namibia Nature Foundation, one of the MAWLR's partners, educated 552 farmers and enhanced the capacities and networks of 12 farming groups, offering field guidance to ensure practical skill application. The training capitalized on local agricultural knowledge, with comprehensive guides on optimal crops, tools, and schedules. Moreover, the foundation pinpointed “lead farmers” with expertise in conservation agriculture, involving them in peer-to-peer training efforts.	<b>Sarafia Ashipala,</b> <i>Agricultural Research &amp; Development</i>  < <a href="mailto:kasheetas@mawf.gov.na">kasheetas@mawf.gov.na</a> >
Kambashu Institute	<a href="#">Food Circles of Permaculture</a>	Implementing permaculture food circles to bolster food	Through 12 organized courses and the dedication of local	<b>Ina Wilkie</b> <i>Director</i>



		<p>security and bolster resilience against extreme climate conditions in Namibia. The essence of a Food Circle entails encircling a pit of edible crops with trees. Household wastewater, a ubiquitous byproduct, is directed into this pit, alongside biomass such as dry grass and cardboard. As the trees mature to a certain height, they begin utilizing the water and nutrients stored within the pit.</p>	<p>trainers, over 140 participants, with nearly 70 percent being women residing in zinc shacks, have been equipped with the knowledge and resources to cultivate their own food circles. With the assistance of seven trainers residing within the settlements, the project's participatory design has facilitated the growth of over 90 food circles since its inception in September 2021.</p>	<p>&lt;ina@kambashu.org&gt;</p>
<p>WFP Namibia CO</p>	<p>Rapid Rural Transformation (RRT)</p>	<p>WFP, Office of the Prime Minister, and Ministry of Urban and Rural Development are collaborating to develop RRT kits in Omaheke and Kunene regions. RRT provides a holistic approach to address rural problems and sustainable development.</p>	<p>The WFP has been supporting Namibia with two RRT kits, and the project is currently under development.</p>	<p><b>Rawan Taha</b> <i>Research, Assessment, Monitoring, Reporting Officer</i>  &lt;rawan.taha@wfp.org&gt;</p>