OPPORTUNITIES FOR TRANSITIONING TO CIRCULAR FOOD SYSTEMS IN MOZAMBIQUE

BACKGROUND

Agriculture is a cornerstone of Mozambique's economy, with approximately 80% of the population relying on it for their livelihoods. Disruptions to agricultural activities due to climate change and extreme weather events have severe consequences for subsistence and well-being (Irish Aid, 2018; Warner et al., 2016). Historically, Mozambique has been impacted by floods and droughts, but the frequency and intensity of these events have increased over time, compounded by cyclones. For instance, Cyclone Idai in 2019 devastated farmland, significantly reducing cassava and maize production due to flooding and soil degradation, exacerbating food insecurity in affected regions. Similarly, prolonged droughts have stressed water resources, leading to reduced maize yields, particularly in regions like Nampula and Zambezia, forcing farmers to adapt their production systems (Care, 2024; ACDI/VOCA, 2024).

KEY MESSAGES

Align National Policies with Circular Food Systems (CFS): Leverage existing frameworks like PEDSA II and PNISA to incorporate circular principles, such as resource recycling and waste-to-value systems, across agricultural value chains. For example, integrate composting and organic fertilizer production into Mozambique's National Fertilizer Program to promote sustainable land use.

Promote Financial and Technical Support for Circular MSMEs: Establish financing mechanisms and capacity-building programs for Micro, Small, and Medium Enterprises (MSMEs) engaged in circular practices, such as renewable energy-powered processing and organic waste recycling. Provide targeted incentives for women and youth-led enterprises to ensure inclusivity and equitable participation in circular economies.

Strengthen Infrastructure for Climate-Resilient Food Systems: Invest in renewable energy-powered storage and irrigation systems to reduce post-harvest losses and improve water-use efficiency. Prioritize infrastructure projects that integrate circular principles, such as water reuse and decentralized energy systems, to enhance productivity and resilience.

Ensure GYSI Integration in Circular Food Systems: Develop targeted initiatives that empower women and youth in agriculture by providing access to funding, technical training, and leadership roles in CFS projects. For instance, include gender-sensitive budgeting and youth-specific programs in Mozambique's agricultural transformation strategies.

Mozambique is one of the most climate-vulnerable countries in Africa, largely due to its dependence on natural resources and its limited capacity to adapt to climate change (Abbas, 2022). The changing climate significantly influences agricultural practices, affecting productivity, crop yields, and soil suitability. These impacts highlight the need for resilient agricultural systems to mitigate climate change effects and ensure sustainable livelihoods.

This policy brief highlights opportunities for transitioning to Circular Food Systems (CFS) in Mozambique. Insights are drawn from the Circular Food Systems in Africa project, which is testing how Small, Medium, and Micro Enterprises (SMMEs) and inclusive value chains can reduce post-harvest losses and enhance rural livelihoods in pilot localities. The project is being implemented by the Australian National University (ANU), Ardhi University, the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), University of Eduardo Mondlane (UEM) and the National Institute of Irrigation in Mozambique. The CFS project operates across five localities in Mozambique, Tanzania, and Zimbabwe, and employs agricultural innovation platforms to foster a shared understanding of Circular Food Systems (CFS) principles. With a focus to creating local jobs, particularly for women and youth groups, through localized value addition, the project facilitates the co-design of SMMEs and the development of inclusive value chains, promoting sustainable livelihood opportunities and reducing migration to urban areas by creating employment in rural areas (Velasco-Muñoz et al., 2021). The CFS project operates across five localities in Mozambique, Tanzania, and Zimbabwe, employing agricultural innovation platforms to foster a shared understanding of circularity fundamentals, including creating local jobs, particularly for women and underserved groups, through localized value addition. The project facilitates the co-design of SMMEs and the development of inclusive value chains, promoting sustainable economic opportunities and reducing urban migration by creating employment in rural areas (Velasco-Muñoz et al., 2021).

CIRCULAR FOOD SYSTEMS – THE CONCEPT

The global food system faces an immense challenge: producing enough food to sustain nearly 10 billion people within the earth's ecological limits. With limited land and water resources, agriculture must adapt to climate change, reduce greenhouse gas emissions, and lift millions out of poverty. Sustainable Intensification (SI) offers one potential pathway, aiming to increase food production without further depleting natural resources (Pretty, 2018).

Building on SI and inspired by circular economy principles, the concept of CFS has gained interest from global research, philanthropic, and policy communities (Velasco-Muñoz et al., 2021). CFS focuses on improving agricultural productivity by reducing reliance on synthetic inputs, localizing food processing to reduce food miles, and recycling agricultural by-products for use as inputs for local agro enterprises.

This approach emphasizes integrating crop and livestock systems to foster sustainable, efficient, and resilient food production cycles (van Rooyen et al., 2024).

CFS seeks to decouple natural resource use from increased food production, thus improving resilience to climate impacts while contributing to climate mitigation through resource efficiency, local processing, and soil carbon sequestration. In essence, CFS aims to enhance socio-economic benefits, particularly for women and youth, by creating more diverse livelihood opportunities and ensuring access to nutritious food through efficient resource management and enhanced nutrient, water, and energy cycles (Matshe, 2022).

CIRCULAR FOOD SYSTEM PRACTICES AND INITIATIVES

Although a large portion of the Mozambican population is not yet fully aware of the importance of CFS practices, several initiatives are emerging and gradually gaining momentum across various levels of the food value chain. The concept of CFS in Mozambique can be observed throughout the value chain, involving a diverse set of actors. Input suppliers provide animal excrement for agricultural processes, farmers adopt conservation agriculture practices to protect soil health, processors develop organic food lines, and traders use food leftovers to feed domestic animals. Consumers are also increasingly prioritizing healthy foods with minimal chemical content, reflecting growing awareness of the benefits of sustainable food practices. Several key initiatives have been developed to support CFS in Mozambique:

Table 1: Circular Food Systems Practices and Initiatives in Mozambique

Initiative/Program	Description	Key CFS Elements
Rural Resilience Project	Implemented in Cabo Delgado, Nampula, and Niassa, the project promotes inclusion of vulnerable communities in decision-making, improves access to natural resources, and fosters sustainable livelihoods.	Sustainable natural resource management, policy support, and livelihood rehabilitation.
Sustainable Rural Economy Program (MozRural)	Focuses on mitigating climate change impacts on agricultural systems and food security through enhanced production capacity, food marketing, and resilience-focused policies in central and northern Mozambique.	Collaboration across ministries, sustainable production, and climate resilience.
Inclusive Agro-Food Value Chain Project (PROCAVA)	Aims to reduce poverty and increase income from climate-resilient agri-food chains for women and youth. Supports irrigation infrastructure, market connections, and poultry/cereal production.	Gender inclusion, irrigation systems, and climate-smart value chain development.
Renewable Energy for Rural Development (RERD2+)	Provides renewable energy services (solar and hydro) to rural areas for irrigation and food production. Promotes solar irrigation systems and offers technical/financial support for farmers and market actors.	Renewable energy, solar irrigation systems, and institutional support for investment in SPIS.
Local Circular Practices	Includes ecological farming in Boane District, permaculture initiatives, and organic production using animal excrement as fertilizer and food waste for livestock feed.	Organic farming, waste-to-value practices, and resource efficiency.

OPPORTUNITIES TO ADVANCE THE CIRCULAR FOOD SYSTEMS AGENDA

Mozambique's policies in agriculture, climate change, and environmental management present both opportunities and challenges for advancing Circular Food Systems (CFS). Existing frameworks such as PEDSA II and PNISA address sustainable agriculture and resilience but lack comprehensive integration of circular principles, such as resource reuse, waste-to-value practices, and cross-sectoral collaboration. Strengthening these policies to align more effectively with CFS can enhance food system sustainability, resilience, and inclusivity. The key policies and their integration opportunities are explored below:

The Strategic Plan for the Development of the Agrarian Sector (PEDSA II) (2010) identifies priorities for increasing productivity, promoting resilient natural resource management, and advancing climate-smart agriculture. While it emphasizes sustainable practices, such as water management for irrigation, the plan lacks a detailed framework for integrating CFS. Specifically, it does not address the reuse and recycling of agricultural resources, such as the connection between poultry and maize production. To advance circularity, PEDSA II should incorporate policies that promote the recycling of agricultural waste and create linkages between value chains to enable waste-to-resource solutions (Government of Mozambique, 2010).

The National Investment Plan for the Agrarian Sector (PNISA 2022-2026) focuses on sustainable production, climate resilience, and the integration of smallholder farmers. However, the plan lacks effective coordination between its various components, such as soil management and fertilizer use. There is a need for greater synergy between programs promoting sustainable farming practices and soil health, especially concerning organic fertilizers. Policies should prioritize organic farming and the sustainable use of fertilizers, alongside a coordinated approach to improving soil health and reducing chemical dependence (Government of Mozambique, 2021). Moreover, the National Fertilizer Program should be enhanced by establishing clear partnerships across the value chain, connecting producers, animal breeders, and fertilizer traders to ensure organic fertilizers are recycled and reused effectively (Government of Mozambique, 2020).

Mozambique's **Irrigation Strategy** focuses on sustainable land and water management to prevent soil degradation. However, the strategy overlooks the potential for water reuse in irrigation. To support circular food systems, the strategy should be expanded to include wastewater treatment and reuse for irrigation, reducing environmental impact and improving water efficiency for food production (Government of Mozambique, 2018). This adjustment would align with the broader goals of CFS by maximizing the sustainable use of water resources.

The Nationally Determined Contributions (NDC) Operationalization Plan 2020-2025 includes actions to promote conservation agriculture, agroforestry, and sustainable land use. While these measures contribute to CFS by enhancing agricultural resilience and reducing resource depletion, the plan lacks coordination among key actors in agriculture, water management, and climate adaptation (Government of Mozambique, 2020). Improved collaboration between ministries, the private sector, and other stakeholders is essential to fully realize CFS objectives. A more integrated approach would facilitate the adoption of circular practices at the national level.

Mozambique's National Climate Change Adaptation and Mitigation Strategy (2013-2025) supports low-carbon development and resilience but does not provide a clear framework for the implementation of circular food systems. There is a need for clearer definitions of stakeholder roles and responsibilities, particularly for actors in agriculture, waste management, and climate adaptation, to ensure effective implementation of CFS principles (Government of Mozambique, 2013).

The PIDACC Zambezi (Integrated Development and Adaptation to Climate Change Program in the Zambezi Watercourse) program integrates water reuse, climate-resilient agriculture, and greenhouse gas emissions reduction, aligning with CFS principles. However, it lacks specific guidance on how stakeholders within the food value chain can collaborate to achieve circularity. Developing clear guidelines and frameworks for the roles of farmers, traders, and other key actors will be essential to scale up circular practices (Government of Mozambique, 2020).

The Environmental Inspection Strategy and Integrated Waste Management Plan promote waste reduction and recycling. However, these policies fail to integrate waste management practices with the agricultural sector. To fully implement circular food systems, waste management practices must be linked with agricultural production. Policies should foster collaboration between agricultural producers, waste recyclers, and the private sector to repurpose agricultural waste into useful inputs for food production (Government of Mozambique, 2022).

POLICY RECOMMENDATIONS

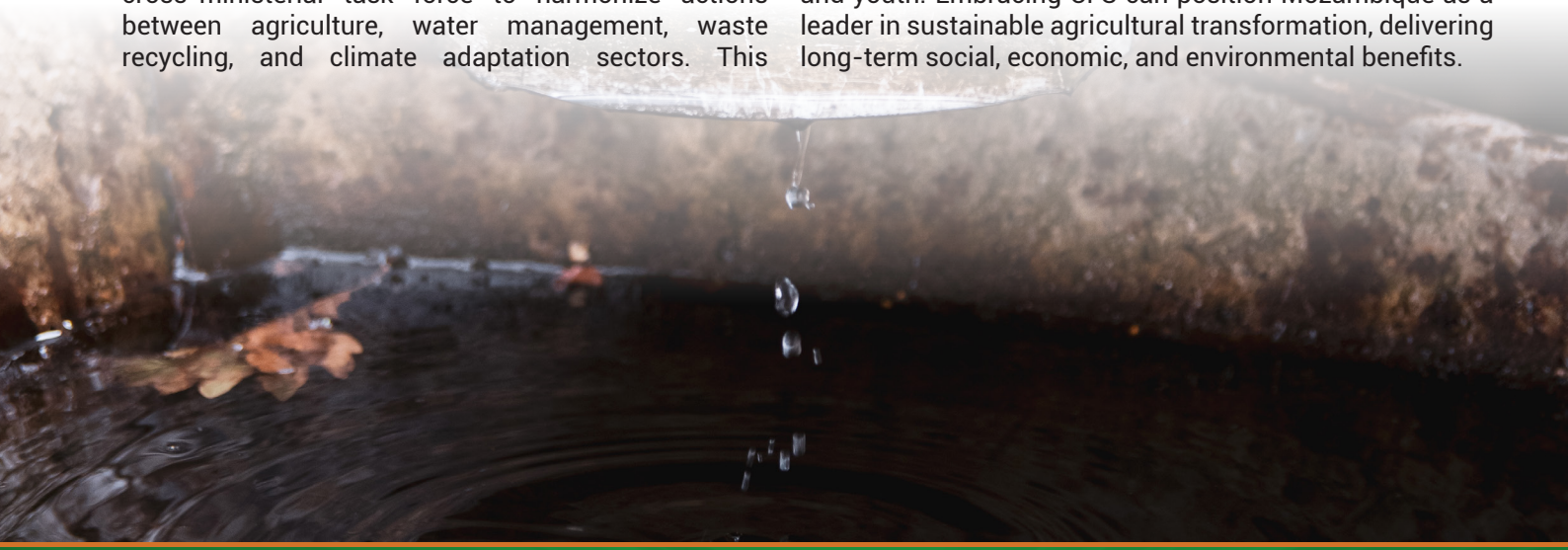
To advance Circular Food Systems (CFS) in Mozambique, the following six targeted recommendations address key gaps and align with identified opportunities:

1. **Integrate Circular Practices into Existing Policies:** Revise PEDSA II and PNISA to explicitly include circular principles such as waste recycling, organic fertilizer use, and wastewater reuse in irrigation. Foster value chain linkages, such as integrating poultry and crop production, to enhance resource efficiency and reduce environmental impact.
2. **Enhance Inter-Ministerial Coordination:** Establish a cross-ministerial task force to harmonize actions between agriculture, water management, waste recycling, and climate adaptation sectors. This task force should oversee the integration of circular principles and ensure accountability in implementation.
3. **Promote Gender, Youth, and Social Inclusion (GYSI):** Incorporate GYSI into all CFS-related policies by providing financial and technical support for women- and youth-led enterprises in waste recycling, compost production, and renewable energy initiatives. This approach ensures equitable participation and benefits from circular practices.
4. **Expand the National Fertilizer Program:** Develop partnerships to scale up organic fertilizer production and distribution. Train farmers on sustainable soil health practices while incentivizing the use of organic fertilizers to reduce chemical dependency and improve soil fertility.
5. **Foster Public-Private Partnerships for Circular Innovations:** Encourage private sector investment in renewable energy-powered cold storage, composting facilities, and food waste recycling systems. Provide tax incentives and technical support for businesses adopting these practices to drive widespread adoption.
6. **Invest in Circular Infrastructure:** Allocate resources to develop renewable energy-powered post-harvest infrastructure, composting facilities, and irrigation systems that incorporate water reuse. Prioritize investments in regions most vulnerable to climate impacts to ensure sustainable productivity and food security.

By implementing these recommendations, Mozambique can enhance the integration of circular principles into its food systems, promoting resilience, sustainability, and economic inclusivity across the agricultural value chain.

CONCLUSION

Mozambique's agricultural sector is vital to its economy but faces significant challenges from climate change, resource depletion, and unsustainable practices. Circular Food Systems (CFS) offer a transformative solution by integrating practices like organic fertilization, waste recycling, and water reuse into existing policies such as PEDSA II and PNISA. Addressing gaps in policy coordination and fostering partnerships among farmers, private enterprises, and government ministries will enhance resilience, food security, and economic opportunities, particularly for women and youth. Embracing CFS can position Mozambique as a leader in sustainable agricultural transformation, delivering long-term social, economic, and environmental benefits.



REFERENCE

Byerlee,D and Fanzo, J,. The SDG of Zero Hunger 75 Years On: Turning full circle on agriculture and nutrition" Global Food Security, Volume 21, 2019, pp. 52-59

Enabel. (2024). Mozambique Renewable Energy for Rural Development – Phase 2 (RERD2), Retrieved from https://open.enabel.be/en/MOZ/2188/updates/renewable-energy-for-rural-development-phase-2.html#

Erälinna,L & Szymoniuk,B. (2021). Managing a Circular Food System in Sustainable Urban Farming. Experimental Research at the Turku University Campus (Finland)", Sustainability 2021, 13(11), 6231;Yhttps://doi.org/10.3390/su13116231

Food, Agriculture Organization (FAO). (2018). Sustainable Food Systems: Concept and framework. 2018.

Food and Agriculture Organization (FAO). (2021). Sustainable agriculture and rural development in Mozambique. Retrieved from www.fao.org

Government of Mozambique. (2010). PEDSA II - Strategic Plan for the Development of the Agrarian Sector.

Government of Mozambique. (2013). National Climate Change Adaptation and Mitigation Strategy (2013-2025).

Government of Mozambique. (2018). Irrigation Strategy.

Government of Mozambique. (2020). National Fertilizer Program.

Government of Mozambique. (2020). NDC Operationalization Plan 2020-2025.

Government of Mozambique. (2020). PIDACC Zambezi - Integrated Development and Adaptation to Climate Change Program in the Zambezi Watercourse.

Government of Mozambique. (2021). National Investment Plan for the Agrarian Sector (PNISA 2022-2026).

Government of Mozambique. (2022). Environmental Inspection Strategy and Waste Management Plans (2022-2027).

Ministry of Agriculture and Rural Development of Mozambique (MADER), 2024, Inclusive Project for the Development of the Agro-food Production Chain (PROCAVA)

Souza,Andre Lunardi de; Viana, Fernando Luiz Emerenciano; Vasconcelos, Danilo Cavalcante de; Vilas, Arthur; Arau Flavia Telis de Vilela."Aplicação dos princípios da Economia Circular na Cadeia de Suprimento de Frutas Frescas", ENGEMA, ISSN: 2359-1048. 2018.

Van Zantena, Hannah H.E; Van Ittersumb, Martin K; De Boera, Imke J.M, "The role of farm animals in a circular food system",Global Food Security, Volume 21, 2019, pp. 18-22

Wirth, M., Vobruba, T., Hartl, M. et al. Potential Nutrient Conversion Using Nature-Based Solutions in Cities and Utilization Concepts to Create Circular Urban Food Systems. Circ.Econ.Sust. 1, 1147–1164 (2021). https://doi.org/10.1007/s43615-021-00081-6

World Bank. (2022). Mozambique – Rural Resilience and MozRural programs. Retrieved from www.worldbank.org

Authors

Sithembile Mwamakamba (FANRPAN Regional Secretariat), Suwilanji Sinyangwe (FANRPAN Regional Secretariat), Felita Julio Julio (FANRPAN Mozambique Node – Eduardo Mondlane University) and Joao Mutondo (FANRPAN Mozambique Node – Eduardo Mondlane University)

Acknowledgement

This publication is an output of the Circular Food Systems in Africa project (WAC/2023/111) funded by the Australian Government through the Australian Centre for International Agriculture Research (ACIAR) The views and opinions expressed in this publication are those of the authors and do not necessarily reflect those of ACIAR.

About FANRPAN

The Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) is an autonomous, multistakeholder policy network with a mandate to coordinate agriculture policy research, analysis and dialogue, promote the dissemination of policy-relevant research results across Africa, and act as a platform for dialogue of all food systems stakeholders. FANRPAN was established in 1997 in response to a call by Ministers of Agriculture from Eastern and Southern Africa (ESA) for the formation of a regional agricultural policy analysis and research network to enhance indigenous capacity for policy formulation and analysis and to reduce dependence on foreign experts when countries develop comprehensive agricultural policies and food security strategies (COMESA Gazette, 1994, volume 201, number 1, clause 23). FANRPAN is mandated to work in all African countries and currently has activities in 17 countries, namely Angola, Benin, Botswana, Democratic Republic of Congo, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

141 Cresswell Road, Weavind Park 0184, Private Bag X2087, Silverton 014, Pretoria, South Africa.
Telephone: +27 12 804 2966. Facsimile: +27 12 804 0600. Email: policy@fanrpan.org. Website: www.fanrpan.org