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BRIEF SERIES | 03

Leveraging the Water–Energy–Food Nexus to Support Agroecological Transitions

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SUMMARY

African food systems are characterised by numerous challenges ranging from unsustainable agricultural practices to environmental degradation and persistent food insecurity. Despite widespread recognition of the need for transformation, large-scale investments continue to reinforce harmful industrial food system models, including monocropping, chemical-intensive farming, and extractive market structures. To break this trajectory and foster resilient, equitable food systems, a strategic shift towards agroecology is imperative.

Agroecology offers a science-based, socially just alternative that integrates ecological principles with food sovereignty and equity. However, scaling agroecology remains difficult, as many promising initiatives remain fragmented, underfunded and confined to small-scale projects. Short-term, project-based funding cycles further limit their ability to drive systemic change. Philanthropy has a critical role to play in overcoming these barriers. With its capacity for long-term, flexible and risk-tolerant funding, philanthropic investment can catalyse agroecological transitions by filling financing gaps, supporting innovation and strengthening networks that scale successful models.

By aligning agroecological initiatives with WEF priorities, philanthropy can unlock new financial and technical resources to accelerate food system transformation

This brief presents the Water–Energy–Food (WEF) nexus as a strategic framework for integrating agroecology into broader sustainability efforts. By aligning agroecological initiatives with WEF priorities, philanthropy can unlock new financial and technical resources to accelerate food system transformation. The WEF framework allows cross-system dependencies and trade-offs to be made more clearly visible, highlighting the social and environmental implications of decision-making processes. Drawing on literature and case studies, this brief highlights how philanthropic organisations can leverage their resources to mainstream agroecology, bridge policy silos and drive systemic change towards sustainable, resilient African food systems.

Key recommendations for philanthropic action

1. **Support policy integration:** Advocate for and fund initiatives that mainstream the WEF nexus within policy frameworks to foster cross-sectoral collaboration, incentivise sustainable agroecological practices and highlight trade-offs.
2. **Strengthen capacity building**: Invest in farmer training programmes that promote agroecological techniques optimising WEF nexus interactions, enhancing resource management and empowering local communities.
3. **Enhance research and innovation:** Provide sustained funding for research on agroecology and the WEF nexus, prioritising local innovations and Indigenous knowledge to bridge knowledge gaps and inform evidence-based decision-making.
4. **Promote territorial and ecosystem-based approaches:** Support initiatives that enable stakeholders to address WEF challenges within specific local contexts, fostering place-based, inclusive solutions for sustainable food systems.

INTRODUCTION

What is at stake?

Current African food systems are characterised by multiple (and often interacting) pressing issues, including environmental degradation, social and gender inequalities, poverty, hunger and conflicts over resources (Ulimwengu 2024). Unsustainable agricultural practices, such as deforestation and overuse of chemical inputs, contribute to soil degradation and water scarcity. At the same time, women, who are vital to food production, often lack access to land and resources, perpetuating gender disparities (HLPE 2019). Despite the continent's rich resources, chronic food insecurity persists, exacerbated by reliance on monoculture and inefficient food distribution systems. Industrial food systems, underpinned by large-scale and resource-intensive agricultural practices, have failed to address these challenges, prioritising productivity at the expense of sustainability and equity, leading to economic disparities that marginalise smallholder farmers. With increasing water scarcity and competition between energy and agriculture, a more integrated approach to resource governance is needed. The WEF nexus offers a framework for addressing these interconnections, emphasising cross-sectoral and multi-stakeholder engagement and reliable policy-relevant data and information for efficient resource allocation and sector governance (FAO–UN 2014). In addition, a transformative shift towards agroecology is critical to promoting sustainable practices that enhance biodiversity, improve soil health and empower local communities (Wezel et al. 2020; IPBES 2024). By integrating social and ecological considerations, agroecology can address the intertwined issues of inequality and food insecurity, fostering resilience against climate change and creating more equitable food systems across Africa.

Key concepts

1. **Agroecology** is a holistic approach that draws on ecological principles to develop diversified, ecosystem-based food systems that enhance resilience and reduce dependency on external inputs (Table 1, HLPE 2019).
2. **The WEF nexus** is an integrated framework that recognises the interconnections between food production, energy generation and water resources. (Simpson & Jewitt 2019).

   As a framework, it typically involves several core components:

   - **Systems-level analysis:** Mapping and quantifying the flows of water, energy and food resources to identify points of synergy, inefficiency and potential conflict.
   - **Scenario planning and modelling:** Using tools to project how different policy, environmental or market changes will impact water, energy and food systems, helping stakeholders plan for uncertainties and shocks.
   - **Multisectoral coordination:** Encouraging collaboration between agriculture, energy and water sectors to design integrated policies and investments that avoid unintended consequences and optimise resource use.
   - **Trade-off and co-benefit assessment:** Identifying and managing the positive and negative interactions between food, water and energy systems, ensuring that resource management decisions enhance overall sustainability and resilience.

The goals of the WEF nexus approach are to:

- **Enhance resource efficiency** by optimising the use and management of water, energy and land in ways that minimise waste and environmental impact.
- **Increase resilience** to climate and resource-related stresses by designing systems that can better withstand shocks to any one of these essential resources.
- **Promote equitable access and sustainability**, particularly for vulnerable communities, by ensuring that resource management and sectoral decision-making consider social impacts and distributional fairness.

TABLE 1: THE 13 AGROECOLOGICAL PRINCIPLES (HLPE 2019)

Goal	Principle	Description
Improve resource efficiency	Recycling	Utilise local renewable resources and close nutrient and biomass cycles.
	Input reduction	Minimise reliance on external inputs.
Strengthen resilience	Soil health	Enhance soil health and functionality.
	Animal health and welfare	Ensure the well-being of livestock.
	Biodiversity	Promote diverse species within the ecosystem.
	Synergy	Foster beneficial interactions among system components.
	Economic diversification	Encourage diverse income sources for farmers.
Secure social equity/ responsibility	Co-creation of knowledge	Integrate local and scientific knowledge.
	Social values and diets	Respect cultural traditions and promote healthy diets.
	Fairness	Ensure equitable access to resources and opportunities.
	Connectivity	Strengthen connections between producers and consumers.
	Land and natural-resource governance	Promote responsible management of natural resources.
	Participation	Encourage inclusive decision-making processes.

Key stakeholders and their contributions

The integration of agroecology with the WEF nexus requires the involvement of multiple stakeholders, each with critical roles:

- **Local communities:** As frontline users of food, energy and water resources, local communities are essential for implementing agroecological practices. Community-led projects in water and resource management have shown that locally driven approaches within the WEF nexus can strengthen resilience and improve sustainability.
- **Government and policymakers:** Effective governance and policy coordination are critical for WEF nexus strategies. Governments can drive multisector collaboration and implement policies that promote resource efficiency, environmental stewardship and equity in access.
- **Philanthropic organisations:** With their agility and flexibility, philanthropic organisations can use innovative funding strategies to support agroecology by leveraging the WEF framework. By strategically investing in research, capacity-building and locally driven solutions, they can help scale agroecological practices that enhance sustainability, equity and resilience.
- **Private sector:** The private sector, particularly in agriculture, energy and water, can contribute innovations for efficient resource use. However, its engagement should align with sustainable and equitable practices that prioritise community well-being and ecosystem health.
- **Civil society and non-governmental organisations (NGOs):** Civil society organisations play a key role in advocating for sustainable, inclusive practices and holding stakeholders accountable to ensure the WEF nexus approach benefits vulnerable populations and upholds social justice.
- **Media:** Media play a key role in shaping how people view, perceive and understand the WEF nexus. They need to enhance responsible and informative media reporting on this subject to influence other stakeholders, including government and local communities.

MOTIVATION

The case for investing in WEF nexus initiatives for accelerating agroecological transitions can be expressed as follows:

Why does this issue matter?

Donor strategies have historically emphasised corporate industrial food systems, often reinforcing vulnerabilities and inequities in African food systems. Large investments continue to flow into harmful food system practices that degrade the environment, deepen social inequalities and leave food systems vulnerable to climate and economic shocks (Biovision Foundation for Ecological Development & IPES-Food 2020). To address this, a fundamental transformation towards more sustainable, just and resilient African food systems is urgently needed. Agroecology offers a critical pathway for achieving this transformation. By promoting diversified, ecosystem-based food system practices that restore biodiversity, improve soil health and empower local communities, agroecology represents a sustainable alternative to extractive industrial models (Wezel et al. 2020). However, agroecology faces significant challenges in respect of scaling. Much of the support for agroecological initiatives remains at the level of small, isolated projects, limiting their ability to become the dominant food system paradigm (Oxfam 2014). A coordinated and well supported transition is essential to ensure agroecology becomes a viable and mainstream approach for food systems in Africa.

Why should philanthropies be interested?

Philanthropic donors are well positioned to play a transformative role in advancing agroecological transitions across Africa. With their flexibility and capacity for risk-taking, philanthropic organisations can provide the kind of long-term, strategic support needed to help agroecology move beyond pilot projects and fragmented interventions (Bajwa & Gopalakrishnan 2023). Philanthropic efforts to support agroecological practices and sustainable food systems are expanding but remain insufficient given the scale of the challenge. Major foundations like Rockefeller, the Agroecology Fund and the Gates Foundation have invested in sustainable agriculture and biodiversity but much of this funding focuses on short-term, localised projects without addressing long-term, systemic transformations (Biovision Foundation for Ecological Development & IPES-Food 2020). Although philanthropy has raised awareness and supported small-scale pilots, it has not filled key gaps in policy advocacy, technical support and infrastructure investment. We propose the WEF nexus framework as a key leverage point for philanthropies to consider in their efforts to support agroecology.

The WEF nexus is increasingly recognised as a strategic framework for driving food systems transformation, particularly in Africa, where social–ecological challenges demand integrated and systemic solutions (Zhang et al. 2024). By linking resource management across sectors, the WEF nexus provides an ideal platform for embedding agroecology into broader development initiatives. This integration moves agroecology beyond niche interventions by mainstreaming its principles within cross-sectoral projects that enhance sustainability, resilience and equity. To the extent that WEF nexus frameworks highlight the uneven distribution of benefits and impacts of sustainable development initiatives, they can promote just food systems transitions. By investing in agroecology within the WEF nexus framework, philanthropies can address several critical challenges simultaneously — enhancing food security, building climate resilience and promoting social equity. The integrated approach of the WEF nexus ensures that resources across water, energy and food sectors are managed holistically, which not only improves sustainability, but also leverages synergies between these sectors (Zhang et al. 2024; Hoff 2011). This means that investments are not siloed but instead yield cross-cutting benefits, creating more resilient and self-sustaining food systems. Moreover, the emphasis on participatory governance and community-led initiatives inherent in agroecology ensures that projects are grounded in local contexts, fostering long-term ownership and scalability. This offers philanthropies an opportunity to achieve transformative, multidimensional impact while maximising both social and environmental returns.

What is the relevance to climate change adaptation and resilience?

Climate change exacerbates resource competition, particularly for water, energy and food, making integrated management crucial. Agroecology enhances resilience by reducing dependency on chemical inputs, restoring ecosystems and diversifying food production, making food systems more adaptable to climate shocks. At the same time, the WEF nexus framework can serve as a valuable tool for identifying, analysing and managing the trade-offs within agroecological systems (Simpson et al.2023; Hoff 2011). For example, in an agroecological system, while the reduction of chemical inputs can lower environmental externalities, it may also lead to increased labour requirements, variable yields and higher water usage per unit of food produced (HLPE 2019). By helping to balance these competing demands, the WEF nexus framework offers a practical pathway for mitigating risks and maximising the benefits of agroecological transitions, ensuring food systems are both climate-resilient and socially just.

CONTEXT

Integrating agroecology with the WEF nexus

The WEF nexus framework offers a critical avenue for achieving food systems transformations at multiple scales (Table 2). By emphasising systems-level coordination and attracting multisectoral investments, the WEF nexus can help align efforts to advance agroecological transitions across sectors and scales. At the same time, integrating agroecology into the WEF nexus could help overcome some of the framework's well-documented challenges. A common critique is that the WEF nexus often functions more as a discourse tool than a practical mechanism for integrated resource management, with limited translation into on-the-ground action (Naidoo et al. 2021). Agroecology's emphasis on place-based practices and local knowledge could help operationalise the WEF nexus more effectively, turning theoretical integration into practical outcomes. Additionally, while the WEF nexus is largely seen as a resource efficiency and management tool, it also engages with issues of equity and community involvement (Mabhaudhi et al. 2019), aspects that are inherent to agroecological systems. By bringing these social dimensions to the forefront, agroecology could help balance the WEF nexus's technical focus with a more holistic and inclusive approach. Finally, the tripartite focus of the nexus on water, energy and food may oversimplify the complex socio-ecological dynamics that shape African food systems. Agroecology's systems-thinking approach complements and expands this perspective, ensuring that critical factors such as land tenure, biodiversity and cultural practices are fully accounted for.

TABLE 2: MULTI-SCALAR IMPLICATIONS OF THE WEF NEXUS IN FOOD SYSTEMS TRANSFORMATION

Scale	Outcomes of WEF nexus-oriented initiatives
Farm or enterprise	Increased resource efficiency through sustainable practices, such as water-saving irrigation and renewable energy use, reduces costs and dependency on external inputs. Enhanced soil health and biodiversity from agroecological practices improve yields and resilience to climate impacts, benefiting farmers' livelihoods and food security.
Landscape	Improved ecosystem health as agroecological practices like agroforestry and soil conservation reduce land degradation and enhance biodiversity. Water cycling and resource-sharing across farms optimise water use and increase landscape resilience, supporting sustainable agriculture and ecosystem services over a broader area.
City-region	Strengthened urban–rural linkages support local food systems, reduce food miles and promote waste recycling. Nexus initiatives enhance resilience by improving food security, water access and energy supply for growing urban populations, fostering circular economies and efficient resource use between cities and their surrounding areas.
Country	National adoption of WEF nexus-aligned policies supports sustainable agriculture and resource conservation, driving down greenhouse gas emissions and bolstering food and water security. A coordinated, cross-sectoral approach promotes economic resilience, reduces rural poverty, and aligns with national sustainability and climate goals.
Region	Cross-border collaboration on WEF nexus issues facilitates shared resource management, addresses water scarcity and enhances food security at a regional scale. Regional partnerships bolster resilience to climate impacts, improve collective resource access and contribute to broader sustainable development goals across countries.

State of knowledge

In Africa, nexus-oriented interventions have demonstrated benefits such as increased agricultural productivity, reduced food loss and improved water and energy security. Given the growing funding landscape for WEF-oriented projects, agroecology practitioners and policymakers have an opportunity to harness these investments to scale agroecological transitions across African food systems. However, these benefits have yet to be fully realised due to governance fragmentation and inadequate investment in nexus-driven food systems transformation (Nhamo et al. 2018).

While studies emphasise the synergy between the WEF nexus and food systems transformations, literature specifically addressing the application of this integrated approach to African food systems transformation is limited (Hoff 2011). Furthermore, despite the evident synergies between the WEF nexus and agroecology, significant knowledge and implementation gaps remain. Key challenges include the lack of empirical evidence on how nexus-based governance structures can support agroecology, as well as limited policy integration at national and regional levels. Additionally, while funding mechanisms exist for WEF nexus initiatives, agroecology may be sidelined in these investments due to misalignment with conventional agricultural funding priorities. More research is needed to develop financing models that explicitly support agroecological approaches within WEF-oriented projects.

HURDLES TO TRANSITION

The following resource and capability gaps have been identified:

Integrating the WEF nexus framework with agroecology presents several interlinked challenges that require systemic and coordinated responses. One of the primary barriers is **governance and policy fragmentation** alongside institutional silos (Oulu et al. 2023). The lack of cross-sectoral coordination limits the ability to integrate agroecology with WEF-oriented policies and initiatives. This integration is further constrained by a tendency to prioritise large-scale, infrastructure-heavy projects over nature-based, smallholder-driven agroecological solutions such as traditional water conservation, often held within indigenous knowledge systems.

Furthermore, **technological and infrastructural barriers** limit the widespread adoption of agroecological practices, as many rural areas lack access to energy-efficient irrigation systems, decentralised renewable energy solutions and circular economy innovations that align with agroecological principles. Competing sectoral priorities and trade-offs further complicate implementation, as industrial and energy-intensive agricultural models often receive more policy and financial support than smallholder agroecological farming systems.

Scaling and replicability remain additional challenges, as agroecology is inherently context-specific, requiring locally adapted practices rather than standardised approaches. WEF nexus strategies, on the other hand, often emphasise broad regional policies that may not align with the localised nature of agroecological systems. Consideration needs to be given to social and equity dimensions, as marginalised groups, including smallholder farmers, women and Indigenous communities, frequently have limited participation in decision-making processes related to WEF governance. **Youth engagement** also remains a challenge, as agriculture and agroecology are often seen as unappealing due to barriers such as limited access to land and resources. Additionally, **inefficiencies in resource management** contribute to significant waste, while weak regulatory frameworks undermine food safety, particularly in informal markets where limited access to clean water and energy infrastructure heightens risks of contamination and foodborne illnesses. Going forward, gender-disaggregated and context-specific data will be crucial for ensuring that agroecological transitions are inclusive and equitable.

Addressing these challenges requires a holistic approach that strengthens cross-sectoral governance, aligns financing mechanisms with agroecological priorities and fosters evidence-based policymaking through improved data collection. By integrating agroecology within the WEF nexus framework, policymakers and practitioners can enhance the sustainability, resilience and equity of food systems, ensuring that agroecological transitions receive the financial and institutional support necessary for widespread adoption and impact.

RECOMMENDATIONS TO PROMOTE TRANSITIONS

1. **Key principles for philanthropic investment**

Equity and justice: At the core of agroecology is a critique of current food systems and neoliberal economic structures which disadvantage, dispossess, exploit or cause underdevelopment of local communities, women, minorities and other groups in the Global South, thereby denying them their human right to development. Philanthropy can play a part in reducing the impacts of such skewed structures but must do so from an equity and justice perspective rather than sympathy or favour.

Defunding harmful policies and programmes: Many of the causes of the challenges of current food systems and WEF insecurity are often funded by philanthropists. Defunding such harmful policies and programmes is critical to reducing the pressures on the WEF nexus while freeing funds needed to support agroecology.

Agency: Lack of consideration of human agency is one of the criticisms levelled against many donor organisations, including philanthropists, who arrogate themselves the role of prescribing communities' destiny simply because they are funding certain interventions. Philanthropy must consider human agency and the desired futures of communities.

Subsidiarity principle: Donors should invest in strengthening democratic governance of food, water and energy resources based on the principle of subsidiarity where decisions are made collectively at the local level by indigenous and local communities.

2. **Mechanisms to ensure funding supports sustainable and equitable transitions in agroecology**

Invest in research: There is much less investment in research on agroecological approaches compared with other approaches, resulting in significant knowledge gaps. Research is critical for the transition to agroecological transformation, including in areas such as performance of agroecological practices, alternative eco-friendly products and services, socially acceptable and just transformation pathways, etc.

Avoid tokenism: There is a lot of symbolic funding such as 'accelerator' programmaes whose processes are cumbersome, with only two or three 'winners' at the end. Such programmes prey on the challenge of access to finance among the population and tilt the scales to these few who get all future funding, leaving out the majority. Such funding mechanisms are unjust tokenism and must be avoided.

Support multi stakeholder platforms: The WEF nexus and agroecology involve many different stakeholders and interests. Multi-Stakeholder Platforms (MSPs) are emerging as an important way of bringing together communities, practitioners, researchers and policymakers to craft a shared vision of the future and find common solutions to food systems and WEF nexus challenges. Philanthropies should identify the role of, and support the work of, MSPs.

Internalise externalities: The series of lock-ins which perpetuate the current dominant model of food systems is partly due to environmental and social externalities not being properly considered. To overcome this inertia and to challenge the status quo, it is important to address such market failures by redirecting investments and efforts to innovative approaches such as participatory guarantee systems (PGS).

Metrics and measurements: If you cannot measure it, you cannot manage it. Investment in comprehensive performance metrics, covering all aspects of the WEF nexus, agroecology and food systems are critical for rational decision-making. This is the only way to know if there is impact and value for money, and whether the transition is sustainable and equitable.

Better coordination: Funding by philanthropy must be better aligned and coordinated for impact. This will help address short-term, sector-focused resource management as well as political factors and ensure repurposing of public investments based on agroecological principles.

CASE STUDIES

Zambia's Katapazi WEF Nexus Demonstration Project

The Katapazi area in Zambia faces severe climate change impacts, including floods, extreme rainfall, high temperatures and droughts. To address these challenges, the Katapazi Project implemented a WEF nexus approach to enhance community resilience and climate adaptation. A solar-powered drip irrigation system was installed on a four-hectare plot, directly benefiting over 800 people and indirectly improving the lives of more than 9 000 residents. This system supports farming activities while providing water for domestic and livestock use, powered by renewable energy. Additionally, the project offered training in system maintenance, agricultural production, marketing and gender-inclusive practices to ensure sustainable use and long-term benefits.

The project demonstrates the value of integrated approaches in building resilient agroecological systems. Key learnings include the importance of renewable energy in reducing resource-dependency, the need for community involvement through skills training, and the potential for social inclusion to drive equitable development. These elements align closely with the WEF nexus framework, showing how targeted investments in infrastructure and capacity-building can enhance climate resilience and food security.

SNV Kenya – WEF Nexus Project for Climate Resilience

The **WEF Nexus Project** in Kenya's Arid and Semi-Arid Lands (ASALs) addresses water scarcity, food insecurity and energy challenges in one of Kenya's most climate-vulnerable regions. The project integrates solar-powered irrigation with sustainable fodder production to enhance agricultural productivity while reducing dependence on fossil fuels and scarce water resources. Smallholder farmers were introduced to drought-tolerant fodder varieties and efficient irrigation technologies, directly benefiting farming households and improving food security for surrounding communities. Additionally, institutional capacity-building efforts ensured local governments and private actors were engaged in scaling and sustaining the initiative.

This project highlights the importance of integrated resource management in climate adaptation. Key learnings include the role of renewable energy in improving agricultural efficiency, the value of climate-smart crops in reducing water stress and the need for institutional collaboration to sustain long-term impacts. These insights reinforce the WEF nexus framework as a viable strategy for enhancing resilience in climate-sensitive regions.

Uganda's Utilities 2.0 Twaake Pilot Project

The **Utilities 2.0 Twaake pilot project** in Uganda identified technical, regulatory and business models necessary for integrated energy systems in the East African context.

This project was implemented by Power for all. This international advocacy organisation is building and mobilising a network of partners across the energy access ecosystem in developing countries to accelerate adoption of decentralised renewable energy.

They have conducted research, implemented pilot projects and developed policy briefs promoting the use of renewable energy in various African food systems phases including irrigation, milling and drying.

This work can facilitate adoption and integration of distributed renewable energy technologies to leverage synergies across the WEF nexus.

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