Agroecology for Sustainable Soil Health:

Reversing Soil Degradation in Sub-Saharan Africa.

A Position Paper

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Executive Summary

Sub-Saharan Africa is facing an escalating soil degradation crisis, with 75-80% of its cultivated land degraded. This has led to nutrient loss valued at USD $4 billion annually, directly impacting the livelihoods of over 485 million people. Soil degradation, exacerbated by conventional agricultural practices such as monocropping and the overuse of chemical fertilizers, has significantly reduced soil fertility, contributed to erosion, and diminished the soil's organic matter content. This issue is further compounded by the global food security crisis, worsened by the COVID-19 pandemic and international conflicts such as the Russia-Ukraine war, leaving over 278 million people undernourished across the region.

In response to this alarming trend, the African Union (AU) has introduced several initiatives such as the Soil Initiative for Africa (SIA) and the African Fertilizer and Soil Health Action Plan (2024–2034), focusing on scalable soil management practices, improved policies, and sustainable agricultural technologies. However, conventional farming practices, particularly the over-reliance on chemical fertilizers, continue to degrade Africa's soils.

This position paper advocates for agroecology as a transformative approach to reversing soil degradation and promoting sustainable agricultural productivity. Agroecology integrates ecological principles, traditional knowledge, and modern science, offering a viable solution through practices such as crop diversification, minimal tillage, and organic inputs. These practices enhance soil fertility, support biodiversity, and build climate resilience, making them a sustainable alternative to conventional methods. Despite its potential, agroecology has not yet received the policy support necessary to drive large-scale adoption.

Aligned with the key declarations such as the Abuja and Malabo Declarations, the Soil Initiative for Africa (SIA), and the African Fertilizer and Soil Health Action Plan, this position paper emphasizes the importance of agroecology in ensuring long-term soil health, food security, and climate resilience in Africa. It calls for a policy shift away from the over-reliance on chemical inputs and toward organic alternatives. This paper also outlines specific policy recommendations for the African Union's post-Malabo agenda, aiming to foster an environment where agroecological practices can thrive and support the continent's sustainable development goals. This position paper provides a roadmap for policymakers, calling for research, capacity-building, and financial investments to support this vital shift.

Main Objectives:

- Framing soil health as fundamental to sustainable development, agricultural productivity, climate resilience, and biodiversity conservation.
- Promoting agroecological practices as sustainable alternatives that restore soil health and address food security challenges.
- Advocating for agroecology's inclusion in the African Union's post-Malabo agenda with specific recommendations for policy reforms, research investments, and market development.
- Challenging the focus on chemical inputs, advocating for a transition toward organic and sustainable soil management practices.

Introduction

Sub-Saharan Africa faces a critical soil degradation crisis, with recent estimates at 75-80% of cultivated land degraded, leading to a loss of nutrients valued at USD $4 billion annually, affecting the livelihoods of over 485 million people (AU, 2024). This comes largely as a result of conventional agricultural practices, which has resulted in nutrient depletion, erosion, and loss of organic matter in soil. This poses a significant threat to agricultural productivity, food security, and climate resilience across the continent. The region currently faces persistent food insecurity, with over 278 million people classified as undernourished in 2021, a figure exacerbated by recent global crises such as COVID-19 and the Russia-Ukraine conflict (AU, 2024). Addressing soil health is therefore crucial for improving agricultural yields, protecting biodiversity and sustaining the livelihoods of millions of smallholder farmers.

The impact of Africa's soil degradation crisis extends beyond the continent's borders, carrying global implications for food systems, biodiversity, human health, and climate change. Degraded soils contribute to declining agricultural yields, making it increasingly difficult to meet the food demands of a growing global population. Furthermore, the collapse of soil ecosystems accelerates biodiversity loss, diminishing the natural services, such as pollination and pest control, which are vital to human health and nutrition. In the face of climate change, healthy soils act as a critical carbon sink, sequestering carbon and mitigating global greenhouse gas emissions. In light of this, the soil health crisis in Africa is more of a global challenge rather than a regional one, as it affects the sustainability of the planet's food systems and ecosystems (Altieri, 2019)..

Green Revolution

The Green Revolution was a global movement to boost agricultural productivity through the use of high-yield crop varieties, as well as chemical fertilizers and pesticides. It reached Africa in the 1970s, however, despite seeing productivity gains in Asia and Latin America, its impact on African agriculture was far less successful (Blaustein, 2008). This is largely because the Green Revolution promoted an agricultural model that was incompatible with Africa's diverse agroecological systems. While some have argued that there are no serious environmental or technical obstacles to agricultural intensification in Africa (Larsson et al., 2002), others warned that without addressing social inequalities and environmental concerns, these technologies may exacerbate existing problems (Kerr, 2012).

The Green Revolution had several negative impacts on African agriculture. These included widespread soil degradation due to overuse of chemical inputs and monocropping, which depleted nutrients and disrupted ecosystems (Boafo & Lyons, 2021). The focus on input-intensive methods marginalized smallholder farmers who were unable to afford the required expenses, thus worsening rural poverty (Kerr, 2012). The promotion of high-yield crop varieties also led to a significant loss of agricultural biodiversity, reducing the resilience of farming systems to environmental challenges (Clay & Zimmerer, 2020). These shortcomings highlighted the need for a more tailored approach to African agriculture, which agroecology can address by promoting diverse, low-input, and locally adapted farming systems that prioritize soil health and resilience (Gliessman, 2020).

IMF Structural Adjustment Programs (SAPs)

In the 1980s and 1990s, many African countries adopted IMF-led Structural Adjustment Programs (SAPs) as part of economic reform packages aimed at reducing debt and stimulating economic growth (Emeagwali, 2011). These SAPs, however, had devastating effects on the agricultural sector across the continent. The programs forced governments to cut public spending, dismantle agricultural support systems, and open up their markets to international competition. This mandated withdrawal of government support severely affected smallholder farmers, making it difficult for them to access

necessary resources and cope with market volatility(Brunger et al., 2002). Simultaneously, the privatization of extension services created a significant knowledge gap, leaving farmers without crucial technical assistance and information, particularly in rural areas. The SAPs also encouraged a shift towards export-oriented agriculture, promoting monocropping of cash crops at the expense of staple food production. This focus on export crops led to soil depletion and increased reliance on chemical inputs, which exacerbated food insecurity across Africa (Brunger et al., 2002).

The SAPs weakened the capacity of African governments to support smallholder farmers and entrenched dependence on external inputs and markets. This materialized in the form of weak institutions, limited access to markets and credit, and inadequate infrastructure, which constrained productivity growth (Shimeles et al., 2018; Salami et al., 2010). The erosion of agricultural institutions and infrastructure under SAPs is one of the root causes of the current challenges in African agriculture, where smallholder farmers remain under-supported and vulnerable to external shocks (Shimeles et al., 2018).

Since the SAP era, various agricultural reform efforts have been initiated across Africa, often driven by international donors and development agencies. These reforms have typically focused on increasing agricultural productivity through technological interventions, input subsidies, and market liberalization. However, many of these reforms have failed to deliver sustainable improvements in agricultural performance or address the structural challenges facing African farmers (Snyder & Cullen, 2014). This failure is due to a combination of factors, including the prevalence of top-down approaches driven by external actors, which resulted in standardized solutions that often misalign with the specific needs and contexts of African smallholders. These solutions have typically prioritized technological fixes over agroecological knowledge, marginalizing valuable indigenous practices and farming systems that are better adapted to Africa's diverse environments (Stoop & Hart, 2005). They have also perpetuated a cycle of dependence on expensive and environmentally harmful external inputs, creating barriers to the adoption of sustainable, locally sourced alternatives. This neglect of local knowledge, coupled with the imposition of ill-suited solutions and the promotion of input-dependent farming, has contributed to the ineffectiveness of many agricultural reform efforts across Sub-Saharan Africa (Altieri et al., 2017).

COVID-19 pandemic

The COVID-19 pandemic, which began in 2020, had far-reaching impacts on global food systems. In Africa, supply chain disruptions caused by lockdown measures led to food shortages, price increases, and limited access to fresh produce, particularly in urban areas (Carey et al., 2020). This crisis exacerbated food insecurity across the continent, with the World Food Programme reporting a substantial rise in undernourishment. The pandemic also disrupted the importation of critical agricultural inputs, hindering farmers' ability to maintain crop yields (Hobbs, 2022). These challenges highlighted the vulnerabilities of Africa's reliance on global supply chains and imported food and inputs. Consequently, the pandemic highlighted the urgent need for more resilient, localized food systems and the development of sustainable, locally sourced agricultural inputs to better withstand future shocks.

The pandemic brought into stark relief the dangers of being overly reliant on global markets for essential food and agricultural supplies. It highlighted the need for Africa to build more sovereign food systems, capable of withstanding global shocks and ensuring that local production meets local needs. Agroecology, with its focus on building local capacities, diversifying production, and reducing dependency on external inputs, offers a pathway toward greater food sovereignty (Altieri & Nicholls, 2020).

Ukraine-Russia War

The outbreak of the war in Ukraine in 2022 further destabilized global food and input markets. The war disrupted the export of key agricultural commodities, including wheat, maize, and sunflower oil, which are crucial food staples in many African countries. Ukraine and Russia together account for a significant share of global wheat exports (Neik et al., 2023). Hence, the conflict triggered sharp increases in global food prices, making essential foodstuffs unaffordable for many African households. Simultaneously, disruptions in fertilizer supplies from Russia led to shortages and price hikes, further challenging farmers already struggling with high input costs (Thusi & Mlambo, 2023). In combination,

these effects deepened food insecurity across the continent, pushing many more people into hunger and malnutrition. This was yet another crisis that has starkly highlighted the vulnerabilities of Africa's dependence on global food and input markets, further emphasizing the need for countries to develop more self-sufficient and resilient food systems to better withstand international shocks and reduce reliance on imports (Neik et al., 2023; Thusi & Mlambo, 2023).

Policy Response

In response to the threat to soil health, the African Union (AU) has introduced several initiatives aimed at reversing soil degradation, including the Soil Initiative for Africa (SIA) and the African Fertilizer and Soil Health Action Plan (2024–2034) (AU, 2024; 2020). These initiatives focus on the need for scalable, locally-adapted soil management practices, improved policy frameworks, and investment in sustainable agricultural technologies. Yet despite these efforts, many challenges persist. Conventional farming methods, particularly the overuse of chemical fertilizers, as well as unsustaible practices such as monocropping, and continuous tillage, continue to degrade soil fertility and resilience across the continent (Dainese et al. 2019).

The limitations of conventional agriculture highlight the need for a transformative approach to soil health management. This is where agroecology, an approach that integrates ecological principles with traditional knowledge and modern science, can offer a viable and much-needed solution. Agroecology focuses on practices such as crop diversification, minimal tillage, the use of organic inputs, and agroforestry, all of which contribute to improving soil fertility, enhancing biodiversity, and increasing resilience to climate change (Zenda & Rudolph, 2024).

Although agroecology has not yet gained the widespread policy support and adoption necessary to drive large-scale change, things are beginning to change. Several African countries have since drafted National Agroecological Strategies, and the policy landscape surrounding agroecology in Africa is beginning to take shape (Biovision, 2024). Yet challenges do persist, largely in the shape of inadequate policy support, limited access to organic inputs, and the dominance of conventional agricultural models reliant on chemical fertilizers. This position paper advocates for a policy shift to address these challenges by promoting agroecology as a key strategy for improving soil ecosystem health and climate adaptation. It aims to influence the African Union's post-Malabo policy frameworks to prioritize soil health, reduce reliance on chemical inputs, and support sustainable agroecological practices that are better suited to the environmental and socio-economic realities in Sub-Saharan Africa.

This position paper is in full alignment with existing frameworks such as the Abuja Declaration, the Malabo Declaration, and the previously mentioned the Soil Initiative for Africa (SIA) and African Fertilizer and Soil Health Action Plan (2024–2034). Critically examining current policy gaps, the paper challenges the over-reliance on chemical fertilizers and advocates for policy reforms and a reallocation of resources towards organic inputs. It ultimately highlights the importance of building soil health through ecological practices to achieve long-term food sovereignty and rural prosperity.

Healthy soils are integral to broader development goals, including food security, climate resilience, and sustainable livelihoods. As a result, the also highlights the economic, social, and environmental benefits of agroecological practices. Agroecology has the potentional to empower farmers, enhance community resilience to climate shocks, and contribute to sustainable economic growth. This is why adopting agroecology can be a response to an environmental problem as well as a strategy for achieving long-term development. Hence, this paper provides actionable recommendations to policymakers that focus on enabling frameworks, market incentives, research support, and capacity-building initiatives essential for its widespread adoption.

One of the central themes of this position paper revolves around the role of agroecology in restoring soil health. Hence, it will highlight agroecological practices that have successfully improved soil fertility, enhanced biodiversity, and increased resilience to climate change. It will also identify the limitations of current agricultural policies that favor conventional farming methods and propose a shift towards supporting agroecological frameworks. It is our firm belief that agroecology should be included in national agricultural policies, which will in turn contribute towards increasing investment in

sustainable soil management, and enhancing knowledge transfer and infrastructure for smallholder farmers.

Main Objectives:

- Framing soil health as fundamental for sustainable development, agricultural productivity, climate resilience, and biodiversity conservation.
- Presenting agroecological practices as sustainable alternatives that restore soil health while addressing food security challenges.
- Advocating for the inclusion of agroecology in the AU's post-Malabo agenda, with specific recommendations for policy reforms, research investments, and market development.
- Challenging the focus on chemical inputs and advocating for the transition towards organic inputs and other sustainable agroecological approaches towards soil management.

Alignment with Key Declarations

The soil health challenges currently facing Sub-Saharan Africa are central to broader development agendas. As a result, efforts to address it must be reflected in the existing regional and international frameworks that govern soil management. The African Union (AU) sand its partners have spearheaded several declarations and action plans that provide a strategic foundation for addressing soil degradation across the continent. These frameworks highlight the importance of integrated soil management, the transition to sustainable agroecological practices, and the need for cohesive policies that prioritize soil health.

Soil Initiative for Africa (SIA)

The Soil Initiative for Africa (SIA) was launched in 2020, and addresses the persistent soil degradation issues faced in Africa. It aligns with the AU's Agenda 2063, promoting soil health restoration through locally adapted, scalable practices that enhance agricultural productivity and climate resilience. The initiative focuses on an integrated approach to soil health, combining conservation techniques and improved land management with institutional capacity building and data-driven decision-making (AU, 2020). The goals of SIA aligns closely with agroecological principles. Practices such as organic input use, crop diversification, minimal tillage, and agroforestry directly contribute to restoring soil fertility, improving water retention, and enhancing resilience to climate change, all of which are fully supported in SIA's framework.

Abuja Declaration on Fertilizers for African Green Revolution

Adopted in 2006, the Abuja Declaration set ambitious targets for increasing fertilizer use in Africa, aiming for an average application of 50 kg per hectare by 2015 (AfDB, 2006). The aim this declaration set out to achieve was to address low soil fertility. However, much of this proposed fertilizer usage was in fact chemical-based, and even though the target has not been met, it has still led to an over-reliance on chemical fertilizers in many regions. This has since gone on to exacerbate soil degradation and reduce biodiversity even further. On top of this, average crop productivity in Africa remains at only 30% of global levels (AU, 2024). There is now sufficient evidence to challenge this approach, and argue for a transition away from chemical inputs toward organic alternatives, such as biofertilizers and compost.

This shift remains in alignment with the broader goals of the Abuja Declaration, which is to improve soil fertility, but it redefines the means by which this should be achieved. A redirection of subsidies towards organic inputs, which have been shown to restore soil organic matter and enhance long-term productivity without causing environmental harm, ensures that agricultural systems become more sustainable, resilient, and supportive of smallholder farmers, who often struggle to afford chemical fertilizers.

Malabo Declaration on Accelerated Agricultural Growth and Transformation

The Malabo Declaration of 2014 builds on the Comprehensive Africa Agriculture Development Programme (CAADP) and places emphasis on sustainable agricultural growth, improved livelihoods, and food security across Africa. The declaration has set goals for halving poverty, increasing agricultural productivity, and boosting intra-African trade in agricultural products by 2025. It also calls for the integration of climate resilience into agricultural practices (AU, 2014). The objectives of the Malabo Declaration align strongly with agroecological principles, particularly in promoting agricultural systems that are sustainable, inclusive, and resilient to climate change. The declaration highlights the need to enhance resilience to climate variability and other related risks, committing to making at least 30% of African households resilient to climate-related risks by 2025 (AU, 2014). Agroecological practices are crucial for addressing the adverse effects of climate variability, as they help maintain soil structure, reduce erosion, and improve water retention (Zenda & Rudolph, 2024). The commitment of the Malabo Declaration to ending hunger by 2025 is also echoed in the principles of agroecology, which focused on food security through soil health. Agroecology promotes practices that improve soil fertility without degrading ecosystems, which is in support of the declaration's vision of doubling agricultural productivity while promoting environmental sustainability.

African Fertilizer and Soil Health Action Plan (2024–2034)

The African Fertilizer and Soil Health Action Plan (2024–2034) is the most recent initiative designed to address both fertilizer use and soil health across the continent. Developed during the 2024 Africa Fertilizer Summit, this plan adopts an encompassing approach by aiming to triple fertilizer use by 2034 (From 18 kg/ha in 2020 to 54 kg/ha by 2034), while promoting integrated soil fertility management (ISFM). This is proposed to be achieved through the combination of both organic and mineral inputs, with the ultimate goal of restoring 30% of degraded soil by 2034 (AU, 2024). The plan also aims to expand the amount of agricultural land under sustainable management; from 8.2% in 2021 to 30% by 2034. Achieving this would require further adoption of sustainable agroecological practices that enhance soil health without the reliance on chemical inputs.

Nairobi Declaration on Africa Fertilizer and Soil Health Summit (2024)

The Nairobi Declaration on Africa Fertilizer and Soil Health (AFSH) Summit was issued in 2024, and formally acknowledges the urgent need to address soil degradation in Africa, which has been a major impediment to agricultural productivity, food security, and economic development. The joint development partners recognize that sustainable fertilizer use and soil health are critical to the long-term productivity, profitability, and resilience of African agriculture and food systems. The AFSH Action Plan forms the foundation of the Nairobi Declaration, outlining outcomes that will guide policies, and interventions related to soil health and fertilizer management across Africa. These include focusing on investment, policy reform, capacity building, and technology adoption. This position paper fully aligns with the Nairobi Declaration, advocating for agroecological principles to restore soil health and promote climate-resilient agriculture. It echoes the declaration's call for a systemic transformation in Africa's agricultural landscape, with a focus on empowering smallholder farmers, promoting biodiversity, and enhancing local markets.

Financing Mechanisms within the African Union

Undoubtedly, the AU has made some progress towards addressing soil health, however, gaps in financing remain a critical barrier to scaling sustainable agroecological practices. This is mainly due to existing mechanisms often prioritizing short-term productivity boosts over long-term investments in soil health and agroecological systems. Hence, this position paper calls for a reallocation of resources towards agroecology, and advocates for innovative financing mechanisms that support sustainable practices. These could include subsidies for organic inputs, soil health bonds, and public-private partnerships focusing on sustainable land management. Financing strategies should prioritize the long-term health of Africa's soils as a foundation for sustainable economic growth and food security.

Agroecology as a Solution for Sustainable Soil Management

It is now well established that the application of agroecological practices contributed to healthy soil, which sustains agricultural productivity as well as plays a significant role in carbon sequestration, water filtration, and supporting biodiversity (Zenda & Rudolph, 2024). As Africa faces severe soil degradation agroecology offers a pathway toward restoring soil health, enhancing biodiversity, and building climate resilience. The following practices all align with the AU's goals for sustainable agricultural development and provide a foundation for more resilient and productive food systems across the continent.

Restoring Soil Health

Agroecology focuses on working with nature rather than against it, by focusing on practices that restore and maintain the natural functions of soils. When successfully implemented, agroecological practices can contribute to enhancing soil structure, increasing organic matter, and supporting microbial activity, all of which are essential for healthy soils.

One of the core principles of agroecology is **crop diversification**, which involves growing a variety of crops in a single field. This approach helps to restore soil fertility by reducing the depletion of nutrients associated with monocropping. For example, intercropping legumes with cereals promotes nitrogen fixation, enriching the soil with this vital nutrient and reducing the need for chemical fertilizers (Altieri, 2019). A meta-analysis revealed that intercropped grain legumes derive 14% more nitrogen from symbiotic fixation compared to sole crops, while intercropped cereals acquire 61% more soil nitrogen than their sole crop counterparts (Rodriguez et al., 2020).

Agroecology promotes **minimal or zero-tillage** practices to protect the soil structure and reduce erosion as well as greenhouse gas emissions (Hassan et al., 2022). Conventional tillage can disrupt soil ecosystems, compact the soil, and increase erosion. In contrast, minimal tillage helps maintain soil moisture, improves microbial activity, and supports the accumulation of organic matter (Hassan et al., 2022). These benefits are particularly important in arid and semi-arid regions, such as parts of Tanzania and Zimbabwe, where water retention is crucial for crop productivity. For example, in central Tanzania, farmers were reported to utilize traditional knowledge to develop context-specific tillage practices as a drought mitigation strategy (Shemdoe et al., 2009).

Replacing synthetic fertilizers with **organic inputs**, such as compost, manure, and biofertilizers, is central to agroecological farming. Organic inputs enhance soil fertility by increasing organic matter content, supporting microbial diversity, and promoting nutrient cycling (Mehata et al., 2023). The effectiveness of this approach has been demonstrated in areas such as Tanzania, where the application of organic manure combined with legume intercropping resulted in improved soil moisture retention, as well as maize yields of 3-4.5 t/ha, significantly higher than national averages (Hilbeck et al., 2024). Moreover, biofertilizers can be locally produced, reducing farmers' dependency on costly chemical inputs while improving the economic sustainability of farming systems (Mehata et al., 2023).

The practice of **agroforestry,** involves integrating trees into agricultural landscapes, and is another critical agroecological practice. Agroforestry systems improve soil health by preventing erosion, enhancing water retention, and promoting nutrient cycling (Fahad et al., 2022). Trees, particularly leguminous species, fix nitrogen in the soil, enriching its nutrient content. In Kenya and Zambia, agroforestry practices were shown to contribute to improved soil fertility, reduced wind erosion, and increased biodiversity, leading to more resilient farming systems (Place et al., 2002).

Climate Resilience and Biodiversity

One of the most significant benefits of agroecology is its capacity to enhance the resilience of farming systems to climate variability. Climate change has exacerbated soil degradation in Africa, making it more difficult for smallholder farmers to maintain productivity in the face of erratic rainfall patterns, droughts, and floods. Agroecological practices help farmers adapt to these changing conditions by improving soil's water retention capacity and reducing erosion.

Techniques such as mulching, rainwater harvesting, and contour farming are integral to agroecology and play a crucial role in **water conservation**. These practices help retain more water in the soil by reducing water runoff, improving water infiltration, and maintaining soil moisture levels; thus making farming systems more resilient to droughts and unpredictable rainfall patterns (Diop et al., 2022). For example, in Zimbabwe, the application of rainwater harvesting has led to significant increases in cereal yields and reduced soil erosion, particularly in regions facing water scarcity (Mutekwa & Kusangaya, 2007).

Agroecological systems promote **biodiversity,** both above and below ground. A diverse range of crops, trees, and animals contributes to ecosystem stability, making farming systems less vulnerable to pests, diseases, and environmental stresses (Altieri, 2019). For example, integrating legumes and cereals or incorporating livestock into farming systems can increase soil organic matter and improve nutrient cycling (Tiemann et al., 2015). Enhancing biodiversity through agroecology can therefore support more resilient ecosystems as well as contribute to long-term soil health and productivity.

Economic and Social Benefits

In addition to agroecology being an ecological solution, it also offers significant economic and social benefits, particularly for smallholder farmers. For instance, the application of organic inputs produced from locally available resources can reduce the reliance on costly chemical inputs, thereby lowering production costs while increasing productivity. Farmers who adopt agroecological practices often experience improved yields, better food security, and enhanced livelihoods.

One of the major barriers for smallholder farmers in Africa is the **high cost of chemical fertilizers and pesticides**. Agroecology reduces these costs by promoting the use of organic inputs, which can be produced on-farm or sourced locally (Auerbach, 2019). For example, farmers in Zambia participating in the Bokashi Fertilizer Initiative significantly reduced their reliance on chemical inputs, leading to both improved maize yields and increased household incomes (See case study below).

Agroecological systems are often more inclusive and accessible than conventional farming models, particularly for **women and marginalized communities.** These practices also promote community cohesion and collective action, as knowledge is often shared through farmer-to-farmer networks (Dagoudo et al., 2023). In Kenya and Uganda, agroecological training programs have empowered women to produce and market biofertilizers, creating new income-generating opportunities and improving soil health (Andersson & Gabrielsson, 2012).

Agroecology directly contributes to **improved food security** in rural communities, through the enhancement of soil fertility and increased crop yields. In Malawi, farmers who adopted legume intercropping reported significant increases in maize yields, and were nearly three times more likely to be food secure (Madsen et al., 2020). Furthermore, a study in Malawi revealed that households adopting agroecological practices were 12% more likely to report optimal health status, highlighting the connection between agroecology, food security, and human health (Nyantakyi-Frimpong et al., 2017). This is connected to the fact that agroecological systems are often more resilient to climate shocks, thereby reducing the risk of crop failure and ensuring more consistent agricultural output.

Case Studies: Success Stories of Agroecology in Africa

Several agroecological projects across Africa have demonstrated the effectiveness of these practices in restoring soil health and improving agricultural productivity. Case studies from various countries show how agroecology can deliver tangible benefits for smallholder farmers and rural communities, , making a compelling argument for their broader implementation across Africa.

In Uganda, the "Plant Every Day to Harvest Every Day" project, demonstrates the transformative power of agroecology. Starting in 2019 on a small plot of previously non-arable land, the project showcases how crop diversification and organic practices can create a self-sustaining, high-yield farming ecosystem. The project implemented a 365-day green cover method and introduced a diverse range of crops including bananas, yams, kale, and green peppers, which transformed barren soil into a thriving, pest-resistant environment. This approach improved soil fertility significantly and enabled daily harvests, providing a consistent food supply and income stream for small-scale farmers. The success of this model led to increased productivity while reducing labor and input requirements (1).

In Zambia, the Kapete Ecological Centre's bokashi fertilizer initiative was launched in 2018, and showcases how locally-produced organic fertilizers can significantly enhance soil health and agricultural productivity while reducing costs and increasing climate resilience. Farmers were trained in bokashi production and use, and the initiative saw average maize yields increase from 2.7 to 5.0 tons per hectare. The bokashi fertilizer improved soil organic matter density and moisture retention, enhancing drought resistance, a crucial benefit in the face of climate change. Despite initial skepticism, the success of the project led to its certification by national agricultural authorities and widespread adoption among local farmers. This case study illustrates how agroecological approaches can simultaneously address soil degradation, food security, and climate adaptation challenges (2).

The Legume Diversification project in Ekwendeni, Malawi, presents a case for agroecology's potential to simultaneously address multiple agricultural challenges. Initiated in 2000, this participatory research project introduced five legume technologies to tackle food insecurity and soil degradation. By 2011, over 10,000 farmers had adopted these practices, resulting in significant improvements in soil fertility, with legumes contributing 30-90 kg of nitrogen per hectare annually. This led to increased maize yields, enhanced soil moisture retention, and reduced erosion. The project also boosted dietary diversity and women's participation in agriculture, which grew from 29% to over 50%. The establishment of a community seed bank and ongoing farmer training ensured long-term sustainability. This case study demonstrates how agroecological approaches can effectively improve soil health, increase productivity, and enhance community resilience (3).

The Soil and Water Conservation project on the slopes of Kilimanjaro, initiated in 1996 by the Himo Environmental Management Trust Fund (HEM), spanned three districts in Tanzania. The initiative successfully addressed soil erosion and low productivity through a comprehensive approach to land management. Farmers were trained in conservation techniques such as contour farming, crop rotation, and mulching; and within a decade, 6,500 farmers across eight villages had implemented these practices on over 4,200 hectares, leading to dramatic improvements in crop yields. Maize production doubled from 1.3 to 2.6 t/ha, while bean yields increased from 0.7 to 1.2 t/ha. The project's encompassing approach, which included establishing tree nurseries and promoting energy-saving stoves, demonstrates how agroecological practices can simultaneously enhance soil health, boost agricultural productivity, and improve rural livelihoods (4).

The Food Forests project in Kenya, led Bio Gardening Innovations (BIOGI), was implemented across Emuhaya, Vihiga, and Kakamega counties, and successfully transitioned farmers from monocultures to diverse, multi-layered food forests. This was achieved through the combination of indigenous knowledge with permaculture techniques. The project significantly improved soil fertility and structure through intercropping, composting, and innovative water management. The use of swales-on-contour and Vetiver grass effectively prevented soil erosion and enhanced water retention. These agroecological practices led to remarkable outcomes, including a fourfold increase in farmers' income from banana sales and improved dietary diversity for participating families. The project's success in

engaging 2,000 smallholder farmers, particularly women, and garnering recognition from international institutions demonstrates the scalability and effectiveness of agroecological approaches (5).

The Conservation Farming (CF) project in Zimbabwe's Nkayi District, was started in 2006, and implemented techniques such as minimal tillage, planting stations, and mulching, alongside the establishment of community seed banks. The project achieved remarkable results, as maize yields increased tenfold, from 0.4 tons per hectare in conventional fields to 4.3 tons per hectare in CF fields. This improvement in productivity was accompanied by enhanced soil fertility, reduced erosion, and decreased reliance on chemical inputs. The success of the project extended beyond crop yields, significantly improving household food security, dietary diversity, and economic well-being. Community seed banks grew from 0.5 to 4.3 tons of open-pollinated variety seeds in just three years, reducing farmers' dependence on expensive hybrid seeds (6).

Comparison with Conventional Practices

Agroecology contrasts sharply with conventional agricultural methods that rely on chemical fertilizers and pesticides, monocultures, and intensive tillage. While conventional methods can achieve high yields in the short term, they degrade soil health over time, leading to diminishing returns (Rosset et al., 2014). Conventional farming practices often lead to the depletion of soil nutrients, while agroecology enhances soil fertility through organic matter inputs and biological processes. Over time, agroecological systems become more self-sustaining, reducing the need for external inputs (Nicholls & Altieri., 2016).

Conventional practices, in particular continuous tillage and monocropping, contribute to soil erosion and poor water retention. In contrast, agroecological methods such as minimal tillage and agroforestry help protect soil from erosion and improve its ability to retain water, which is crucial for drought-prone regions (Fahad et al., 2022). Agroecology also promotes biodiversity and ecosystem services that enhance the resilience of farming systems to climate shocks. Conventional systems, which often rely on monocultures and external inputs, are more vulnerable to climate variability and extreme weather events (Altieri, 2019). Despite requiring higher labor inputs initially, they reduce farmers' long-term dependency on costly chemical inputs. Therefore, compared to their chemical counterparts, orgnaic inputs can lower production costs over time, while improving yields and environmental sustainability (Auerbach, 2019).

Key Challenges

Universal adoption of agroecology across Africa faces several significant challenges, in spite of its many benefits. These challenges need to be thoroughly understood, as they are rooted in institutional, economic, social, and environmental factors that hinder the transition from conventional farming methods to more agroecologically sustainable systems.

One of the main obstacles to promoting agroecology and sustainable soil management is the **lack of robust, supportive policies.** In many African countries, existing agricultural policies still prioritize conventional farming practices that rely heavily on chemical fertilizers and pesticides. This policy bias is reinforced by subsidies and financial incentives that make synthetic inputs more accessible than organic alternatives. The fragmentation of regulatory frameworks related to soil health management across various ministries (agriculture, environment, and water resources) creates difficulties in aligning policies and implementing cohesive agroecological strategies. For example, soil health policies may be handled separately by ministries of agriculture, environment, and water, without coordinated efforts to promote integrated land management (AU, 2020). This lack of a unified approach hinders

development and efforts to implement cohesive agroecological strategies that address soil degradation, erosion control, and nutrient management.

Access to organic inputs remains a major challenge for smallholder farmers. Fertilizer use in Africa is already significantly lower than global averages, as many farmers rely heavily on imported fertilizers, which are expensive and often inaccessible (AU, 2024). Locally produced fertilizers are often unavailable or prohibitively expensive compared to chemical fertilizers. This is likely due to production and distribution networks for organic inputs being underdeveloped in most countries. In contrast, chemical inputs are more readily available due to established supply chains and government subsidies (AU, 2020). Market structures for agroecological products are also weak, with underdeveloped certification systems and limited access to premium markets, making it difficult for farmers to benefit financially from transitioning to sustainable farming practices. This further exacerbates soil fertility issues

The **economic realities facing smallholder farmers** pose a significant challenge to adopting agroecology. Many operate with limited capital, and transitioning from conventional to agroecological practices often involves initial costs that most cannot afford. While agroecology can reduce input costs in the long term, there are upfront expenses related to training, acquiring organic inputs, and adopting new farming technologies. Many smallholders lack access to credit and financial services tailored to support their transition to agroecology, as existing financial products are frequently geared towards conventional agriculture. Access to credit and financing options for sustainable farming practices is also limited. Most financial institutions and government programs prioritize short-term agricultural inputs, rather than supporting investments in long-term sustainable practices. The absence of innovative financing mechanisms such as subsidies for organic inputs, agroecological credit schemes, and insurance products for climate-resilient farming further compounds the financial challenges faced by farmers seeking to adopt agroecology (AU, 2020).

A critical barrier to the adoption of agroecological practices is the **lack of technical knowledge and support** available to farmers. Agricultural extension services are often geared toward promoting conventional farming methods, with little emphasis on sustainable practices. Extension workers typically lack the expertise to guide farmers in implementing agroecological techniques effectively (Nairobi Declaration, 2024). Agroecology requires a shift towards knowledge-intensive systems, which depend on farmers understanding complex ecological interactions and processes. Without adequate training and support, farmers may find it challenging to transition to agroecology, particularly in the early stages when results may be slower to materialize compared to conventional practices.

Agroecological practices are often **more labor-intensive** than conventional farming methods, which can be a significant barrier for smallholder farmers with limited resources. Practices such as composting, organic manure application, and water conservation techniques require considerable manual labor. This increased labor demand can discourage adoption, especially in regions where labor availability is constrained due to rural-to-urban migration or population aging (Mukamuri & Pedzisa, 2021).

Even when farmers successfully adopt agroecological practices, they often face challenges in **accessing markets** that recognize the value of sustainably produced products. Many African countries lack well-established value chains for agroecological products. Without proper market recognition, farmers are unable to command premium prices for their agroecologically produced crops, limiting the economic benefits of adopting sustainable practices. Certification systems for organic products are either underdeveloped or prohibitively expensive, making it difficult for smallholder farmers to market their produce as organic. In addition, local and regional markets are often dominated by conventionally produced crops, with limited demand for sustainably grown products (FAO, 2014). This lack of market access and demand discourages the widespread adoption of agroecological practices.

While agroecology is a proven tool for building climate resilience, the immediate **impacts of climate change** pose significant challenges to farmers seeking to adopt agroecological practices. Agroecological practices often rely on stable environmental conditions to function effectively. Climate variability makes it difficult for farmers to predict and plan for growing seasons, increasing the risks associated with transitioning to new farming systems. Increasing climate variability, including droughts and floods, compounds soil health challenges and makes soils more susceptible to erosion, loss of

moisture, and other degradation processes (AFSA, n.d). For example, water conservation practices, which are central to agroecology, become even more critical in the face of increasing water scarcity. However, without adequate infrastructure, training, or financial support, smallholder farmers may find it difficult to implement these practices effectively, particularly in regions facing acute climate risks (Mekuria et al., 2022).

Africa faces significant challenges in **soil data management and monitoring,** hindering effective agricultural interventions and sustainable land use. Africa lacks comprehensive soil data systems, making it difficult to monitor soil health or plan interventions based on accurate, real-time information. Real-time continuous soil monitoring (RTCSM) offers potential for tracking soil parameters and pollutants, but faces hurdles in data acquisition, transmission, and processing (Fan et al., 2022). While national statistical offices are primarily responsible for data collection, their capabilities to transform data into actionable insights are limited (Assefa et al., 2019). The absence of a unified soil health monitoring system impedes the ability to track the success of agroecological interventions and adapt practices based on local soil conditions.

Several agroecological practices have proven effective at the local level, however, there are significant challenges in scaling them across different agroecological zones and regions. These practices are often location-specific, requiring customization to local soil types, climates, and farming systems. Scaling agroecological innovations is complex without significant investments in research and adaptation, as it requires consideration of biophysical, social, economic, and institutional factors (Wigboldus et al., 2016).

Agroecology vs the Conventional Agriculture Model

Despite the growing recognition of agroecology as a sustainable pathway for African agriculture, critics argue that it may not be able to address the continent's immediate food security challenges or scale to the levels necessary to meet the needs of a rapidly growing population (Mugwanya, 2019). The conventional approach to agriculture, centered on input-intensive, large-scale monocropping, and the widespread use of chemical fertilizers and pesticides, has long been positioned as the most efficient means of achieving food security. Proponents of conventional agriculture argue that high-yield varieties, chemical inputs, and mechanization are essential to increase food production and meet global food demand (Mockshell & Villarino, 2019).

While it is true that conventional approaches have produced short-term gains in yield, they come at the expense of long-term sustainability and resilience. The conventional agricultural model has significant limitations that impact both environmental and socio-economic systems. Intensive monocropping and heavy reliance on chemical inputs lead to long-term soil degradation, reducing land productivity and creating a cycle of increased input dependency They also contribute to widespread environmental degradation, ranging from water pollution to biodiversity loss. Economically, the high costs of chemical inputs entrench rural poverty and create market dependencies that disadvantage smallholder farmers (Meynard, 2013). Furthermore, conventional agriculture's vulnerability to climate change impacts is pronounced, with monocultures and intensive farming practices reducing ecosystem resilience to extreme weather events. These practices also contribute to greenhouse gas emissions, exacerbating global climate change (Komatsuzaki & Ohta, 2013).

Critics of agroecology often raise concerns about its scalability and whether it can deliver the same levels of productivity as conventional agriculture. They argue that the reliance on locally adapted practices and organic inputs could limit its ability to scale rapidly across large geographic areas and that smallholder farmers may struggle to achieve the high yields necessary to meet Africa's growing food demand (Mugwanya, 2019). However, these concerns overlook the broader context of agricultural sustainability and the true costs of conventional farming practices. Agroecology does in fact address long-term soil health and resilience and offers practical solutions to these criticisms.

Agroecology offers a scalable and adaptable approach to sustainable agriculture, contrary to the idea that it lacks broad applicability. The key to scaling agroecology lies in investing in training, extension services, and market access, ensuring farmers have the necessary knowledge and resources (Dushyant

et al., 2024). Unlike conventional agriculture's one-size-fits-all approach, agroecology's focus on decentralized, context-specific solutions makes it more flexible across diverse environments. It scales principles such as crop diversity, soil conservation, and water management, rather than single technologies, allowing for widespread application across various farming systems (Dushyant et al., 2024).

Critics often overlook agroecology's long-term benefits when comparing it to conventional agriculture's immediate high yields. Agroecological practices build sustained soil fertility and ecosystem resilience, leading to more stable yields over time. Studies have shown that practices such as intercropping and organic fertilization can produce yields comparable to conventional systems, especially when combined with improved water management and pest control techniques (Pronti & Coccia, 2020). Moreover, agroecology offers farmers diversified income streams through multiple crop cultivation, reducing risks associated with market fluctuations or crop failures. The economic viability of agroecology is further enhanced by its reliance on locally available inputs, which reduces costs and builds self-reliance (Pronti & Coccia, 2020). The growing market for organic and sustainably produced products also presents opportunities for smallholders to access premium prices through mechanisms such as Participatory Guarantee Systems (Dushyant et al., 2024). While the transition to agroecology may present short-term challenges, its long-term benefits in terms of reduced input costs, improved resilience to climate shocks, and enhanced food security at the household level make it a practical alternative to conventional agricultural models.

Policy Recommendations

Establish Agroecological Innovation Hubs

Agroecological innovation hubs can serve as regional centers where farmers, researchers, and policymakers collaborate to test, refine, and scale agroecological practices. These hubs would facilitate the exchange of best practices, provide training on sustainable soil management, and create networks for knowledge dissemination.

Who is Responsible:
National agricultural ministries, research institutions, regional bodies (e.g., ECOWAS, SADC)

Recommended Action:
Governments and regional bodies should designate specific areas as agroecological innovation hubs. These centers should be provided with financial support, skilled personnel, and infrastructure to conduct research, training, and knowledge-sharing initiatives.

Introduce Soil Health Monitoring and Restoration Targets

Governments should set national soil health targets, monitored through advanced soil data platforms. For example, each country could aim to restore a specific percentage of degraded land over a ten-year period. These targets should be linked to public investment in soil health programs, including agroecological practices, to ensure sustained progress.

Who is Responsible:
National governments, ministries of agriculture, national statistics offices, and technology partners

Recommended Action:
Governments should create national soil health restoration plans with clear targets. Advanced soil monitoring technologies, such as GIS and remote sensing, should be employed to track progress and adjust interventions as necessary. Public investments should be tied to achieving these targets.

Accelerate Agroecological Input Production through Local Enterprises

To reduce dependency on imported inputs, governments should promote the local production of bio-fertilizers, compost, and other organic inputs. This can be achieved by providing small-scale

enterprises with seed funding, technical support, and business incubation services to build local agroecological input industries.

Who is Responsible:
National governments, ministries of trade and industry, agricultural ministries, small and medium enterprises (SMEs)

Recommended Action:
Governments should launch initiatives that support the local production of agroecological inputs by providing seed funding, establishing business incubation programs, and facilitating access to markets for small agro-enterprises. This will create jobs and reduce farmers' dependence on imported inputs.

Implement Agroecology in Public Procurement Policies

Public institutions such as schools, hospitals, and government offices should source a portion of their food supplies from agroecologically certified farms. This would create a reliable market for agroecological products and incentivize farmers to adopt sustainable practices by offering a guaranteed market for their produce.

Who is Responsible:
National governments, ministries of agriculture, ministries of education and health

Recommended Action:
Governments should amend public procurement policies to mandate that a percentage of food purchased for schools and hospitals comes from agroecologically certified farms. Certification systems such as Participatory Guarantee Systems (PGS) should be used to ensure that smallholder farmers can meet these requirements.

Leverage Digital Platforms for Farmer Training and Market Linkages

Governments should develop digital platforms that provide smallholder farmers with real-time information on soil health management, climate adaptation techniques, and market opportunities for agroecological products. These platforms can also serve as marketplaces where farmers can sell their produce directly to consumers or processors, bypassing middlemen and securing better prices.

Who is Responsible:
National governments, private sector technology companies, farmer cooperatives

Recommended Action:
Develop and implement digital platforms that offer farmers access to training modules, market information, and direct market linkages. Governments should collaborate with technology companies to make these platforms widely available and user-friendly for rural farmers.

Redirect Subsidies Toward Sustainable Inputs

Many African countries currently subsidize synthetic fertilizers and chemical inputs, which contribute to long-term soil degradation. Governments should gradually redirect these subsidies towards supporting organic inputs such as compost, manure, and bio-fertilizers. This shift would help make sustainable inputs more affordable and accessible to smallholder farmers while reducing the dependency on chemical fertilizers that harm soil health. For example, in countries where the government heavily subsidizes chemical fertilizers (e.g. Zambia and Malawi through the Farmer Input Support Programme (FISP)), the program could be restructured to allocate at least 30% of its resources to subsidizing organic inputs. This would provide farmers with vouchers to purchase compost or bio-fertilizers, allowing them to gradually transition away from chemical fertilizers while still receiving financial support.

Who is Responsible:
National governments, Ministries of Finance, and agricultural subsidy programs.

Recommended Action:

Governments should restructure existing agricultural subsidy programs to gradually reduce subsidies for chemical fertilizers and reallocate them to organic inputs. The Finance minstries should work with agricultural departments to budget for this transition, ensuring that sustainable inputs become more affordable and accessible to farmers.

Strengthen Extension Services for Agroecology

Farmers need access to technical knowledge and support to successfully adopt agroecological practices. Governments should invest in training agricultural extension officers on agroecology so that they can effectively disseminate information, provide guidance, and assist farmers in transitioning to sustainable farming methods. Extension services should also promote farmer-to-farmer learning networks, enabling the exchange of knowledge and best practices. For example, the Ministry of Agriculture could establish a nationwide agroecology training program for extension workers. The program would include practical workshops and field demonstrations on key agroecological practices. Regional agroecology centers of excellence could also be set up to serve as training hubs, where extension officers and farmers alike can receive hands-on experience in sustainable farming techniques.

Who is Responsible:
Agricultural ministries, local agricultural departments, and agricultural training institutions.

Recommended Action:
National agricultural departments should design and fund training programs for extension officers to specialize in agroecological practices. Training institutions should offer comprehensive workshops and certification programs in agroecology. Local agricultural departments must deploy trained extension officers to rural areas, providing on-the-ground support to farmers and promoting farmer-to-farmer learning networks.

Create Incentives for Private Investment in Agroecology

The private sector can play a crucial role in scaling up agroecological practices, particularly by developing organic input markets and value chains. Governments should create financial incentives, such as tax credits or low-interest loans, to encourage private companies to invest in the production and distribution of organic inputs. Public-private partnerships (PPPs) can also be established to foster innovation and improve access to sustainable agricultural products. For example, the government could offer tax incentives to local agribusinesses that invest in the production of bio-fertilizers and compost. A public-private partnership could also be formed between the government, private sector, and farmer cooperatives to build a network of organic input supply chains, ensuring that smallholder farmers have affordable access to these sustainable products. This would stimulate local economic growth while promoting soil health.

Who is Responsible:
National governments, Trade, Finance, and Agricultural ministries, private sector actors, and farmer cooperatives.

Recommended Action:
Governments should introduce tax incentives, low-interest loans, and other financial mechanisms to encourage private companies to invest in the production and distribution of organic inputs. Public-private partnerships (PPPs) should be formed between governments, private companies, and farmer cooperatives to develop organic input supply chains and infrastructure.

Facilitate Market Access for Agroecological Products

To make agroecology economically viable for smallholder farmers, governments should develop certification systems and market infrastructure that enable farmers to sell their agroecologically produced goods at premium prices. Certification systems should be affordable and accessible to small-scale producers, and governments should promote agroecological products through public procurement programs, such as sourcing food for schools and hospitals from certified sustainable farms. For example, a national Participatory Guarantee System (PGS) could be established to certify

agroecological products at a lower cost than conventional certification schemes. This would involve farmer groups working together to ensure compliance with agroecological standards, thereby reducing the cost and complexity of certification. The government could also prioritize purchasing agroecological products for school feeding programs, creating a reliable market for sustainably grown produce and encouraging wider adoption of agroecological practices.

Who is Responsible: National governments, Trade and Agricultural ministries, and farmer organizations.

Recommended Action:
Governments should develop affordable certification systems, such as Participatory Guarantee Systems (PGS), to certify agroecological products. Agricultural and Trade ministries must work together to promote these certified products through public procurement programs. Farmer organizations should collaborate with government bodies to ensure that smallholder farmers can access local and regional markets for sustainably produced goods.

Promote Research and Innovation in Agroecology

Governments must invest in agroecological research to develop context-specific solutions for soil health improvement. This includes researching locally adapted agroecological practices, monitoring their long-term effects on soil health, and evaluating their economic viability. Research institutions should work closely with farmers to co-create solutions, ensuring that innovations are practical and scalable. For example, the relevant government department could establish a research fund dedicated to agroecology, supporting universities and research institutes to explore best practices for improving soil health in different ecological zones. Researchers could work directly with smallholder farmers to test and refine agroecological methods, such as integrated pest management or agroforestry, ensuring that findings are shared widely through extension services and farmer networks.

Who is Responsible:
National governments, research institutions, universities, and international development partners.

Recommended Action:
Governments, in collaboration with research institutions and universities, should fund agroecological research projects that develop locally adapted solutions for soil health improvement. Research findings should be shared widely with farmers and integrated into national agricultural strategies. International development partners can provide technical and financial support to ensure that research is practical and scalable.

Build Climate-Resilient Agroecological Systems

Governments should prioritize agroecology within their climate adaptation and mitigation strategies, aligning these efforts with international commitments such as the Paris Agreement. Investment in climate-smart agroecological practices, such as rainwater harvesting and mulching, will enhance the resilience of farming systems to climate change. For example, governments could implement a national program to promote agroecological practices that enhance climate resilience in semi-arid regions. This could include the construction of rainwater harvesting systems and the adoption of agroforestry to mitigate the effects of drought. Such practices would be integrated into the country's climate adaptation plan, providing farmers with the tools to maintain soil moisture and fertility in increasingly variable climates.

Who is Responsible:
National governments, Ministries of Environment and Agriculture, local authorities, and international climate organizations.

Recommended Action:
Governments must integrate agroecological practices into national climate adaptation and mitigation strategies. Ministries of Environment and Agriculture should collaborate to implement climate-smart agroecological practices such as water harvesting, agroforestry, and mulching. Local authorities would

manage the on-the-ground implementation of these practices in regions vulnerable to climate change. International climate organizations should provide funding and technical expertise.

Strengthen Policy Coherence and Regulatory Frameworks

The fragmented nature of soil management policies across various ministries limits the effectiveness of sustainable soil management practices. To address this, governments should develop integrated national policies that prioritize soil health within national development frameworks, such as National Agriculture Investment Plans (NAIPs). This integration should ensure cross-sector coordination between agriculture, water, environment, and climate sectors. Clear soil health standards should be established, along with incentive-based policies that promote sustainable practices. For instance, a government could implement financial incentives, such as tax credits for farmers adopting regenerative agricultural techniques such as agroforestry and composting. Such incentives would encourage wider adoption of sustainable practices, improving soil health while ensuring food security.

Who is Responsible:

National governments, ministries of agriculture, water, and environment, and local authorities.

Recommended Action:
Governments should develop and coordinate integrated national soil health policies, ensuring alignment across sectors such as agriculture, water, and environmental management. Ministries should collaborate to establish a National Soil Health Commission responsible for overseeing the alignment of soil health efforts and ensuring soil health is prioritized in land-use and resource management policies. Local authorities should ensure the implementation and monitoring of policies at the community level.

Build Institutional and Human Capacity for Soil Health Management

Weak institutional frameworks and limited technical knowledge are significant barriers to effective soil health management. Strengthening national research institutions and scaling up farmer-centric training programs are critical to overcoming these challenges. This could include integrating soil science into national curricula, ensuring future generations are knowledgeable about sustainable soil practices. An example would involve establishing regional soil research hubs that collaborate with universities and technical colleges to create continuous professional development programs for agricultural extension officers. These programs would empower officers to disseminate soil health knowledge to farmers, particularly smallholders, ensuring sustainable practices are widely adopted.

Who is Responsible:
National governments, regional bodies (e.g., African Union Development Agency - NEPAD), and educational institutions.

Recommended Action:
Governments should establish national soil management training institutes that provide regular professional development for agricultural extension officers and researchers. Educational institutions should integrate soil health topics into curricula and offer specialized degrees in soil science and sustainable agriculture. Regional bodies should promote cross-border cooperation in capacity building and ensure standardized training across countries to enhance human resource development in soil management.

Promote Sustainable Soil and Water Management

Soil degradation is often exacerbated by poor water management, requiring integrated approaches that combine soil conservation with water resource management. Implementing water retention technologies, such as rainwater harvesting and contour plowing, alongside soil conservation practices, is essential for improving soil moisture and fertility. A practical example would be a regional initiative in semi-arid areas that promotes community-level water harvesting systems. This could involve constructing small check dams or terraces to slow water runoff, thereby improving soil retention and enhancing agricultural productivity across the landscape.

Who is Responsible:
National governments, environmental ministries, water authorities, and local farmer cooperatives.

Recommended Action:
Governments and water authorities should implement policies promoting rainwater harvesting, soil moisture conservation, and integrated watershed management. Local farmer cooperatives should be engaged to implement on-the-ground sustainable practices such as terracing, constructing small dams, and using soil erosion control methods. Environment ministries should monitor compliance and provide technical support to farmers adopting these practices.

Improve Data and Information Systems for Soil Monitoring

Effective soil health interventions require reliable data. Governments should invest in national and regional soil information systems to track soil health and inform evidence-based policymaking. Implementation could involve developing a digital soil health platform that integrates remote sensing data and Geographic Information Systems (GIS) to map and monitor soil degradation. For instance, a country could use satellite imagery to monitor changes in soil quality over time, enabling policymakers to identify areas most at risk of degradation and prioritize interventions.

Who is Responsible:
Ministries of agriculture, national statistical offices, regional data centers, and technology partners (private sector).

Recommended Action:
Agricultural ministries and statistical offices should establish national soil information systems that collect and monitor soil health data. Technology partners should assist in developing digital tools and platforms that allow real-time monitoring of soil conditions through remote sensing and GIS. Regional data centers should harmonize data across borders and develop standard reporting frameworks to ensure consistency in data collection and usage.

Enhance Access to Financial Resources and Investments for Soil Health

Financial constraints limit many smallholder farmers from adopting sustainable soil management practices. Governments and development partners should create innovative financing mechanisms, such as soil health bonds or green bonds, to fund large-scale soil health programs. For example, a public-private partnership could be developed in which financial institutions offer low-interest loans to farmers who commit to sustainable practices, such as crop rotation and organic farming. In return, the government could guarantee a portion of the loans to reduce the risk to financial institutions.

Who is Responsible:
National governments, financial institutions, private sector stakeholders, and development partners (e.g., World Bank, African Development Bank).

Recommended Action:
Governments should develop public-private partnerships to create targeted financial products, such as low-interest loans and grants, to support sustainable soil health practices. Financial institutions should offer tailored credit schemes specifically designed for farmers investing in regenerative practices such as organic composting or purchasing cover crops. Development partners should provide technical and financial support to ensure the sustainability of these programs.

Foster Regional and Continental Partnerships for Knowledge Sharing

Addressing soil degradation requires collaborative action across borders, particularly in areas that share ecosystems and water resources. Establishing regional centers of excellence for soil health would facilitate cross-country knowledge sharing and capacity-building. For instance, implementation could see West African nations collaborate to create a knowledge hub focusing on the Sahel region's unique soil challenges. This hub would collect and disseminate best practices, such as agroecological farming techniques, and facilitate farmer-to-farmer learning exchanges across borders.

Who is Responsible:
African Union (AU), regional economic communities (e.g., ECOWAS, SADC), national governments, and research institutions.

Recommended Action:
The AU and regional economic communities should facilitate the establishment of regional centers of excellence to support soil research and foster collaboration on shared soil management challenges. National governments should engage in cross-border knowledge-sharing programs and support joint research initiatives focused on sustainable soil practices. Research institutions should partner across regions to drive innovation and share best practices with farmers and policymakers.

Promote Gender Equality and Youth Involvement in Soil Health Initiatives

Women and youth are key players in African agriculture, yet they often lack access to land, finance, and decision-making opportunities. Governments should design gender-sensitive policies that provide women with equitable access to agricultural resources, including land and credit. Implementation could involve creating youth-led agribusiness incubation centers that provide training and startup financing for young entrepreneurs interested in soil health technologies and sustainable farming. Such programs would empower youth and drive innovation in sustainable agriculture across the continent.

Who is Responsible:
National governments, ministries of gender and youth, financial institutions, and agricultural organizations.

Recommended Action:
Governments should implement gender-sensitive agricultural policies that guarantee women's access to land and provide equal opportunities for training and financing in soil health practices. Gender and Youth ministries should create youth-specific programs promoting careers in sustainable agriculture, with dedicated funding for young entrepreneurs developing soil health solutions. Financial institutions should design inclusive financial products, such as grants and low-interest loans, targeting women and youth-led agribusiness ventures.

Conclusion

The historical failures of the Green Revolution, IMF structural adjustment programs, and various agricultural reforms have left African agriculture in a fragile state, characterized by degraded soils, low productivity, and increased vulnerability to climate change. This position paper argues that agroecology offers a new vision for African agriculture—one that addresses these historical failures by promoting ecological balance, local knowledge, and farmer empowerment.

Soil health is at the core of sustainable agricultural productivity, food security, and climate resilience in Sub-Saharan Africa. As highlighted throughout this position paper, the region's current soil degradation crisis poses a significant threat to the livelihoods of millions of smallholder farmers and, by extension, to the continent's economic stability and environmental sustainability. The AU has made important strides through frameworks such as the SIA and the AFSH Action Plan, but much more needs to be done to prioritize agroecology as a scalable and sustainable solution.

Agroecology provides a holistic approach to reversing soil degradation by integrating traditional knowledge, modern science, and ecological principles. It is also aligned with climate adaptation strategies, offering farmers the tools they need to manage the growing risks posed by climate change. Practices such as crop diversification, minimal tillage, organic inputs, and agroforestry can restore soil health and build the resilience of farming systems to climate change, improve biodiversity, and reduce

reliance on costly chemical inputs. However, significant barriers remain, particularly in terms of policy support, financial investment, and market access.

To overcome these challenges, the paper advocates for a comprehensive policy shift that prioritizes agroecology in post-Malabo frameworks. Key recommendations include redirecting subsidies from chemical fertilizers to organic inputs, strengthening extension services to provide technical support for farmers, and creating certification systems that enable smallholder farmers to access premium markets for sustainably grown products. Governments must also invest in research and innovation to develop context-specific solutions, while fostering partnerships between the public and private sectors to scale up agroecological practices.

It is now clear that Africa's current dependence on global food markets and inputs is unsustainable. The COVID-19 pandemic and the Ukraine-Russia war highlighted the dangers of global dependencies and justifies the need for Africa to develop sovereign food systems that prioritize local production, sustainability, and resilience. Food sovereignty focuses on the right of people to define their own food systems, prioritizing local production for local consumption and reducing dependency on external markets and inputs. To achieve this, African countries must develop more robust, sovereign food systems that protect soil health, and empower smallholder farmers. Agroecology provides a proven, sustainable pathway toward achieving this goal and ensuring that Africa can meet its own food needs in the face of future global challenges.

While conventional agriculture may deliver higher yields in the short term, the long-term costs of soil degradation, environmental damage, and rural poverty make it an unsustainable model for Africa's future. Agroecology offers an encompassing, sustainable alternative that can restore soil health and build resilience, while addressing the socio-economic challenges facing smallholder farmers. Rather than viewing agroecology as a low-productivity alternative, it should be seen as a long-term investment in soil health, biodiversity, and climate resilience. With the right policy support, agroecology can be scaled to meet Africa's food needs while creating sustainable farming systems that benefit both people and the environment.

The transition to agroecology requires concerted policy action and a fundamental rethinking of how agricultural development is approached in Africa. It is essential that the lessons of the past be taken into account to ensure that future agricultural reforms are inclusive, sustainable, and beneficial to smallholder farmers—the backbone of African agriculture. The future of Africa's food systems depends on the health of its soils. Therefore, the time for action is now. African governments, regional bodies, and development partners must adopt and implement policies that promote sustainable soil management through agroecology. Only through addressing the root causes of soil degradation and unsustainable farming practices can Africa achieve food sovereignty, biodiversity conservation, and climate resilience.

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