

Repurposing Soil Health Management in West Africa

Practices, Projects, Programs, Policies, and
Pathways for Scale

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Soil is not merely
"dirt" but a living
ecosystem
essential for life
(King Charles III)

Soil is a strategic national asset; its vitality directly dictates the physical health of the people, the strength of the economy, and the long-term sovereign security of the state.

Healthy soil underpins:

- Food security
- Human health
- Farmer livelihoods
- Biodiversity conservation
- Climate change mitigation

THE CRISIS

A continent's topsoil is being liquidated

65%

of arable land in Sub-Saharan Africa is degraded

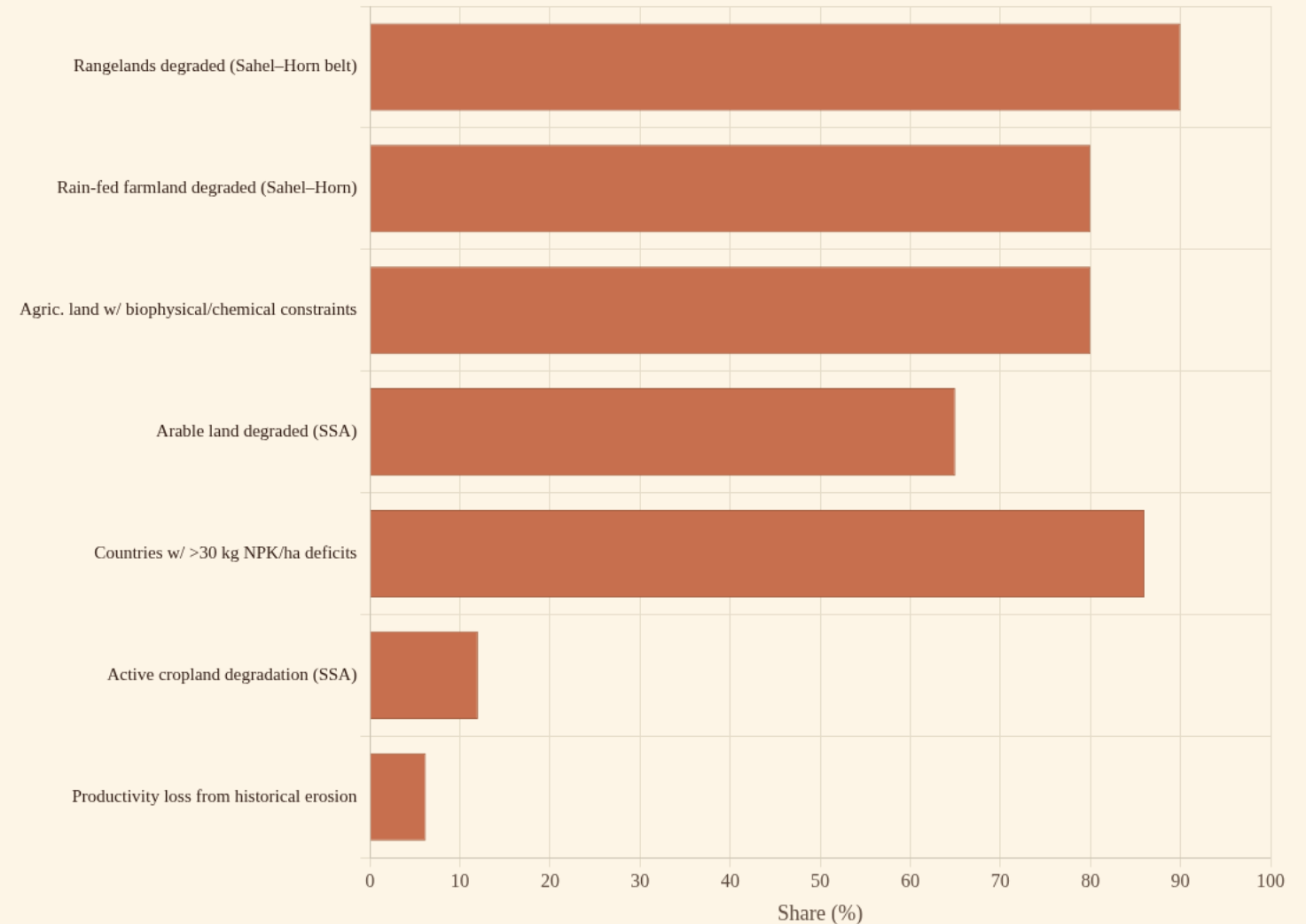
US\$4B+

lost in soil nutrients every year

41M+

people facing acute food insecurity in West Africa

Degradation by indicator



Sources: World Bank; FAO; UNEP ELD; IFPRI; CGIAR synthesis (2015–2026).

"Soil quality [health] is the capacity of a specific kind of soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation.“

Karlen et al. (1997)

Key Components of Karlen's Definition

From a functional perspective, Karlen broke it down into three main goals:

- **Sustainability of Productivity:** The soil must be able to support the growth of plants and animals over the long term without degrading the resource base. Thus, workers in Africa should aim to stop "nutrient mining."
- **Environmental Regulation:** A healthy soil doesn't just grow crops; it acts as a filter. It regulates how water moves through the landscape (preventing floods and erosion) and determines how much carbon or nitrogen (GHGs) is released into the atmosphere or leached into groundwater.
- **Health and Habitation:** the soil's ability to provide nutrient-dense food and a safe environment free from toxins.

Karlen, D. L., Mausbach, M. J., Doran, J. W., Cline, R. G., Harris, R. F., & Schuman, G. E. (1997). *Soil quality: A concept, definition, and framework for evaluation*. Soil Science Society of America Journal, 61(1), 4-10.

The Health of the Soil is the Health of the Nation

Notable Quotes

"The nation that destroys its soil destroys itself."

President Franklin D. Roosevelt (USA)

"The fertility and health of the soil is at the heart of everything." **King Charles III**

"The health of the soil, the landscape, and our own souls are deeply interconnected." **King Charles III**

"The missing link to Africa's food security is the health of the soil." **President Lazarus Chakwera (Malawi)**

"Building farmers' capacities for effective fertilizer use and soil health improvement is imperative." **President William Ruto (Kenya)**



“The major challenge facing food systems in Africa is how to exponentially increase productivity and sustainability while maintaining or enhancing the health of the soil resource base.” **Former Prime Minister Hailemariam Dessalegn, (Ethiopia)**



“ “To bridge the productivity gap with the rest of the world, Africa needs to take bold measures to manage our soils while ensuring that we do not destroy our environment.” **Dr. Monique Nsanzabaganwa, (Deputy Chairperson, African Union Commission)**

“Healthy soils are the foundation of sustainable agriculture, food security, and economic growth.” **Dr. Owusu Afriyie Akoto, Former Minister for Food and Agriculture, (Ghana)**

Many smallholder farmers in Nigeria are now farming on land that is no longer sufficiently fertile. Today, the key challenge is figuring out how to regenerate and improve soil health and nutrient content.” **Idris Rufus, AGRA Country Director, (Nigeria)**

We have to rehabilitate our soils and make them more productive... To achieve food security, nutrition security and environmental security, we have to pay attention to our soil health; it is the starting point for all other interventions.” **Hon. Frank Tumwebaze, Minister of Agriculture, (Uganda)**

“Healthy soils are the foundation of food security, farmer livelihoods, environmental sustainability, and national economic development. Without healthy soils, sustainable agricultural transformation cannot be achieved.”

Source: African Union – Africa Fertilizer and Soil Health Summit 2024

Does Soil Health Matter?

Although concerns about soil degradation date back to the 1930s, soil health began gaining significant scientific attention in the 1990s through the work of researchers such as Douglas Karlen

Soil health major global recognition in 2015 when the United Nations declared the International Year of Soils, highlighting the role of healthy soils in food security, environmental sustainability, and climate resilience.

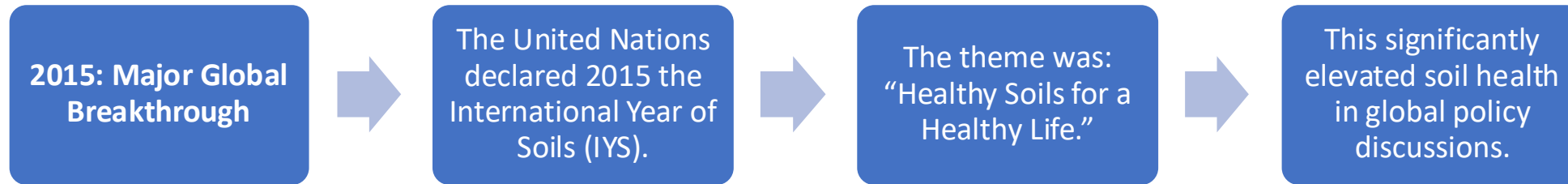
Soil Health has implications for SDGs: E.g. No Poverty (SDG 1), Zero Hunger (SDG 2), and Climate Action (SDG 13).





Timeline of Global Attention to Soil Health

- **Early 1900s: Foundations:** Scientists began recognizing that soil is a living system rather than merely a medium for plant growth.
- **1930s: Soil Conservation Movement:** The Dust Bowl in the United States (1930–1936) demonstrated the devastating consequences of poor soil management.
- **1970s–1980s: Sustainable Agriculture Emerges:** Growing concerns about land degradation, erosion, and excessive use of agrochemicals led researchers to emphasize soil quality and sustainability.
- **1990s: Development of the Soil Health Concept:** Douglas L. Karlen and colleagues formally defined soil quality/health as: “The capacity of a specific kind of soil to function within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation.” — Karlen et al. (1997)
- **2000s: International Recognition:** Organizations such as FAO, USDA, and the United Nations increasingly promoted soil health as essential for food security, biodiversity, and environmental sustainability.



2015–Present: Soil Health and Climate Change

2024: Africa's Soil Health Initiative: African leaders adopted the Africa Fertilizer and Soil Health Action Plan (2024–2034), placing soil health at the center of agricultural transformation and food security efforts across the continent.

**African Union 2024
Summit Theme:
“Listen to the Land.”**

- This theme reflects the recognition that restoring soil health is fundamental to food security, climate resilience, and economic development across Africa.

Key Functions of Healthy Soil

Healthy soil provides five essential ecosystem services:

Water Regulation: Controlling the infiltration and flow of rainwater

Life Sustenance: Providing a habitat for a diverse range of microorganisms and supporting plant and animal productivity.

Pollutant Filtration: Acting as a filter to protect water and air quality.

Nutrient Cycling: Managing the storage and release of nitrogen, phosphorus, and other vital nutrients.

Physical Stability: Supporting structures and providing a stable medium for plant roots.

Is There an African Definition of Soil Health?

There is no single "official" dictionary definition exclusive to the continent; the **African Union (AU)**, through its recent strategic frameworks and the **African Fertilizer and Soil Health (AFSH) Action Plan (2024–2034)** has contextualized soil health specifically for the African landscape.

In the African context, soil health is defined not just as a biological property, but as a **foundation for socio-economic resilience**.

The Contextual African Definition

Broadly, soil health in Africa is defined as: "The capacity of soil to function as a vital living ecosystem to support sustainable agricultural productivity, environmental services, and climate resilience, ensuring food and nutrition security for present and future generations."

Key Pillars of the African Definition

The definition used by African policymakers and scientists (such as those at IITA, AGRA, and the AU) emphasizes three specific dimensions that differentiate it from Western definitions:

1. Productivity-Relinked Resilience

In Sub-Saharan Africa, soil health is inseparable from **food security**. A soil is considered "healthy" only if it has the nutrient status and structure to support crop yields that can pull smallholder farmers out of poverty. It focuses heavily on reversing "nutrient mining" (the removal of nutrients without replenishment).

2. The "Living Ecosystem" (Biological Integrity)

Traditional African soil management often focused only on NP-K (nitrogen, phosphorus, potassium) fertilizers. The modern African definition now emphasizes **Soil Organic Matter (SOM)**. Healthy soil must be biologically active to unlock the potential of both organic amendments (compost, biochar) and mineral fertilizers.

3. Climate Adaptation and Mitigation

Given that Africa is highly vulnerable to climate change, the definition includes the soil's ability to **sequester carbon** and **regulate water**. Healthy soil must act as a sponge to withstand the frequent droughts and flash floods characteristic of the region.



Differences between the African and the Global (USDA/FAO) Definition

- While the FAO defines soil health as the "continued capacity of soil to function," the African version is more **action-oriented**. It specifically highlights **restoration** and **rehabilitation**, acknowledging that much of the continent's soil is already degraded (65% of arable land) and requires active intervention rather than just "maintenance."

Soil Health Policies in Sub-Saharan Africa : African Union (AU) and Continental Frameworks

Abuja Declaration on Fertilizer for the African Green Revolution (2006)

The African Union committed to improving soil fertility by increasing fertilizer use and promoting Integrated Soil Fertility Management (ISFM) to reverse soil degradation and boost agricultural productivity.

Comprehensive Africa Agriculture Development Programme (CAADP)

CAADP, under the African Union's Agenda 2063, promotes sustainable land management, soil fertility improvement, climate-smart agriculture, and increased agricultural productivity across African countries.

National Soil Health and Sustainable Land Management Policies

Many
SSA
countries
integrate
soil
health
into:

National Agricultural
Investment Plans (NAIPs).

Climate-Smart Agriculture
(CSA) strategies.

Sustainable Land Management
(SLM) programs.

National Adaptation Plans
(NAPs) for climate change.

Official Framework References

- **Africa Fertilizer and Soil Health Action Plan (2024–2034):** This document defines soil health improvement as the "integrated management of soil's physical, chemical, and biological properties to restore productivity and ecosystem functions."
- **The Nairobi Declaration (May 2024):** African Heads of State reaffirmed that soil health is a "strategic national asset" and defined its restoration as a prerequisite for the continent's "Green Revolution."

Ghana and Nigeria's specific National Policies

Ghana

National Climate-Smart Agriculture and Food Security Action Plan. Supports composting, biochar use, conservation agriculture, and sustainable nutrient management.

Nigeria

National Agricultural Technology and Innovation Policy (NATIP). Prioritizes soil fertility management, sustainable fertilizer use, and climate-resilient agriculture.

Key Policy Approaches Promoted Across SSA

Most soil health initiatives emphasize:

- Integrated Soil Fertility Management (ISFM).
- Conservation agriculture.
- Organic resource management (compost, manure, biochar).
- Agroforestry systems.
- Soil and water conservation.
- Precision agriculture technologies.
- Soil testing and nutrient management planning.
- Climate-smart agricultural practices.
- Restoration of degraded lands.

Africa Fertilizer and Soil Health Action Plan (AFSH- AP) 2024–2034

Adopted by African leaders in 2024,
this strategy aims to:

- Restore degraded soils.
- Improve soil fertility and nutrient management.
- Promote balanced use of organic and inorganic fertilizers.
- Enhance soil testing and digital soil mapping.
- Strengthen national soil health policies and institutions.
- Improve farmer access to soil health technologies and advisory services

Challenges to Implementation of Soil Health Actions

Limited access to soil testing services.

Low adoption of soil health technologies.

Inadequate extension services.

High cost of agricultural inputs.

Weak policy enforcement.

Insufficient investment in soil health research and monitoring.

Potential Solutions and Interventions

Several sustainable soil management practices can restore soil health and improve food security:

Integrated Soil Fertility Management (ISFM), combining organic amendments and mineral fertilizers.

Application of compost, manure, and biochar to increase soil organic matter and nutrient availability.

Conservation agriculture practices such as minimum tillage, crop rotation, and cover cropping.

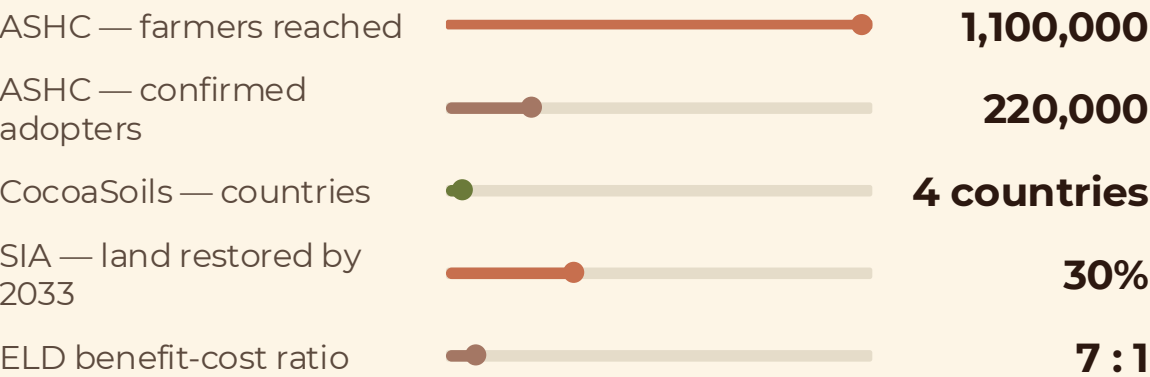
Agroforestry systems that improve soil fertility and reduce erosion.

Precision agriculture technologies for efficient nutrient and water management.

Soil testing and site-specific fertilizer recommendations.

Strengthened agricultural extension services and farmer training programs.

Program reach & targets



- GGW** Great Green Wall
Sahel-wide restoration spine, Senegal → Djibouti.
- ECW** ECOWAS Fertilizer & Soil-Health Roadmap
Regional fertilizer supply, local production, subsidy repurposing.
- SIA** Soil Initiative for Africa
Restore 30% of degraded land by 2033.
- FSRP** World Bank Food Systems Resilience Program
Inputs + capacity at scale across West Africa.
- AGRA** AGRA & IFAD
Bundled seed, fertilizer, credit, aggregation finance.

Roles of Key Stakeholders in Improving Soil Health in Africa

Improving soil health in Africa requires coordinated efforts from multiple stakeholders, each contributing unique resources, expertise, and influence.

Policymakers

Policymakers develop frameworks and regulations that promote sustainable soil management and agricultural productivity. Their roles include:

- Formulating soil health and land management policies.
- Promoting incentives for sustainable farming practices.
- Supporting fertilizer and organic amendment regulations.
- Integrating soil health into national agricultural and climate strategies.
- Allocating resources for soil conservation programs and monitoring systems.

Governments

Governments play a central role in implementing policies and creating an enabling environment for soil health improvement by:

- Investing in agricultural research and extension services.
- Establishing soil testing laboratories and monitoring systems.
- Funding land restoration and conservation projects.
- Supporting farmer access to inputs, credit, and markets.
- Enforcing environmental and land-use regulations.

Farmers

Farmers are the primary custodians of soil resources and are essential for implementing soil health practices. Their roles include:

- Adopting sustainable land management practices.
- Using organic amendments such as compost, manure, and biochar.
- Practicing crop rotation, cover cropping, and agroforestry.
- Minimizing soil erosion through conservation agriculture.
- Participating in training programs and sharing local knowledge.

Private Sector Organizations

Private companies contribute through innovation, investment, and service delivery. Their roles include:

- Producing and distributing quality fertilizers, biofertilizers, compost, and soil amendments.
- Developing precision agriculture technologies and digital soil mapping tools.
- Investing in sustainable agricultural value chains.
- Providing financial services and agricultural insurance.
- Supporting public-private partnerships for soil restoration initiatives.

Research Institutions

Research organizations generate scientific knowledge and technologies that support sustainable soil management. Their roles include:

- Conducting soil fertility and soil health research.
- Developing innovative soil management technologies and practices.
- Evaluating the effectiveness of interventions such as biochar, compost, and conservation agriculture.
- Providing evidence-based recommendations for policymakers and farmers.
- Monitoring soil degradation and restoration outcomes.

Examples include the International Institute of Tropical Agriculture (IITA), CGIAR centers, and national agricultural research institutes.

Educational Institutions

Universities and colleges contribute by:

- Training future agricultural professionals, researchers, and extension officers.
- Conducting applied research on soil health and sustainable agriculture.
- Raising awareness about soil conservation and climate-smart agriculture.
- Providing technical expertise and capacity-building programs for stakeholders.

Professional and National Societies

- Organizations such as soil science societies and agricultural associations play important roles by:
- Promoting professional standards and best practices.
- Facilitating knowledge sharing among scientists, practitioners, and policymakers.
- Organizing conferences, workshops, and training programs.
- Advocating for increased investment in soil health initiatives.
- Supporting public awareness campaigns on soil conservation.



Soil Health Education and Research for Socioeconomic Development in African Countries

- Soil health education and research play a critical role in the socioeconomic development of African countries because agriculture remains the backbone of many African economies.
- Approximately 60–70% of the population in Sub-Saharan Africa depends on agriculture for employment and livelihoods, making healthy soils essential for food security, income generation, and sustainable economic growth.



Contribution of Soil Health Education

- Soil health education equips farmers, extension officers, researchers, and policymakers with knowledge and skills to manage soils sustainably. Through training and capacity building,
- Educated farmers are more likely to adopt sustainable soil management practices, leading to increased crop productivity, reduced production costs, and improved household incomes. Furthermore, soil health education strengthens extension services, enabling effective dissemination of technologies and innovations to farming communities.

Contribution of Soil Health Research

Research generates scientific evidence and innovative solutions to address soil degradation, nutrient depletion, climate change, and declining agricultural productivity. Soil health research contributes to:

- Development of improved soil fertility management technologies.
- Evaluation of organic amendments such as compost, manure, and biochar.
- Identification of location-specific nutrient deficiencies.
- Development of climate-smart agricultural practices.
- Soil mapping and digital agriculture tools for decision-making.

Research institutions such as the International Institute of Tropical Agriculture (IITA), CGIAR centers, national agricultural research organizations, and African universities play key roles in generating knowledge that supports sustainable agricultural development.

What Africa Is Not Doing Well Regarding Soil Health

Despite growing awareness of the importance of soil health, Africa continues to face significant challenges in managing and restoring its soils effectively.

These shortcomings contribute to declining agricultural productivity, food insecurity, and environmental degradation

Constraints repeatedly identified across Ghana, Nigeria, Mali & the Sahel.

Insecure land tenure	Suppresses long-term soil investment in Ghana & Nigeria	Tenure reform; long-term lease registration
Input access & price	Only 28.1% of Ghanaian fertilizer users reach $VCR \geq 2$	Local production; targeted subsidies; cooperative procurement
Credit & finance gaps	Credit favors chemical over organic inputs	Bundled credit-insurance; warehouse receipts
Extension deficits	ASHC reached 1.1M but only 220k confirmed adopters	Digital extension (AKILIMO, SMS); demo plots
Climate variability & erosion	>80% seasonal rainfall in N. Sahel; >50 t/ha soil loss in places	Conservation agriculture; agroforestry; water harvesting
Gender inequality	Microdosing adoption skewed to men; women face land & credit gaps	Gender-sensitive extension; women’s land rights enforcement



Shortcomings

- Inadequate Investment in Soil Health Research and Development
- Weak Extension Services and Farmer Training
- Continued Nutrient Mining
- Poor Soil Conservation Practices
- Limited Adoption of Organic Amendments
- Insufficient soil testing and site-specific nutrient management
- Slow adoption of digital and precision agriculture technologies and tools
- Weak policy implementation
- Limited Private sector engagement.

What Africa Needs to Do Better

To improve soil health,
African countries should:

Increase investment in soil
health research and
innovation.

Strengthen agricultural
extension and farmer
education.

Promote integrated soil
fertility management.

Expand soil testing
services and digital
agriculture technologies.

Encourage greater use of
compost, manure, and
biochar.

Strengthen soil health
policies and their
implementation.

Foster stronger
partnerships among
governments, researchers,
universities, farmers, and
the private sector.

Scale up land restoration
and climate-smart
agriculture programs.

Not just restoring soils —
repurposing the institutions,
incentives, and knowledge
systems around them.

FROM
Input-centric subsidies



TO
Integrated Soil Fertility
Management (ISFM)

FROM
Productivity-only metrics

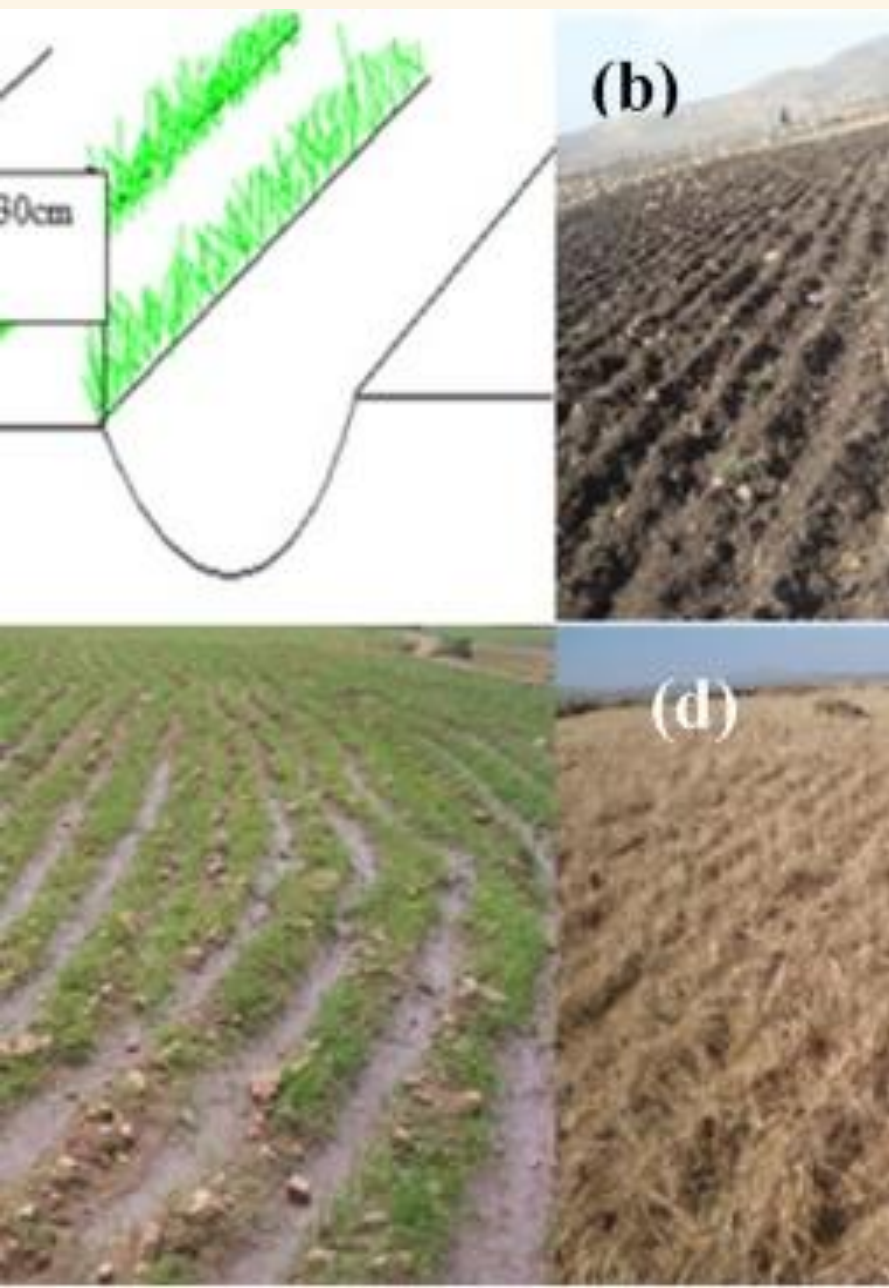


TO
Climate adaptation +
resilience

FROM
Top-down extension



TO
Farmer-centered, digital, 4R
advisory



Three principles, one defense against erosion

01

Minimum tillage

Protects soil structure and organic matter; cuts erosion on slopes losing >50 t/ha/yr.

02

Permanent soil cover

Residues and cover crops shield against 50–100 mm/day rainfall events now common in the Sahel.

03

Crop rotation

Legume rotations restore N and boost succeeding cereal yields by up to 1 t/ha.

MALI • SENEGAL • GUINEA SAVANNA

Africa RISING (2011–2022) embedded CA + ISFM across Sikasso & Northern Ghana — combining conservation tillage, agroforestry, and water harvesting.

SOME SOIL HEALTH PRACTICES

PRACTICE 01

ISFM — Ghana & Nigeria

+27%

maize yield uplift, Northern Ghana
(Tamale)

>100%

maize yield gain, biochar + compost
+ fertilizer, Tolon District

+0.38–1.01 t/ha

succeeding maize from legume
rotation (cowpea/soy/groundnut)

Combined organic + inorganic
delivers the highest net income and
marginal rate of return.



PRACTICE 02

Agroforestry & FMNR — Sahel

+20–75%

increase in soil total carbon under
trees on fields

-25% to +120%

millet & sorghum yield range under
tree cover

**Niger · Burkina Faso ·
Mali**

core FMNR geographies

Anchors the Great Green Wall —
Senegal to Djibouti restoration spine.

01

Policy integration

Align subsidies, climate plans & land-use policy behind ISFM and CA.

02

Farmer cooperatives

Cut transaction costs for inputs, credit, and output marketing.

03

Digital advisory

E.g., soil nutrient maps for site-specific advice.

04

Bundled finance

Credit + weather/crop insurance designed for organic-inorganic strategies.

05

Local fertilizer manufacturing

Balanced blends, regional production — ECOWAS Roadmap priority.

“Every US\$1 of land-degradation action returns roughly US\$7 in benefits.”

Don't just restore the soil

Repurpose

the system around it.

Subsidies, finance, extension, and tenure must move together — at SIA's 30%-by-2033 horizon.

BY 2033

- | | |
|-----------|---|
| 01 | Redirect fertilizer subsidies into ISFM
Balanced blends, biochar, compost, legume seed. |
| 02 | Scale FMNR + agroforestry parklands
+20–75% soil carbon; integrate with Great Green Wall finance. |
| 03 | Secure land tenure & close gender gaps
Registration, long leases, women's land & credit rights. |
| 04 | Mobilize blended finance for SIA
Leverage 7:1 ELD benefit-cost ratio for climate & food finance. |

Webinar Q&A to follow — share your country's repurposing priority.

Key sources

1. World Bank (2023). Soil erosion and land management in Mali.
2. FAO (2022). Status of soils and sustainable soil management in Sub-Saharan Africa.
3. IFPRI / Africa RISING (2011–2022). Sustainable intensification in the Guinea Savanna.
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5. CGIAR / CGSpace repository — ISFM, agroforestry, conservation agriculture studies (2015–2026).
6. APNI (2024). 4R Nutrient Stewardship in Ghana.

Programs & tools

1. **Great Green Wall** — greatgreenwall.org
2. **ECOWAS Fertilizer & Soil-Health Roadmap** — ecowas.int
3. **Soil Initiative for Africa (SIA)** — [au-ibar resources](#)
4. **World Bank Food Systems Resilience Program (FSRP)** — worldbank.org

Africa Soil Health Consortium (ASHC) legacy materials — [CABI](#)

Conclusion

Africa's greatest challenge is not a lack of awareness about the need to improve soil health, but rather the slow adoption, inadequate investment, and weak implementation of proven soil health restoration, management and improvement solutions.

Addressing these gaps is critical for achieving food security, poverty reduction, climate resilience, and sustainable agricultural development across the continent.

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1. African Union Commission. (2024). Africa Fertilizer and Soil Health Action Plan (AFSH-AP) 2024–2034.
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THANK YOU FOR
YOUR ATTENTION

