### **Comprehensive Overview of Crop Diversity and Food Security**

This synthesis explores key themes regarding crop diversity, food security, and the role of community-based initiatives across various regions, with a focus on enhancing resilience through diverse cropping systems.

#### **1. Crop Diversity and Food Security**

The relationship between crop diversity and food security is paramount, with diverse cropping systems enhancing resilience to climate change and market fluctuations.

* Diversity Benefits: Increased crop diversity leads to improved nutrition and food security, particularly in vulnerable populations. Studies in regions like India and Southeast Asia emphasize the importance of traditional crop varieties. [[12861](https://reporting.cgiar.org/reports/result-details/12861?phase=4)]
* Community Seed Banks: Initiatives to establish community seed banks are crucial for preserving local varieties and ensuring access to seeds, which enhances food sovereignty. [[13587](https://reporting.cgiar.org/reports/result-details/13587?phase=4)]

#### **2. Agroecological Approaches and Sustainability**

Agroecological methods are highlighted as effective strategies for enhancing crop diversity and promoting sustainable agriculture.

* Participatory Breeding: Engaging local communities in breeding programs helps develop crop varieties that are better suited to local conditions, fostering resilience and sustainability. [[14520](https://reporting.cgiar.org/reports/result-details/14520?phase=4)]
* Intercropping Systems: The adoption of intercropping systems has shown to enhance soil health and agricultural productivity, as seen in various projects across Africa and Asia. [[15788](https://reporting.cgiar.org/reports/result-details/15788?phase=4)]

#### **3. Community Engagement and Knowledge Sharing**

Community involvement and knowledge transfer are essential for the success of initiatives aimed at improving crop diversity and food security.

* Farmer Field Schools: These platforms enable farmers to share experiences and learn from one another, enhancing their understanding of sustainable practices. [[18314](https://reporting.cgiar.org/reports/result-details/18314?phase=4)]
* Local Knowledge Integration: Incorporating local knowledge into agricultural practices is pivotal for developing context-specific solutions that enhance food security. [[16230](https://reporting.cgiar.org/reports/result-details/16230?phase=4)]

#### **4. Challenges in Crop Production and Food Security**

Various challenges persist in the realm of crop production and food security, necessitating focused efforts to overcome them.

* Climate Change Impacts: The adverse effects of climate change on crop yields and food security are increasingly recognized, highlighting the need for adaptive strategies. [[14515](https://reporting.cgiar.org/reports/result-details/14515?phase=4)]
* Market Access Issues: Limited access to markets remains a significant barrier for smallholder farmers, impacting their livelihoods and food security. Initiatives are advocating for improved market linkages. [[12862](https://reporting.cgiar.org/reports/result-details/12862?phase=4)]

### **Final Comprehensive Synthesis**

The comprehensive overview of soil health and sustainable agriculture initiatives, alongside the exploration of crop diversity and food security, reveals interconnected themes critical for enhancing agricultural resilience and productivity, particularly in vulnerable regions like Africa and parts of Asia.

#### **Key Themes and Findings**

1. Soil Health and Agricultural Productivity: A strong emphasis on soil health as a cornerstone of sustainable agriculture emerges across both overviews. Research initiatives focus on developing effective soil health frameworks and regenerative practices that not only improve productivity but also contribute to environmental sustainability. Key projects highlight the use of digital platforms and remote sensing for monitoring soil conditions, which is crucial for tailored interventions.
2. Community Engagement and Knowledge Sharing: Both parts emphasize the importance of community involvement in agricultural initiatives. Whether through participatory approaches in agroecological projects or farmer field schools, engaging local farmers fosters knowledge transfer and enhances the effectiveness of sustainable practices.
3. Agroecological and Integrated Practices: The integration of agroecological practices, including intercropping and conservation agriculture, is highlighted as a means to improve soil health and crop diversity. These practices serve to enhance resilience against climate change and market variability

### **Cluster Summaries:**

Topic 13 - Soil Health for Sustainable Agriculture

The text discusses the critical importance of soil health for sustainable agriculture and environmental well-being, particularly in the context of climate change. [[16895](https://reporting.cgiar.org/reports/result-details/16895?phase=4), [10247](https://reporting.cgiar.org/reports/result-details/10247?phase=3), [7412](https://reporting.cgiar.org/reports/result-details/7412?phase=3)] It highlights the need for consensus on defining soil health and the urgency in consolidating essential properties into the soil health framework to promote sustainability. [[16895](https://reporting.cgiar.org/reports/result-details/16895?phase=4), [10247](https://reporting.cgiar.org/reports/result-details/10247?phase=3)] Postdoctoral research is focused on developing soil health indicators and assessing agronomic gains, while a Community of Practice on Soil Health emphasizes the role of healthy soils in supporting productivity and environmental sustainability, especially for smallholder farmers. [[16869](https://reporting.cgiar.org/reports/result-details/16869?phase=4), [10247](https://reporting.cgiar.org/reports/result-details/10247?phase=3), [7412](https://reporting.cgiar.org/reports/result-details/7412?phase=3)]

The rise of regenerative agriculture underscores the importance of enhancing soil health to yield multiple benefits for society and farmers. [[7414](https://reporting.cgiar.org/reports/result-details/7414?phase=3), [7627](https://reporting.cgiar.org/reports/result-details/7627?phase=3)] Despite its growing popularity, challenges remain regarding the measurement and interpretation of soil health indicators, particularly in developing countries. [[7627](https://reporting.cgiar.org/reports/result-details/7627?phase=3), [7412](https://reporting.cgiar.org/reports/result-details/7412?phase=3)] A literature review and case studies reveal gaps in empirical studies linking soil health to agronomic and environmental outcomes, as well as insufficient attention to how indicators can support farmer decision-making. [[16869](https://reporting.cgiar.org/reports/result-details/16869?phase=4), [7627](https://reporting.cgiar.org/reports/result-details/7627?phase=3), [7412](https://reporting.cgiar.org/reports/result-details/7412?phase=3)]

Efforts are underway to develop biological soil health indicators and assessment methods, with a focus on their potential to respond to management interventions. [[16869](https://reporting.cgiar.org/reports/result-details/16869?phase=4), [5817](https://reporting.cgiar.org/reports/result-details/5817?phase=3), [7412](https://reporting.cgiar.org/reports/result-details/7412?phase=3)] The text also addresses the need for interdisciplinary research and robust experimental studies to inform effective practices and business models for enhancing soil health. [[10247](https://reporting.cgiar.org/reports/result-details/10247?phase=3), [7412](https://reporting.cgiar.org/reports/result-details/7412?phase=3)]

Finally, the Ground Zero project aims to create a framework for measurable indicators of carbon footprint, soil health, and biodiversity in cocoa and coffee production systems, ultimately contributing to the goals of reducing emissions, enhancing soil health, and safeguarding biodiversity while improving the livelihoods of smallholder producers. [[7410](https://reporting.cgiar.org/reports/result-details/7410?phase=3), [7627](https://reporting.cgiar.org/reports/result-details/7627?phase=3), [7412](https://reporting.cgiar.org/reports/result-details/7412?phase=3)]

Topic 1 - Sustainable Soil Health Innovations

The provided text outlines various research initiatives and findings related to soil health, conservation agriculture, and land management practices in regions like Morocco and Ethiopia, emphasizing their implications for sustainable agriculture amid climate change challenges. [[7195](https://reporting.cgiar.org/reports/result-details/7195?phase=4), [7194](https://reporting.cgiar.org/reports/result-details/7194?phase=4), [16958](https://reporting.cgiar.org/reports/result-details/16958?phase=4), [2371](https://reporting.cgiar.org/reports/result-details/2371?phase=1), [19276](https://reporting.cgiar.org/reports/result-details/19276?phase=4), [1542](https://reporting.cgiar.org/reports/result-details/1542?phase=1), [3165](https://reporting.cgiar.org/reports/result-details/3165?phase=1)]

Key highlights include:

1. [[7195](https://reporting.cgiar.org/reports/result-details/7195?phase=4), [7194](https://reporting.cgiar.org/reports/result-details/7194?phase=4), [12926](https://reporting.cgiar.org/reports/result-details/12926?phase=4), [2371](https://reporting.cgiar.org/reports/result-details/2371?phase=1), [11402](https://reporting.cgiar.org/reports/result-details/11402?phase=3), [8555](https://reporting.cgiar.org/reports/result-details/8555?phase=3), [19276](https://reporting.cgiar.org/reports/result-details/19276?phase=4), [2367](https://reporting.cgiar.org/reports/result-details/2367?phase=1), [3165](https://reporting.cgiar.org/reports/result-details/3165?phase=1), [6587](https://reporting.cgiar.org/reports/result-details/6587?phase=4), [1542](https://reporting.cgiar.org/reports/result-details/1542?phase=1), [3666](https://reporting.cgiar.org/reports/result-details/3666?phase=1), [18740](https://reporting.cgiar.org/reports/result-details/18740?phase=4)] PhD Research: Ongoing research projects focus on the impacts of no-till and conservation agriculture on soil nitrogen and carbon dynamics in Morocco. [[7195](https://reporting.cgiar.org/reports/result-details/7195?phase=4), [7194](https://reporting.cgiar.org/reports/result-details/7194?phase=4), [12926](https://reporting.cgiar.org/reports/result-details/12926?phase=4), [2371](https://reporting.cgiar.org/reports/result-details/2371?phase=1), [11402](https://reporting.cgiar.org/reports/result-details/11402?phase=3), [19276](https://reporting.cgiar.org/reports/result-details/19276?phase=4), [2367](https://reporting.cgiar.org/reports/result-details/2367?phase=1), [3165](https://reporting.cgiar.org/reports/result-details/3165?phase=1)] Two PhD students are preparing theses and papers on these topics. [[7195](https://reporting.cgiar.org/reports/result-details/7195?phase=4), [7194](https://reporting.cgiar.org/reports/result-details/7194?phase=4)]
2. Soil Quality Dynamics: Studies in Northwestern Ethiopia reveal that soil and water conservation practices (SWCP) improve soil quality indicators significantly, enhancing organic matter, nitrogen, and reducing bulk density. [[16958](https://reporting.cgiar.org/reports/result-details/16958?phase=4), [1542](https://reporting.cgiar.org/reports/result-details/1542?phase=1)]
3. Sustainable Soil Management: The report discusses sustainable soil management practices (SSMP) in Morocco that contribute to climate change mitigation, emphasizing the importance of innovative farming practices. [[2371](https://reporting.cgiar.org/reports/result-details/2371?phase=1), [19276](https://reporting.cgiar.org/reports/result-details/19276?phase=4), [18506](https://reporting.cgiar.org/reports/result-details/18506?phase=4)]
4. [[7195](https://reporting.cgiar.org/reports/result-details/7195?phase=4), [7194](https://reporting.cgiar.org/reports/result-details/7194?phase=4), [12926](https://reporting.cgiar.org/reports/result-details/12926?phase=4), [2371](https://reporting.cgiar.org/reports/result-details/2371?phase=1), [11402](https://reporting.cgiar.org/reports/result-details/11402?phase=3), [19276](https://reporting.cgiar.org/reports/result-details/19276?phase=4), [2367](https://reporting.cgiar.org/reports/result-details/2367?phase=1), [3165](https://reporting.cgiar.org/reports/result-details/3165?phase=1), [6587](https://reporting.cgiar.org/reports/result-details/6587?phase=4)] Efficacy of Tillage Systems: Research shows that conservation agriculture, particularly no-till systems, improves soil physical properties and reduces erosion compared to conventional tillage, leading to better crop yields and nitrogen use efficiency.
5. Workshops and Training: Various workshops have been conducted to raise awareness about soil fertility and sustainable practices among stakeholders, including farmers, researchers, and policymakers.
6. Impact of Conservation Agriculture (CA): Long-term studies indicate that CA enhances soil health, crop resilience, and productivity, particularly in rainfed Mediterranean climates, leading to significant improvements in yields and soil carbon stocks.
7. Soil Organic Carbon (SOC) Studies: Several studies examine the spatial distribution and factors affecting SOC across different land uses, emphasizing the role of management practices in enhancing soil carbon sequestration. [[12926](https://reporting.cgiar.org/reports/result-details/12926?phase=4), [2371](https://reporting.cgiar.org/reports/result-details/2371?phase=1), [2370](https://reporting.cgiar.org/reports/result-details/2370?phase=1), [9316](https://reporting.cgiar.org/reports/result-details/9316?phase=3)]
8. Training Programs: Initiatives like field days and training sessions for farmers aim to promote the adoption of no-till and conservation agriculture practices, highlighting their benefits for soil health and productivity. [[3666](https://reporting.cgiar.org/reports/result-details/3666?phase=1), [3638](https://reporting.cgiar.org/reports/result-details/3638?phase=1), [18740](https://reporting.cgiar.org/reports/result-details/18740?phase=4)]
9. Future Directions: The text suggests the need for continued assessment of integrated land management practices to further enhance soil quality, crop productivity, and ecosystem services, particularly in light of ongoing climate challenges. [[19276](https://reporting.cgiar.org/reports/result-details/19276?phase=4), [2371](https://reporting.cgiar.org/reports/result-details/2371?phase=1), [3165](https://reporting.cgiar.org/reports/result-details/3165?phase=1), [1542](https://reporting.cgiar.org/reports/result-details/1542?phase=1)]

In summary, the text underscores the critical role of innovative agricultural practices and research in improving soil health and resilience in the face of climate change, particularly through conservation agriculture and sustainable land management strategies. [[15539](https://reporting.cgiar.org/reports/result-details/15539?phase=4), [19276](https://reporting.cgiar.org/reports/result-details/19276?phase=4), [1542](https://reporting.cgiar.org/reports/result-details/1542?phase=1), [3165](https://reporting.cgiar.org/reports/result-details/3165?phase=1)]

Topic 6 - Soil Health Restoration in Kenya

The text examines various efforts and challenges related to soil health and restoration in tropical regions, particularly focusing on Kenya. [[18505](https://reporting.cgiar.org/reports/result-details/18505?phase=4), [20093](https://reporting.cgiar.org/reports/result-details/20093?phase=4), [16199](https://reporting.cgiar.org/reports/result-details/16199?phase=4)] Key points include:

1. [[16198](https://reporting.cgiar.org/reports/result-details/16198?phase=4), [16199](https://reporting.cgiar.org/reports/result-details/16199?phase=4), [16200](https://reporting.cgiar.org/reports/result-details/16200?phase=4)] Degraded Tropical Soils: There is a significant knowledge gap regarding soil degradation indicators in tropical pastures, especially in western Kenya, where soil characteristics differ vastly from those in Europe. [[16198](https://reporting.cgiar.org/reports/result-details/16198?phase=4), [16199](https://reporting.cgiar.org/reports/result-details/16199?phase=4)] Traditional lab methods for analyzing soil health are often impractical for local communities.
2. [[16198](https://reporting.cgiar.org/reports/result-details/16198?phase=4), [16199](https://reporting.cgiar.org/reports/result-details/16199?phase=4), [16200](https://reporting.cgiar.org/reports/result-details/16200?phase=4)] Soil Health Trials: Long-term trials in Kenya aim to develop strategies for restoring soil health by understanding the unique properties of local soils. [[18505](https://reporting.cgiar.org/reports/result-details/18505?phase=4), [20093](https://reporting.cgiar.org/reports/result-details/20093?phase=4)] Insights from these trials emphasize the importance of soil for the agricultural ecosystem and the need for tailored restoration approaches. [[18505](https://reporting.cgiar.org/reports/result-details/18505?phase=4), [20093](https://reporting.cgiar.org/reports/result-details/20093?phase=4), [16200](https://reporting.cgiar.org/reports/result-details/16200?phase=4)]
3. Personalized Soil Reports: The Agroecology Initiative has implemented personalized soil reports for farmers, providing them with specific data on soil health indicators to guide their agricultural practices. [[18101](https://reporting.cgiar.org/reports/result-details/18101?phase=4)]
4. Grassland Management: Research highlights the need to understand how grazing by livestock and wildlife affects soil health and grassland ecosystems, emphasizing the importance of managing these interactions for successful restoration. [[16199](https://reporting.cgiar.org/reports/result-details/16199?phase=4), [16200](https://reporting.cgiar.org/reports/result-details/16200?phase=4), [19050](https://reporting.cgiar.org/reports/result-details/19050?phase=4)]
5. Agroecological Practices: Various initiatives are promoting agroecological practices to improve soil health and agricultural productivity, focusing on local farmer involvement and co-designing innovative solutions based on local knowledge and preferences.
6. [[16198](https://reporting.cgiar.org/reports/result-details/16198?phase=4), [16199](https://reporting.cgiar.org/reports/result-details/16199?phase=4), [13054](https://reporting.cgiar.org/reports/result-details/13054?phase=4)] Rangeland Restoration: Efforts to restore rangelands in Kenya address environmental degradation and aim to enhance the livelihoods of pastoral communities by improving grazing areas and adapting to climate change.
7. Organic Resource Mapping: A systematic mapping of organic resources in Kiambu and Makueni counties aims to enhance agroecological transitions and optimize resource utilization for sustainable farming. [[19159](https://reporting.cgiar.org/reports/result-details/19159?phase=4), [18665](https://reporting.cgiar.org/reports/result-details/18665?phase=4)]
8. Community Engagement: Workshops and assessments involving diverse stakeholders are crucial for shaping effective agroecological practices and ensuring that local perspectives are integrated into the development of soil and water management strategies.

Overall, the text underscores the vital role of soils in agricultural ecosystems, the need for localized research and practices, and the importance of community engagement in addressing soil degradation and enhancing sustainable agriculture in tropical regions. [[16198](https://reporting.cgiar.org/reports/result-details/16198?phase=4), [16199](https://reporting.cgiar.org/reports/result-details/16199?phase=4), [19050](https://reporting.cgiar.org/reports/result-details/19050?phase=4), [10811](https://reporting.cgiar.org/reports/result-details/10811?phase=3)]

Topic -1 - Sustainable Agriculture and Soil Health

The provided text outlines a comprehensive array of research initiatives and educational programs focusing on sustainable agricultural practices, soil health, and climate resilience across various regions. [[16871](https://reporting.cgiar.org/reports/result-details/16871?phase=4), [16592](https://reporting.cgiar.org/reports/result-details/16592?phase=4), [15980](https://reporting.cgiar.org/reports/result-details/15980?phase=4), [12863](https://reporting.cgiar.org/reports/result-details/12863?phase=4), [17457](https://reporting.cgiar.org/reports/result-details/17457?phase=4)] Key highlights include:

1. Agroecological Practices: Emphasis on the benefits of agroecological farming practices for enhancing soil health, crop productivity, and combating climate change. [[16871](https://reporting.cgiar.org/reports/result-details/16871?phase=4), [15980](https://reporting.cgiar.org/reports/result-details/15980?phase=4), [17453](https://reporting.cgiar.org/reports/result-details/17453?phase=4)] Workshops and training sessions are being conducted to equip various stakeholders (farmers, technicians, students) with methods for soil assessment and improved agricultural practices. [[16592](https://reporting.cgiar.org/reports/result-details/16592?phase=4), [14249](https://reporting.cgiar.org/reports/result-details/14249?phase=4)]
2. Soil Health Assessments: The development of comprehensive methodologies for soil health assessment is a focal point, highlighting the importance of soil properties such as carbon content, pH, and texture in monitoring agricultural sustainability. [[16592](https://reporting.cgiar.org/reports/result-details/16592?phase=4), [5744](https://reporting.cgiar.org/reports/result-details/5744?phase=3)] Workshops are planned in Colombia to refine these assessment methods. [[16592](https://reporting.cgiar.org/reports/result-details/16592?phase=4), [1762](https://reporting.cgiar.org/reports/result-details/1762?phase=1)]
3. Impact of Fertilization: Research indicates that balanced use of fertilizers can enhance soil organic matter while preventing pollution and soil degradation. [[4234](https://reporting.cgiar.org/reports/result-details/4234?phase=1), [10127](https://reporting.cgiar.org/reports/result-details/10127?phase=3)] Studies in regions like Vietnam and Sub-Saharan Africa illustrate the positive effects of improved forages and conservation agriculture on soil health. [[10127](https://reporting.cgiar.org/reports/result-details/10127?phase=3), [16879](https://reporting.cgiar.org/reports/result-details/16879?phase=4), [12863](https://reporting.cgiar.org/reports/result-details/12863?phase=4)]
4. Training and Capacity Building: Multiple training programs are aimed at enhancing farmers' knowledge of sustainable practices, including the use of digital tools for pest and disease management in crops like coffee and banana. These initiatives are crucial in regions prone to environmental challenges. [[12863](https://reporting.cgiar.org/reports/result-details/12863?phase=4), [12557](https://reporting.cgiar.org/reports/result-details/12557?phase=4)]
5. Research on Nematodes and Biodiversity: Investigations into free-living nematodes and their role in soil health reveal the superior performance of organic farming systems in enhancing biodiversity compared to conventional methods. [[2701](https://reporting.cgiar.org/reports/result-details/2701?phase=1), [11775](https://reporting.cgiar.org/reports/result-details/11775?phase=1)]
6. Climate Resilience: Various studies address the impact of climate change on agriculture, emphasizing the need for improved climate information services and climate-smart agricultural practices to bolster resilience among smallholder farmers. [[20191](https://reporting.cgiar.org/reports/result-details/20191?phase=4), [4675](https://reporting.cgiar.org/reports/result-details/4675?phase=3), [12863](https://reporting.cgiar.org/reports/result-details/12863?phase=4), [15980](https://reporting.cgiar.org/reports/result-details/15980?phase=4)]
7. Integrated Approaches: The integration of trees, crops, and livestock through agroforestry is highlighted as a means to create resilient ecosystems, reduce production costs, and enhance environmental health. [[15980](https://reporting.cgiar.org/reports/result-details/15980?phase=4)]
8. Sustainability Indicators: The implementation of key performance indicators (KPIs) for measuring agronomic gains is being standardized to enhance the understanding of agricultural practices' impacts across diverse environments. [[4188](https://reporting.cgiar.org/reports/result-details/4188?phase=4), [5739](https://reporting.cgiar.org/reports/result-details/5739?phase=3)]
9. Community Engagement: Efforts are being made to involve local communities in decision-making processes, ensuring that agricultural innovations are tailored to their specific needs and challenges.

Overall, the text emphasizes the interconnectedness of soil health, sustainable agriculture, and climate resilience, showcasing collaborative efforts across various regions to enhance agricultural productivity while safeguarding environmental integrity. [[16871](https://reporting.cgiar.org/reports/result-details/16871?phase=4), [15980](https://reporting.cgiar.org/reports/result-details/15980?phase=4), [12557](https://reporting.cgiar.org/reports/result-details/12557?phase=4)]

Topic 15 - Innovative Soil Health Solutions

The report outlines key findings and innovations regarding soil health and disease management in agricultural systems across Kenya and neighboring regions. [[17214](https://reporting.cgiar.org/reports/result-details/17214?phase=4), [18871](https://reporting.cgiar.org/reports/result-details/18871?phase=4), [9319](https://reporting.cgiar.org/reports/result-details/9319?phase=3)] It emphasizes the crucial role of soil microorganisms, particularly in nutrient cycling and plant health, highlighting the potential benefits of using edible mushrooms and their spent substrates to enhance soil fertility and manage diseases in organic banana production. [[7123](https://reporting.cgiar.org/reports/result-details/7123?phase=3), [17214](https://reporting.cgiar.org/reports/result-details/17214?phase=4)]

Significant attention is given to the use of biochar as a soil amendment to combat groundnut stem rot, revealing that its application can effectively suppress disease incidence and improve soil conditions. [[18871](https://reporting.cgiar.org/reports/result-details/18871?phase=4)] Additionally, the report discusses the bioprospecting of arbuscular mycorrhizal fungi (AMF) in banana and cassava systems, showcasing their ability to enhance plant growth and resilience against stress. [[9029](https://reporting.cgiar.org/reports/result-details/9029?phase=3), [14907](https://reporting.cgiar.org/reports/result-details/14907?phase=4)]

Management strategies for Fusarium wilt in banana are explored, with a focus on integrated disease management (IDM) approaches, including soil analysis and cover cropping to mitigate disease spread. [[9334](https://reporting.cgiar.org/reports/result-details/9334?phase=3), [9319](https://reporting.cgiar.org/reports/result-details/9319?phase=3)] The report also addresses the ginger blight outbreak in Nigeria, identifying Fusarium verticilliodes as a significant pathogen and emphasizing the need for further research to understand its impact. [[19094](https://reporting.cgiar.org/reports/result-details/19094?phase=4)]

Overall, the report underscores the importance of innovative, eco-friendly practices in improving soil health and managing crop diseases, while identifying ongoing research efforts that aim to close knowledge gaps and enhance agricultural resilience. [[18871](https://reporting.cgiar.org/reports/result-details/18871?phase=4), [14907](https://reporting.cgiar.org/reports/result-details/14907?phase=4), [9334](https://reporting.cgiar.org/reports/result-details/9334?phase=3)]

Topic 17 - Soil Biodiversity and Agricultural Productivity

The research on soil biodiversity in Vietnam highlights its critical role in agricultural productivity, emphasizing the relationship between soil health and microbial diversity. [[13057](https://reporting.cgiar.org/reports/result-details/13057?phase=4), [15856](https://reporting.cgiar.org/reports/result-details/15856?phase=4), [12424](https://reporting.cgiar.org/reports/result-details/12424?phase=4), [15349](https://reporting.cgiar.org/reports/result-details/15349?phase=4)] The study, particularly in the Sapa District and Son La Province, investigates the microbial communities in soils and roots of various crops, including rice, maize, and longan fruit. [[15856](https://reporting.cgiar.org/reports/result-details/15856?phase=4), [15349](https://reporting.cgiar.org/reports/result-details/15349?phase=4), [17354](https://reporting.cgiar.org/reports/result-details/17354?phase=4)] It aims to understand how agricultural practices, such as fertilizer use and land management, influence these microbial populations and, consequently, soil health and crop yields. [[13057](https://reporting.cgiar.org/reports/result-details/13057?phase=4), [18503](https://reporting.cgiar.org/reports/result-details/18503?phase=4), [15856](https://reporting.cgiar.org/reports/result-details/15856?phase=4), [12424](https://reporting.cgiar.org/reports/result-details/12424?phase=4), [15884](https://reporting.cgiar.org/reports/result-details/15884?phase=4)]

Key findings indicate that human activities and climate change are diminishing soil's functional capabilities, raising concerns about the impact on ecosystem services. [[12424](https://reporting.cgiar.org/reports/result-details/12424?phase=4), [15884](https://reporting.cgiar.org/reports/result-details/15884?phase=4)] The research explores the effects of different farming practices, including monocropping versus intercropping and organic versus inorganic fertilizer use, on soil microbiome composition. [[15884](https://reporting.cgiar.org/reports/result-details/15884?phase=4), [12424](https://reporting.cgiar.org/reports/result-details/12424?phase=4)] Improvements in soil biodiversity can enhance nutrient cycling, disease resistance, and water retention, fostering resilient agricultural systems. [[12424](https://reporting.cgiar.org/reports/result-details/12424?phase=4), [15856](https://reporting.cgiar.org/reports/result-details/15856?phase=4)]

Ultimately, this study seeks to contribute to a deeper understanding of soil microbial diversity, aiming to inform sustainable agricultural practices that bolster ecological balance and enhance crop productivity in Vietnam's diverse agricultural landscape. [[13057](https://reporting.cgiar.org/reports/result-details/13057?phase=4), [15856](https://reporting.cgiar.org/reports/result-details/15856?phase=4), [12424](https://reporting.cgiar.org/reports/result-details/12424?phase=4)]

Topic 0 - Sustainable Soil Health Education

The provided text outlines a series of workshops and training sessions focused on soil health and sustainable agricultural practices across various communities in Peru, Honduras, Guatemala, and Mexico. [[14371](https://reporting.cgiar.org/reports/result-details/14371?phase=4), [12116](https://reporting.cgiar.org/reports/result-details/12116?phase=4), [15933](https://reporting.cgiar.org/reports/result-details/15933?phase=4), [12074](https://reporting.cgiar.org/reports/result-details/12074?phase=4), [12649](https://reporting.cgiar.org/reports/result-details/12649?phase=4), [15924](https://reporting.cgiar.org/reports/result-details/15924?phase=4), [12742](https://reporting.cgiar.org/reports/result-details/12742?phase=4), [12723](https://reporting.cgiar.org/reports/result-details/12723?phase=4), [12737](https://reporting.cgiar.org/reports/result-details/12737?phase=4), [12730](https://reporting.cgiar.org/reports/result-details/12730?phase=4)] Key highlights include:

1. Soil Health Workshops: Numerous workshops were conducted to educate local farmers on assessing soil health through practical methodologies, including soil testing for physical, chemical, and biological properties. These sessions emphasized the importance of understanding soil pH, organic matter, and compaction to enhance agricultural productivity.
2. Community Participation: The training sessions actively involved community members, with significant participation from women, fostering inclusivity in agricultural education. For instance, workshops in Honduras included diverse groups, ensuring that both men and women engaged with the material. [[12116](https://reporting.cgiar.org/reports/result-details/12116?phase=4), [10534](https://reporting.cgiar.org/reports/result-details/10534?phase=3), [16090](https://reporting.cgiar.org/reports/result-details/16090?phase=4), [12723](https://reporting.cgiar.org/reports/result-details/12723?phase=4), [12748](https://reporting.cgiar.org/reports/result-details/12748?phase=4), [15924](https://reporting.cgiar.org/reports/result-details/15924?phase=4)]
3. [[12116](https://reporting.cgiar.org/reports/result-details/12116?phase=4), [10534](https://reporting.cgiar.org/reports/result-details/10534?phase=3), [16090](https://reporting.cgiar.org/reports/result-details/16090?phase=4), [10156](https://reporting.cgiar.org/reports/result-details/10156?phase=3), [9630](https://reporting.cgiar.org/reports/result-details/9630?phase=3), [12742](https://reporting.cgiar.org/reports/result-details/12742?phase=4), [12723](https://reporting.cgiar.org/reports/result-details/12723?phase=4), [9931](https://reporting.cgiar.org/reports/result-details/9931?phase=3), [12117](https://reporting.cgiar.org/reports/result-details/12117?phase=4), [12737](https://reporting.cgiar.org/reports/result-details/12737?phase=4), [12748](https://reporting.cgiar.org/reports/result-details/12748?phase=4), [12045](https://reporting.cgiar.org/reports/result-details/12045?phase=4), [12649](https://reporting.cgiar.org/reports/result-details/12649?phase=4), [16031](https://reporting.cgiar.org/reports/result-details/16031?phase=4), [16089](https://reporting.cgiar.org/reports/result-details/16089?phase=4), [16006](https://reporting.cgiar.org/reports/result-details/16006?phase=4)] Innovative Agricultural Techniques: The workshops promoted the adoption of sustainable practices such as organic fertilization, conservation agriculture, and integrated pest management. [[12074](https://reporting.cgiar.org/reports/result-details/12074?phase=4), [14406](https://reporting.cgiar.org/reports/result-details/14406?phase=4), [14361](https://reporting.cgiar.org/reports/result-details/14361?phase=4), [10156](https://reporting.cgiar.org/reports/result-details/10156?phase=3), [12045](https://reporting.cgiar.org/reports/result-details/12045?phase=4)] Farmers learned to prepare and apply organic fertilizers, improving soil health and reducing reliance on chemical inputs. [[14371](https://reporting.cgiar.org/reports/result-details/14371?phase=4), [14406](https://reporting.cgiar.org/reports/result-details/14406?phase=4), [10152](https://reporting.cgiar.org/reports/result-details/10152?phase=3), [10076](https://reporting.cgiar.org/reports/result-details/10076?phase=3)]
4. [[14371](https://reporting.cgiar.org/reports/result-details/14371?phase=4), [12116](https://reporting.cgiar.org/reports/result-details/12116?phase=4), [10534](https://reporting.cgiar.org/reports/result-details/10534?phase=3), [15933](https://reporting.cgiar.org/reports/result-details/15933?phase=4), [10156](https://reporting.cgiar.org/reports/result-details/10156?phase=3), [16090](https://reporting.cgiar.org/reports/result-details/16090?phase=4), [9630](https://reporting.cgiar.org/reports/result-details/9630?phase=3), [10158](https://reporting.cgiar.org/reports/result-details/10158?phase=3), [12649](https://reporting.cgiar.org/reports/result-details/12649?phase=4), [15924](https://reporting.cgiar.org/reports/result-details/15924?phase=4), [12074](https://reporting.cgiar.org/reports/result-details/12074?phase=4), [12742](https://reporting.cgiar.org/reports/result-details/12742?phase=4), [12723](https://reporting.cgiar.org/reports/result-details/12723?phase=4), [8565](https://reporting.cgiar.org/reports/result-details/8565?phase=3), [9977](https://reporting.cgiar.org/reports/result-details/9977?phase=3), [9984](https://reporting.cgiar.org/reports/result-details/9984?phase=3), [9931](https://reporting.cgiar.org/reports/result-details/9931?phase=3), [12738](https://reporting.cgiar.org/reports/result-details/12738?phase=4), [12736](https://reporting.cgiar.org/reports/result-details/12736?phase=4), [12748](https://reporting.cgiar.org/reports/result-details/12748?phase=4), [12747](https://reporting.cgiar.org/reports/result-details/12747?phase=4), [12045](https://reporting.cgiar.org/reports/result-details/12045?phase=4), [12117](https://reporting.cgiar.org/reports/result-details/12117?phase=4), [12737](https://reporting.cgiar.org/reports/result-details/12737?phase=4), [10529](https://reporting.cgiar.org/reports/result-details/10529?phase=3), [15735](https://reporting.cgiar.org/reports/result-details/15735?phase=4), [12108](https://reporting.cgiar.org/reports/result-details/12108?phase=4), [16031](https://reporting.cgiar.org/reports/result-details/16031?phase=4), [9601](https://reporting.cgiar.org/reports/result-details/9601?phase=3), [9613](https://reporting.cgiar.org/reports/result-details/9613?phase=3), [14406](https://reporting.cgiar.org/reports/result-details/14406?phase=4), [9626](https://reporting.cgiar.org/reports/result-details/9626?phase=3), [9989](https://reporting.cgiar.org/reports/result-details/9989?phase=3), [9603](https://reporting.cgiar.org/reports/result-details/9603?phase=3), [12665](https://reporting.cgiar.org/reports/result-details/12665?phase=4), [12646](https://reporting.cgiar.org/reports/result-details/12646?phase=4), [12729](https://reporting.cgiar.org/reports/result-details/12729?phase=4), [9593](https://reporting.cgiar.org/reports/result-details/9593?phase=3), [10530](https://reporting.cgiar.org/reports/result-details/10530?phase=3), [15737](https://reporting.cgiar.org/reports/result-details/15737?phase=4), [14023](https://reporting.cgiar.org/reports/result-details/14023?phase=4), [12103](https://reporting.cgiar.org/reports/result-details/12103?phase=4), [16001](https://reporting.cgiar.org/reports/result-details/16001?phase=4), [12645](https://reporting.cgiar.org/reports/result-details/12645?phase=4), [12726](https://reporting.cgiar.org/reports/result-details/12726?phase=4), [15725](https://reporting.cgiar.org/reports/result-details/15725?phase=4), [12029](https://reporting.cgiar.org/reports/result-details/12029?phase=4), [14051](https://reporting.cgiar.org/reports/result-details/14051?phase=4), [12667](https://reporting.cgiar.org/reports/result-details/12667?phase=4), [12735](https://reporting.cgiar.org/reports/result-details/12735?phase=4), [14058](https://reporting.cgiar.org/reports/result-details/14058?phase=4), [10516](https://reporting.cgiar.org/reports/result-details/10516?phase=3), [12073](https://reporting.cgiar.org/reports/result-details/12073?phase=4), [8556](https://reporting.cgiar.org/reports/result-details/8556?phase=3), [12730](https://reporting.cgiar.org/reports/result-details/12730?phase=4), [15713](https://reporting.cgiar.org/reports/result-details/15713?phase=4), [16006](https://reporting.cgiar.org/reports/result-details/16006?phase=4), [9953](https://reporting.cgiar.org/reports/result-details/9953?phase=3), [13865](https://reporting.cgiar.org/reports/result-details/13865?phase=4)] Field Diagnostics: Practical exercises, including soil pit excavations (calicatas), allowed participants to gain hands-on experience in diagnosing soil conditions, which is crucial for tailoring agricultural practices to local conditions. [[10156](https://reporting.cgiar.org/reports/result-details/10156?phase=3), [10158](https://reporting.cgiar.org/reports/result-details/10158?phase=3), [12730](https://reporting.cgiar.org/reports/result-details/12730?phase=4), [12737](https://reporting.cgiar.org/reports/result-details/12737?phase=4), [12649](https://reporting.cgiar.org/reports/result-details/12649?phase=4), 12727, [12723](https://reporting.cgiar.org/reports/result-details/12723?phase=4), [12646](https://reporting.cgiar.org/reports/result-details/12646?phase=4), [12665](https://reporting.cgiar.org/reports/result-details/12665?phase=4), [12645](https://reporting.cgiar.org/reports/result-details/12645?phase=4)]
5. Collaborative Learning: The training sessions fostered a collaborative environment where farmers shared experiences and challenges, promoting peer learning and community support. This approach aimed to build local knowledge bases, enhance agricultural resilience, and ultimately improve crop yields. [[12074](https://reporting.cgiar.org/reports/result-details/12074?phase=4), [12649](https://reporting.cgiar.org/reports/result-details/12649?phase=4), [12117](https://reporting.cgiar.org/reports/result-details/12117?phase=4), [10156](https://reporting.cgiar.org/reports/result-details/10156?phase=3), [15933](https://reporting.cgiar.org/reports/result-details/15933?phase=4), [10152](https://reporting.cgiar.org/reports/result-details/10152?phase=3), [10530](https://reporting.cgiar.org/reports/result-details/10530?phase=3)]
6. Focus on Sustainability: The overarching theme across all workshops was sustainability, with a strong emphasis on preserving natural resources, mitigating climate change effects, and ensuring environmental well-being through improved agricultural practices. [[16090](https://reporting.cgiar.org/reports/result-details/16090?phase=4), [10530](https://reporting.cgiar.org/reports/result-details/10530?phase=3), [12074](https://reporting.cgiar.org/reports/result-details/12074?phase=4), [12045](https://reporting.cgiar.org/reports/result-details/12045?phase=4), [10152](https://reporting.cgiar.org/reports/result-details/10152?phase=3), [12103](https://reporting.cgiar.org/reports/result-details/12103?phase=4), [10516](https://reporting.cgiar.org/reports/result-details/10516?phase=3), [9953](https://reporting.cgiar.org/reports/result-details/9953?phase=3)]

Overall, these initiatives reflect a concerted effort to empower local farmers with the knowledge and tools necessary for sustainable agriculture, thereby enhancing food security and community resilience in the face of environmental challenges.

Topic 5 - Sustainable Soil Health Innovations

This text provides an extensive overview of various studies and initiatives aimed at improving soil health, agricultural practices, and sustainability in South Asia, particularly India and Pakistan. [[17213](https://reporting.cgiar.org/reports/result-details/17213?phase=4), [6253](https://reporting.cgiar.org/reports/result-details/6253?phase=3), [11126](https://reporting.cgiar.org/reports/result-details/11126?phase=3), [12443](https://reporting.cgiar.org/reports/result-details/12443?phase=4), [3076](https://reporting.cgiar.org/reports/result-details/3076?phase=1)] Key themes include the significance of soil health for agricultural productivity, the adoption of Conservation Agriculture (CA) practices to enhance soil quality and mitigate climate change, and the role of institutional frameworks in promoting sustainable land management. [[6253](https://reporting.cgiar.org/reports/result-details/6253?phase=3), [11126](https://reporting.cgiar.org/reports/result-details/11126?phase=3), [12015](https://reporting.cgiar.org/reports/result-details/12015?phase=4), [12443](https://reporting.cgiar.org/reports/result-details/12443?phase=4), [1406](https://reporting.cgiar.org/reports/result-details/1406?phase=1)]

1. [[17213](https://reporting.cgiar.org/reports/result-details/17213?phase=4), [11126](https://reporting.cgiar.org/reports/result-details/11126?phase=3), [12443](https://reporting.cgiar.org/reports/result-details/12443?phase=4), [1406](https://reporting.cgiar.org/reports/result-details/1406?phase=1), [2669](https://reporting.cgiar.org/reports/result-details/2669?phase=1)] Soil Health and Baseline Studies: A soil baseline study in Maharashtra, India, highlights the importance of understanding soil properties for effective land management and sustainable agriculture. [[17213](https://reporting.cgiar.org/reports/result-details/17213?phase=4)] Black soils in regions like Akole and Nandurbar are noted for their moisture retention but face challenges like compaction and waterlogging. [[17213](https://reporting.cgiar.org/reports/result-details/17213?phase=4), [18223](https://reporting.cgiar.org/reports/result-details/18223?phase=4)]
2. [[17213](https://reporting.cgiar.org/reports/result-details/17213?phase=4), [6253](https://reporting.cgiar.org/reports/result-details/6253?phase=3), [11126](https://reporting.cgiar.org/reports/result-details/11126?phase=3), [12443](https://reporting.cgiar.org/reports/result-details/12443?phase=4), [3076](https://reporting.cgiar.org/reports/result-details/3076?phase=1)] Conservation Agriculture (CA): CA practices have been shown to improve soil organic carbon (SOC), enhance nutrient availability, and mitigate greenhouse gas emissions. Studies indicate that CA can lead to higher crop yields and better soil health in the context of rice-wheat and other cropping systems in South Asia, despite limited knowledge on its diverse impacts.
3. Impact of Climate Smart Agricultural Practices (CSAP): Research in Haryana, India, demonstrates that CSAPs, such as zero tillage and crop residue retention, significantly improve soil quality and reduce greenhouse gas emissions compared to conventional practices. These practices also enhance wheat yields and organic carbon levels in the soil. [[11126](https://reporting.cgiar.org/reports/result-details/11126?phase=3), [3073](https://reporting.cgiar.org/reports/result-details/3073?phase=1), [12443](https://reporting.cgiar.org/reports/result-details/12443?phase=4), [2669](https://reporting.cgiar.org/reports/result-details/2669?phase=1)]
4. Institutional Factors in Soil Fertility: In Punjab, Pakistan, a study explores how institutional dynamics and sustainable land management practices contribute to soil fertility in mixed crop-livestock systems. Access to resources and information is crucial for adopting sustainable practices.
5. [[17213](https://reporting.cgiar.org/reports/result-details/17213?phase=4), [6253](https://reporting.cgiar.org/reports/result-details/6253?phase=3), [11126](https://reporting.cgiar.org/reports/result-details/11126?phase=3), [12443](https://reporting.cgiar.org/reports/result-details/12443?phase=4), [3076](https://reporting.cgiar.org/reports/result-details/3076?phase=1)] Diverse Cropping Systems: The research emphasizes the need for diversification in cropping systems to improve productivity and sustainability. Different cropping scenarios based on CA principles show improved soil quality and economic returns, with implications for policy support and market guarantees. [[11126](https://reporting.cgiar.org/reports/result-details/11126?phase=3), [12443](https://reporting.cgiar.org/reports/result-details/12443?phase=4), [1406](https://reporting.cgiar.org/reports/result-details/1406?phase=1), [2669](https://reporting.cgiar.org/reports/result-details/2669?phase=1)]
6. Role of Fungal Communities: The impact of CA on soil fungal diversity is investigated, revealing that CA practices enhance fungal communities that are vital for nutrient recycling and crop stability. [[15804](https://reporting.cgiar.org/reports/result-details/15804?phase=4), [3121](https://reporting.cgiar.org/reports/result-details/3121?phase=1), [1406](https://reporting.cgiar.org/reports/result-details/1406?phase=1)]
7. Soil and Water Conservation: Long-term CA has been shown to reclaim sodic soils, enhancing soil organic carbon and overall soil health. [[3080](https://reporting.cgiar.org/reports/result-details/3080?phase=1), [1406](https://reporting.cgiar.org/reports/result-details/1406?phase=1), [15804](https://reporting.cgiar.org/reports/result-details/15804?phase=4)]
8. Challenges and Future Directions: Despite the recognized benefits of CA and CSAPs, widespread adoption remains limited due to economic and social constraints. [[6253](https://reporting.cgiar.org/reports/result-details/6253?phase=3), [3076](https://reporting.cgiar.org/reports/result-details/3076?phase=1), [3118](https://reporting.cgiar.org/reports/result-details/3118?phase=1)] Future efforts should focus on tailored policies, farmer education, and partnerships to facilitate the transition towards more sustainable practices. [[6253](https://reporting.cgiar.org/reports/result-details/6253?phase=3), [11126](https://reporting.cgiar.org/reports/result-details/11126?phase=3), [12443](https://reporting.cgiar.org/reports/result-details/12443?phase=4), [14010](https://reporting.cgiar.org/reports/result-details/14010?phase=4), [2669](https://reporting.cgiar.org/reports/result-details/2669?phase=1)]

Overall, the text underscores the critical intersection between agricultural practices, soil health, and climate action, advocating for innovative solutions and collaborative approaches to enhance productivity and sustainability in the region's agri-food systems.

Topic 16 - Nature-Positive Farming Solutions

The "Nature-Positive Solutions" initiative aims to enhance soil health and support smallholder farming systems in sub-Saharan Africa by promoting sustainable agricultural practices that restore ecosystems and improve livelihoods. [[13055](https://reporting.cgiar.org/reports/result-details/13055?phase=4), [10754](https://reporting.cgiar.org/reports/result-details/10754?phase=3), [13349](https://reporting.cgiar.org/reports/result-details/13349?phase=4), [10809](https://reporting.cgiar.org/reports/result-details/10809?phase=3)] This initiative combines research, policy realignments, and equitable support to facilitate the adoption of nature-positive solutions (NPS) at the community and farm levels. [[10754](https://reporting.cgiar.org/reports/result-details/10754?phase=3), [20203](https://reporting.cgiar.org/reports/result-details/20203?phase=4), [13349](https://reporting.cgiar.org/reports/result-details/13349?phase=4)]

Key challenges addressed include land degradation, limited evidence for sustainable practices, and the need for viable public-private business models. [[13055](https://reporting.cgiar.org/reports/result-details/13055?phase=4), [8480](https://reporting.cgiar.org/reports/result-details/8480?phase=3), [19806](https://reporting.cgiar.org/reports/result-details/19806?phase=4), [15391](https://reporting.cgiar.org/reports/result-details/15391?phase=4), [10809](https://reporting.cgiar.org/reports/result-details/10809?phase=3)] Industrial agriculture has significantly harmed the environment, accounting for 80% of deforestation and contributing to biodiversity loss and greenhouse gas emissions. [[11986](https://reporting.cgiar.org/reports/result-details/11986?phase=4), [19806](https://reporting.cgiar.org/reports/result-details/19806?phase=4)] The initiative emphasizes the importance of transitioning to resilient farming systems that not only sustain smallholder farmers but also contribute positively to nature. [[13055](https://reporting.cgiar.org/reports/result-details/13055?phase=4), [13349](https://reporting.cgiar.org/reports/result-details/13349?phase=4), [10809](https://reporting.cgiar.org/reports/result-details/10809?phase=3)]

The World Bank's upcoming Biodiversity in Agriculture Flagship Report will further highlight agriculture's impact on biodiversity, offering policy tools and recommendations to safeguard ecosystems while meeting food demands. [[8480](https://reporting.cgiar.org/reports/result-details/8480?phase=3)] The report's findings will influence agricultural programs globally, underscoring the urgent need for systemic transformation in the agricultural sector. [[8480](https://reporting.cgiar.org/reports/result-details/8480?phase=3), [20203](https://reporting.cgiar.org/reports/result-details/20203?phase=4), [11986](https://reporting.cgiar.org/reports/result-details/11986?phase=4), [19806](https://reporting.cgiar.org/reports/result-details/19806?phase=4)]

Nature-based solutions are positioned as essential for addressing environmental challenges, improving agricultural productivity, and fostering sustainable food systems capable of supporting vulnerable communities. [[20203](https://reporting.cgiar.org/reports/result-details/20203?phase=4), [13349](https://reporting.cgiar.org/reports/result-details/13349?phase=4), [13055](https://reporting.cgiar.org/reports/result-details/13055?phase=4)] The CGIAR initiative, particularly in regions like Burkina Faso, focuses on leveraging ecological benefits to create a balanced approach that meets both human and environmental needs.

Topic 2 - Sustainable Agriculture Training Initiatives

The text outlines various training initiatives aimed at promoting sustainable agricultural practices across different regions, including Lao PDR, Kenya, Zimbabwe, Ghana, and India. [[13830](https://reporting.cgiar.org/reports/result-details/13830?phase=4), [15789](https://reporting.cgiar.org/reports/result-details/15789?phase=4), [12874](https://reporting.cgiar.org/reports/result-details/12874?phase=4), [17503](https://reporting.cgiar.org/reports/result-details/17503?phase=4), [2740](https://reporting.cgiar.org/reports/result-details/2740?phase=1), [19164](https://reporting.cgiar.org/reports/result-details/19164?phase=4)] These initiatives leverage agroecological principles to enhance soil health, improve crop yields, and reduce reliance on synthetic fertilizers and pesticides. [[15789](https://reporting.cgiar.org/reports/result-details/15789?phase=4), [9547](https://reporting.cgiar.org/reports/result-details/9547?phase=4), [8571](https://reporting.cgiar.org/reports/result-details/8571?phase=3), [14719](https://reporting.cgiar.org/reports/result-details/14719?phase=4), [18627](https://reporting.cgiar.org/reports/result-details/18627?phase=4)]

Key highlights include:

1. [[13830](https://reporting.cgiar.org/reports/result-details/13830?phase=4), [15789](https://reporting.cgiar.org/reports/result-details/15789?phase=4), [9708](https://reporting.cgiar.org/reports/result-details/9708?phase=3), [8005](https://reporting.cgiar.org/reports/result-details/8005?phase=3)] Lao PDR Training Program: Utilizing the FAO soil doctor methodology, this program trained farmers from nine villages to understand their soil conditions and implement sustainable practices. [[13830](https://reporting.cgiar.org/reports/result-details/13830?phase=4), [18549](https://reporting.cgiar.org/reports/result-details/18549?phase=4)]
2. Biopesticides in Kenya: Since 2023, farmers in Kiambu County have transitioned from conventional methods to using biopesticides and practices like crop rotation and companion planting, leading to improved soil health and pest control. [[15789](https://reporting.cgiar.org/reports/result-details/15789?phase=4), [8005](https://reporting.cgiar.org/reports/result-details/8005?phase=3)]
3. Zimbabwe Soil and Water Management: Training sessions focused on organic manure preparation and agroecological practices to address low soil fertility and promote sustainable farming methods. [[12874](https://reporting.cgiar.org/reports/result-details/12874?phase=4), [19164](https://reporting.cgiar.org/reports/result-details/19164?phase=4)]
4. Community Initiatives: Various community-led projects, such as Black Soldier Fly (BSF) farming in Kenya, turned organic waste into compost and protein-rich feed, enhancing local farming sustainability and productivity. [[18316](https://reporting.cgiar.org/reports/result-details/18316?phase=4), [18710](https://reporting.cgiar.org/reports/result-details/18710?phase=4)]
5. Training and Capacity Building: Multiple training programs across regions emphasized practical skills in agroecological practices, integrated pest management, soil fertility management, and water conservation techniques. These programs engaged over a thousand farmers and extension staff, enhancing their knowledge and capacity to adopt sustainable practices. [[18549](https://reporting.cgiar.org/reports/result-details/18549?phase=4), [19164](https://reporting.cgiar.org/reports/result-details/19164?phase=4)]
6. Focus on Women and Youth: Specific training targeted women and youth, promoting their engagement in sustainable agriculture through innovative techniques like container gardening and vermiculture.
7. Collaborative Learning and Exchange: Farmer exchange visits and community events fostered knowledge sharing and cooperation among farmers, strengthening local agricultural networks.

Overall, these initiatives reflect a growing movement towards agroecology, focusing on sustainable practices that improve food security, environmental health, and community resilience.

Topic 18 - Digital Soil Health Innovation

ICRISAT is developing a digital platform called MSOIL for soil health monitoring, integrating various digital tools and AI/ML algorithms to analyze soil data and provide site-specific recommendations to improve soil health and agricultural productivity. [[14527](https://reporting.cgiar.org/reports/result-details/14527?phase=4), [14511](https://reporting.cgiar.org/reports/result-details/14511?phase=4)] The platform aims to synthesize data from multiple sources, including advanced digital soil mapping (DSM) techniques that utilize remote sensing and GIS to create detailed soil property maps. [[14527](https://reporting.cgiar.org/reports/result-details/14527?phase=4), [14511](https://reporting.cgiar.org/reports/result-details/14511?phase=4), [8015](https://reporting.cgiar.org/reports/result-details/8015?phase=3)] In Bangladesh, DSM is prioritized for effective agricultural development, addressing the diverse and variable soil types across the country. [[8015](https://reporting.cgiar.org/reports/result-details/8015?phase=3)]

Additionally, the use of machine learning in DSM has been applied in Kenya at the Kapiti Research Station and Wildlife Conservancy, where high-resolution soil maps have been created to combat issues like overgrazing and nutrient depletion. [[18962](https://reporting.cgiar.org/reports/result-details/18962?phase=4), [12638](https://reporting.cgiar.org/reports/result-details/12638?phase=4), [13597](https://reporting.cgiar.org/reports/result-details/13597?phase=4)] These maps facilitate targeted interventions for sustainable pasture management and enhance livestock productivity. [[18962](https://reporting.cgiar.org/reports/result-details/18962?phase=4), [12638](https://reporting.cgiar.org/reports/result-details/12638?phase=4), [13597](https://reporting.cgiar.org/reports/result-details/13597?phase=4)]

In Guatemala, the Alliance Bioversity International-CIAT and CIMMYT have established a digital plot to collect meteorological and soil data, which will aid in understanding environmental conditions and support data-driven crop management decisions. [[7326](https://reporting.cgiar.org/reports/result-details/7326?phase=3), [14561](https://reporting.cgiar.org/reports/result-details/14561?phase=4)] Overall, these initiatives emphasize the importance of integrating technology and data analysis in enhancing soil health and optimizing agricultural practices globally. [[14527](https://reporting.cgiar.org/reports/result-details/14527?phase=4), [14511](https://reporting.cgiar.org/reports/result-details/14511?phase=4)]

Topic 19 - Soil Fertility and Wheat Production

The provided text outlines various MSc research studies conducted on soil fertility and wheat production in Ethiopia, all of which were completed and defended by Q4 2024. [[7308](https://reporting.cgiar.org/reports/result-details/7308?phase=4), [7302](https://reporting.cgiar.org/reports/result-details/7302?phase=4), [7301](https://reporting.cgiar.org/reports/result-details/7301?phase=4), [7303](https://reporting.cgiar.org/reports/result-details/7303?phase=4), [7305](https://reporting.cgiar.org/reports/result-details/7305?phase=4)] Key studies include:

1. Soil Amendments: Evaluation of soil amendments on bread wheat yield in acidic soils in Chencha district. [[7308](https://reporting.cgiar.org/reports/result-details/7308?phase=4)] 2. Integrated Nutrient Management: Assessment of integrated nutrient management's effects on wheat yield and soil properties in Lasta district. [[7204](https://reporting.cgiar.org/reports/result-details/7204?phase=3), [7302](https://reporting.cgiar.org/reports/result-details/7302?phase=4)] 3. Lime and Vermicompost Application: Investigation of the combined application of lime and vermicompost on soil properties and performance of wheat varieties in Liben Jawi district. [[7301](https://reporting.cgiar.org/reports/result-details/7301?phase=4), [7303](https://reporting.cgiar.org/reports/result-details/7303?phase=4)] 4. Nutrient Response: Study of bread wheat's response to nitrogen and phosphorus fertilizer rates and nutrient use efficiency in Bora district, East Shewa zone. [[7303](https://reporting.cgiar.org/reports/result-details/7303?phase=4)] 5. Optimum Fertilizer Rates: Determination of optimal nitrogen and phosphorus fertilizer rates for wheat and its impact on soil characteristics in Kersa district. [[7307](https://reporting.cgiar.org/reports/result-details/7307?phase=4)] 6. Yield Components: Effects of nitrogen and phosphorus rates on bread wheat yield and components under Nitosoil conditions in the Arsi zone. [[7305](https://reporting.cgiar.org/reports/result-details/7305?phase=4)]

All studies focus on improving soil fertility and enhancing wheat yield through different agronomic practices. [[7308](https://reporting.cgiar.org/reports/result-details/7308?phase=4), [7302](https://reporting.cgiar.org/reports/result-details/7302?phase=4), [7301](https://reporting.cgiar.org/reports/result-details/7301?phase=4), [7204](https://reporting.cgiar.org/reports/result-details/7204?phase=3), [7203](https://reporting.cgiar.org/reports/result-details/7203?phase=3), [7303](https://reporting.cgiar.org/reports/result-details/7303?phase=4), [7307](https://reporting.cgiar.org/reports/result-details/7307?phase=4), [7305](https://reporting.cgiar.org/reports/result-details/7305?phase=4)]

Topic 8 - Nutrient Management for Food Security

The agricultural sector in Sub-Saharan Africa, particularly in Kenya, faces significant challenges in meeting food demands due to low nutrient management practices, which have led to food insecurity. [[17805](https://reporting.cgiar.org/reports/result-details/17805?phase=4)] Maize, as the primary staple crop in Kenya, heavily relies on fertilizers, yet average yields remain low, indicating suboptimal input levels. [[17805](https://reporting.cgiar.org/reports/result-details/17805?phase=4), [1146](https://reporting.cgiar.org/reports/result-details/1146?phase=1), [1477](https://reporting.cgiar.org/reports/result-details/1477?phase=1)] A study on organic fertilizer usage suggests that it can enhance soil health and crop yield, particularly in maize production, by improving soil organic carbon levels. [[17805](https://reporting.cgiar.org/reports/result-details/17805?phase=4), [1146](https://reporting.cgiar.org/reports/result-details/1146?phase=1)]

Research across various locations in East Africa has examined the impact of landscape positions and soil types on nutrient responses and crop productivity, particularly in wheat. [[14020](https://reporting.cgiar.org/reports/result-details/14020?phase=4), [11461](https://reporting.cgiar.org/reports/result-details/11461?phase=3)] Findings indicate that specific nutrient interactions can lead to significant increases in biomass and crop yields. [[1146](https://reporting.cgiar.org/reports/result-details/1146?phase=1), [1477](https://reporting.cgiar.org/reports/result-details/1477?phase=1)] For maize in Ethiopia, balanced nutrient applications were shown to optimize yields, emphasizing the necessity for site-specific recommendations rather than blanket approaches. [[1146](https://reporting.cgiar.org/reports/result-details/1146?phase=1), [1477](https://reporting.cgiar.org/reports/result-details/1477?phase=1)]

In West Africa, studies on rice cultivation have highlighted innovative practices such as mid-season drainage to mitigate iron toxicity and improve water productivity. [[5468](https://reporting.cgiar.org/reports/result-details/5468?phase=3), [1453](https://reporting.cgiar.org/reports/result-details/1453?phase=1)] Additionally, the long-term effects of irrigation and fertilizer management on nutrient concentrations in soils and crops have been analyzed, revealing the potential for sustainable practices to enhance yields.

The importance of micronutrient management, particularly in potato and yam production, has been emphasized, with studies identifying prevalent deficiencies in various agro-ecological zones. [[18498](https://reporting.cgiar.org/reports/result-details/18498?phase=4), [11395](https://reporting.cgiar.org/reports/result-details/11395?phase=3), [592](https://reporting.cgiar.org/reports/result-details/592?phase=1)] Integrated approaches that combine organic amendments, crop rotation, and careful water management have been shown to improve nutrient uptake and crop quality.

Overall, a multi-faceted approach that includes improved soil management practices, targeted fertilizer applications, and innovative irrigation techniques is crucial for enhancing agricultural productivity and addressing food security in the region. [[17805](https://reporting.cgiar.org/reports/result-details/17805?phase=4), [1146](https://reporting.cgiar.org/reports/result-details/1146?phase=1), [11461](https://reporting.cgiar.org/reports/result-details/11461?phase=3)] The findings underscore the need for ongoing research and development focused on optimizing nutrient management tailored to specific environmental conditions. [[1146](https://reporting.cgiar.org/reports/result-details/1146?phase=1), [18498](https://reporting.cgiar.org/reports/result-details/18498?phase=4), [1477](https://reporting.cgiar.org/reports/result-details/1477?phase=1)]

Topic 20 - Sustainable Livestock and Soil Recovery

The text discusses various strategies for optimizing legume seed production and improving sustainable livestock practices in the tropics, particularly in Latin America and the Caribbean (LAC). [[7917](https://reporting.cgiar.org/reports/result-details/7917?phase=3)] It highlights the challenge of soil degradation caused by poor management of natural resources, urging for the recovery of soil fertility to curb agricultural expansion. [[1062](https://reporting.cgiar.org/reports/result-details/1062?phase=1), [16196](https://reporting.cgiar.org/reports/result-details/16196?phase=4)] The role of livestock in transforming agri-food systems is examined, emphasizing its potential in regenerating soils and landscapes, supported by successful case studies in Burkina Faso and Tunisia, where the integration of fodder crops improved livestock productivity and soil health. [[5635](https://reporting.cgiar.org/reports/result-details/5635?phase=3), [18116](https://reporting.cgiar.org/reports/result-details/18116?phase=4)]

Moreover, the environmental impact of livestock production is scrutinized, as it occupies a significant portion of agricultural land and contributes to greenhouse gas emissions, water pollution, and biodiversity loss. [[20059](https://reporting.cgiar.org/reports/result-details/20059?phase=4), [1062](https://reporting.cgiar.org/reports/result-details/1062?phase=1)] The text stresses the urgent need to mitigate the environmental footprint of livestock through sustainable practices, particularly as global demand for animal products is projected to rise. [[20059](https://reporting.cgiar.org/reports/result-details/20059?phase=4), [1062](https://reporting.cgiar.org/reports/result-details/1062?phase=1)]

Additionally, tools like CLEANED (Comprehensive Livestock Environmental Assessment) are developed to assess and improve the environmental performance of livestock systems in data-scarce environments. [[1341](https://reporting.cgiar.org/reports/result-details/1341?phase=1)] The inclusion of environmental considerations in livestock master plans is crucial to balance food production with sustainability goals. [[1062](https://reporting.cgiar.org/reports/result-details/1062?phase=1), [20059](https://reporting.cgiar.org/reports/result-details/20059?phase=4)] Finally, rotational grazing is highlighted as a sustainable rangeland management practice that enhances soil health, forage productivity, and economic viability for livestock producers. [[16196](https://reporting.cgiar.org/reports/result-details/16196?phase=4)] Overall, the text advocates for integrated approaches to enhance agricultural productivity while minimizing environmental degradation. [[1062](https://reporting.cgiar.org/reports/result-details/1062?phase=1), [20059](https://reporting.cgiar.org/reports/result-details/20059?phase=4)]

Topic 11 - Sustainable Soil Health Initiatives

The text discusses various initiatives aimed at improving soil health and agricultural productivity in Bangladesh and Ethiopia through sustainable practices. [[14984](https://reporting.cgiar.org/reports/result-details/14984?phase=4), [20179](https://reporting.cgiar.org/reports/result-details/20179?phase=4), [7542](https://reporting.cgiar.org/reports/result-details/7542?phase=3)] It highlights the critical role of organic matter in soil fertility, which is currently deficient in many regions of Bangladesh, averaging less than 1%. [[14984](https://reporting.cgiar.org/reports/result-details/14984?phase=4), [8214](https://reporting.cgiar.org/reports/result-details/8214?phase=3)] This deficiency is attributed to inadequate organic recycling and reliance on chemical fertilizers, leading to soil degradation and reduced crop yields. [[8214](https://reporting.cgiar.org/reports/result-details/8214?phase=3), [14984](https://reporting.cgiar.org/reports/result-details/14984?phase=4)]

Key initiatives include promoting vermicomposting, which enhances soil quality by improving its biological, physical, and chemical properties, while also creating employment opportunities for rural women. [[8214](https://reporting.cgiar.org/reports/result-details/8214?phase=3), [20179](https://reporting.cgiar.org/reports/result-details/20179?phase=4)] Training programs have been implemented to teach farmers about organic fertilizer production and effective agricultural practices, which are necessary for sustainable food security. [[8214](https://reporting.cgiar.org/reports/result-details/8214?phase=3), [20179](https://reporting.cgiar.org/reports/result-details/20179?phase=4)]

In Ethiopia's Central Rift Valley, similar challenges exist with low soil fertility and high chemical fertilizer use. [[7542](https://reporting.cgiar.org/reports/result-details/7542?phase=3)] Training has been provided to farmers on vermicompost production, which has the potential for sustainable agricultural innovation. [[8214](https://reporting.cgiar.org/reports/result-details/8214?phase=3), [20179](https://reporting.cgiar.org/reports/result-details/20179?phase=4)]

Additional projects in Bangladesh focus on innovative techniques like zero-tillage potato production and the use of biofertilizers such as Rhizobium to enhance mungbean yields. [[5334](https://reporting.cgiar.org/reports/result-details/5334?phase=4), [10380](https://reporting.cgiar.org/reports/result-details/10380?phase=3), [18219](https://reporting.cgiar.org/reports/result-details/18219?phase=4)] These practices aim to address climate change challenges, improve resource use efficiency, and promote gender equity in agriculture. [[20179](https://reporting.cgiar.org/reports/result-details/20179?phase=4), [5334](https://reporting.cgiar.org/reports/result-details/5334?phase=4)]

Overall, the text emphasizes the importance of systemic changes in agricultural practices through training, organic matter recycling, and integrated farming systems to support sustainable development in agriculture, enhance food security, and improve rural livelihoods. [[14984](https://reporting.cgiar.org/reports/result-details/14984?phase=4), [8214](https://reporting.cgiar.org/reports/result-details/8214?phase=3), [20179](https://reporting.cgiar.org/reports/result-details/20179?phase=4)]

Topic 3 - Agroecological Practices for Sustainable Farming

The text discusses various agroecological practices in Kenya, Zimbabwe, and other African countries aimed at enhancing agricultural productivity and sustainability. [[18359](https://reporting.cgiar.org/reports/result-details/18359?phase=4), [18130](https://reporting.cgiar.org/reports/result-details/18130?phase=4), [17464](https://reporting.cgiar.org/reports/result-details/17464?phase=4), [18343](https://reporting.cgiar.org/reports/result-details/18343?phase=4), [5245](https://reporting.cgiar.org/reports/result-details/5245?phase=3)] Key findings include:

1. [[18359](https://reporting.cgiar.org/reports/result-details/18359?phase=4), [18130](https://reporting.cgiar.org/reports/result-details/18130?phase=4), [17464](https://reporting.cgiar.org/reports/result-details/17464?phase=4), [17467](https://reporting.cgiar.org/reports/result-details/17467?phase=4), [18343](https://reporting.cgiar.org/reports/result-details/18343?phase=4)] Soil-Water Conservation Practices: Farmers in Kenya and Zimbabwe who implement soil-water conservation techniques, such as vegetated terraces and conservation agriculture, significantly improve crop yields (e.g., a 25% increase in bean productivity in Kenya) and reduce pest damage, particularly from fall armyworms. [[18359](https://reporting.cgiar.org/reports/result-details/18359?phase=4)]
2. [[18359](https://reporting.cgiar.org/reports/result-details/18359?phase=4), [17464](https://reporting.cgiar.org/reports/result-details/17464?phase=4), [18130](https://reporting.cgiar.org/reports/result-details/18130?phase=4), [17467](https://reporting.cgiar.org/reports/result-details/17467?phase=4)] Innovative Agroecological Packages: A field experiment over four years showed that an innovative agroecological package, including crop rotation and intercropping with cover crops, significantly improved soil health and crop yields compared to traditional practices. [[5245](https://reporting.cgiar.org/reports/result-details/5245?phase=3), [4519](https://reporting.cgiar.org/reports/ipsr-details/4519?phase=5), [4518](https://reporting.cgiar.org/reports/ipsr-details/4518?phase=5), [789](https://reporting.cgiar.org/reports/result-details/789?phase=4)] For instance, bean and maize yields increased substantially when using the agroecological methods. [[18359](https://reporting.cgiar.org/reports/result-details/18359?phase=4), [17467](https://reporting.cgiar.org/reports/result-details/17467?phase=4), [18130](https://reporting.cgiar.org/reports/result-details/18130?phase=4)]
3. [[18359](https://reporting.cgiar.org/reports/result-details/18359?phase=4), [18130](https://reporting.cgiar.org/reports/result-details/18130?phase=4), [17464](https://reporting.cgiar.org/reports/result-details/17464?phase=4), [17467](https://reporting.cgiar.org/reports/result-details/17467?phase=4)] Mobile Kraaling: In Zimbabwe, mobile kraaling has been identified as an effective method for enhancing soil fertility and productivity, although further research is needed to assess its impact on soil health. [[19169](https://reporting.cgiar.org/reports/result-details/19169?phase=4)]
4. [[18359](https://reporting.cgiar.org/reports/result-details/18359?phase=4), [18130](https://reporting.cgiar.org/reports/result-details/18130?phase=4), [17464](https://reporting.cgiar.org/reports/result-details/17464?phase=4), [17467](https://reporting.cgiar.org/reports/result-details/17467?phase=4)] Animal Manure Utilization: In various countries, the application of animal manure has shown positive effects on crop yields, with significant increases reported in maize and bean production in Kenya, Burkina Faso, and Senegal. [[18130](https://reporting.cgiar.org/reports/result-details/18130?phase=4), [19169](https://reporting.cgiar.org/reports/result-details/19169?phase=4)]
5. [[18359](https://reporting.cgiar.org/reports/result-details/18359?phase=4), [17464](https://reporting.cgiar.org/reports/result-details/17464?phase=4), [18130](https://reporting.cgiar.org/reports/result-details/18130?phase=4)] Crop Associations: Multiple trials across different countries demonstrate that intercropping and crop rotations significantly boost productivity, resilience, and sustainability. [[18343](https://reporting.cgiar.org/reports/result-details/18343?phase=4), [4519](https://reporting.cgiar.org/reports/ipsr-details/4519?phase=5), [4518](https://reporting.cgiar.org/reports/ipsr-details/4518?phase=5), [4511](https://reporting.cgiar.org/reports/ipsr-details/4511?phase=2), [789](https://reporting.cgiar.org/reports/result-details/789?phase=4)] For instance, millet's productivity increased dramatically when rotated with legumes in Senegal.
6. [[18359](https://reporting.cgiar.org/reports/result-details/18359?phase=4), [17467](https://reporting.cgiar.org/reports/result-details/17467?phase=4), [18130](https://reporting.cgiar.org/reports/result-details/18130?phase=4)] Conservation Agriculture (CA): CA practices, based on principles like minimum tillage and crop residue retention, have shown to enhance yields and reduce labor in Malawi and Zambia. [[4519](https://reporting.cgiar.org/reports/ipsr-details/4519?phase=5), [4518](https://reporting.cgiar.org/reports/ipsr-details/4518?phase=5), [4511](https://reporting.cgiar.org/reports/ipsr-details/4511?phase=2), [789](https://reporting.cgiar.org/reports/result-details/789?phase=4), [10232](https://reporting.cgiar.org/reports/result-details/10232?phase=3), [7569](https://reporting.cgiar.org/reports/result-details/7569?phase=4)] CA also contributes to environmental sustainability by promoting healthy ecosystems.
7. Challenges and Opportunities: The text highlights systemic challenges, such as the need for better weed management and the effective use of crop residues. [[11922](https://reporting.cgiar.org/reports/result-details/11922?phase=4), [6544](https://reporting.cgiar.org/reports/result-details/6544?phase=3)] It emphasizes the importance of integrating social and economic factors into agroecological practices to enhance adoption and effectiveness. [[17464](https://reporting.cgiar.org/reports/result-details/17464?phase=4), [18130](https://reporting.cgiar.org/reports/result-details/18130?phase=4), [6544](https://reporting.cgiar.org/reports/result-details/6544?phase=3)]
8. [[18359](https://reporting.cgiar.org/reports/result-details/18359?phase=4), [17464](https://reporting.cgiar.org/reports/result-details/17464?phase=4), [17467](https://reporting.cgiar.org/reports/result-details/17467?phase=4)] Future Directions: The need for more extensive research and policy support is essential for scaling these innovations, particularly in understanding the socio-economic impacts of agroecological transitions on farming communities. [[6544](https://reporting.cgiar.org/reports/result-details/6544?phase=3)]

Overall, the findings emphasize the potential of agroecological practices to restore degraded lands, enhance productivity, and promote sustainable agricultural systems in Africa, while also addressing broader environmental and socio-economic challenges.

Topic 7 - Enhancing Fertilizer Use Efficiency in SSA

The blog and accompanying documents discuss the challenges and strategies for enhancing fertilizer use efficiency in Sub-Saharan Africa (SSA), particularly following the 2006 Abuja Fertilizer Declaration aimed at achieving food self-sufficiency. [[15394](https://reporting.cgiar.org/reports/result-details/15394?phase=4), [18671](https://reporting.cgiar.org/reports/result-details/18671?phase=4)] Despite increased fertilizer use, the efficiency of nitrogen (N) and phosphorus (P) application remains inadequate, leading to yield gaps. [[1661](https://reporting.cgiar.org/reports/result-details/1661?phase=1), [15394](https://reporting.cgiar.org/reports/result-details/15394?phase=4)] Experts convened at the Africa Fertilizer and Soil Health Conference in Nairobi emphasized the need for evidence-based fertilizer practices and capacity development, recommending improved data collection, site-specific fertilizer plans, and partnerships to support smallholder farmers. [[15394](https://reporting.cgiar.org/reports/result-details/15394?phase=4), [18671](https://reporting.cgiar.org/reports/result-details/18671?phase=4), [18816](https://reporting.cgiar.org/reports/result-details/18816?phase=4)]

Key strategies outlined include the development of digital tools, such as the EcoFarm App, which uses AI to optimize resource use and provide tailored crop advice, and the Smart Fertilizer Recommendation Tool, designed for local extension agents and farmers. The importance of integrating site-specific recommendations based on biophysical environmental data to address variability in soil fertility and landscape position is highlighted, particularly through initiatives in Ethiopia. [[18214](https://reporting.cgiar.org/reports/result-details/18214?phase=4), [15846](https://reporting.cgiar.org/reports/result-details/15846?phase=4), [16960](https://reporting.cgiar.org/reports/result-details/16960?phase=4), [18816](https://reporting.cgiar.org/reports/result-details/18816?phase=4)] These initiatives seek to enhance agricultural practices and improve profitability by providing targeted fertilizer recommendations and comprehensive training for extension agents.

Furthermore, the application of Fertilizer Replacement Value (FRV) as a metric for organic fertilizers is proposed to enhance the precision of nutrient recommendations. Collaborative efforts in various regions aim to develop agronomy and soil health databases to support localized agricultural solutions, thereby promoting sustainable practices and improving farmer returns on fertilizer investments.

Overall, the discourse underscores the necessity of multi-sectoral collaboration, innovative technology, and farmer engagement to effectively implement fertilizer and soil health strategies that align with the African Union's 10-year action plan. [[18671](https://reporting.cgiar.org/reports/result-details/18671?phase=4), [15394](https://reporting.cgiar.org/reports/result-details/15394?phase=4)]

Topic 21 - Empowering Women for Soil Health

The text outlines critical challenges and strategies for improving soil health and agricultural productivity in Africa, particularly emphasizing the empowerment of women farmers. [[18004](https://reporting.cgiar.org/reports/result-details/18004?phase=4), [12221](https://reporting.cgiar.org/reports/result-details/12221?phase=4), [17544](https://reporting.cgiar.org/reports/result-details/17544?phase=4)] It highlights the significant degradation of productive land in Africa, affecting smallholder farmers who often face sociocultural, economic, and institutional barriers to adopting effective soil management practices. [[18004](https://reporting.cgiar.org/reports/result-details/18004?phase=4), [19162](https://reporting.cgiar.org/reports/result-details/19162?phase=4)]

Key findings include the substantial gender disparities in agricultural resource access, contributing to lower productivity among women farmers. [[12221](https://reporting.cgiar.org/reports/result-details/12221?phase=4), [17544](https://reporting.cgiar.org/reports/result-details/17544?phase=4)] A recent side event at the African Union's summit advocated for integrating equity into the African Fertilizer and Soil Health Action Plan, focusing on participatory action research to enhance women's engagement in sustainable land management (SLM) and improve resilience against climate shocks. [[12221](https://reporting.cgiar.org/reports/result-details/12221?phase=4), [17544](https://reporting.cgiar.org/reports/result-details/17544?phase=4)]

Research from Ethiopia and Zimbabwe indicates that while there is some adoption of Integrated Soil Fertility Management (ISFM) practices, challenges such as limited access to resources and gender-based disparities hinder optimal implementation. [[19162](https://reporting.cgiar.org/reports/result-details/19162?phase=4), [17544](https://reporting.cgiar.org/reports/result-details/17544?phase=4)] Recommendations include targeted interventions to improve women's access to agricultural assets, the adoption of agroecological practices, and promoting labor-saving technologies. [[12221](https://reporting.cgiar.org/reports/result-details/12221?phase=4), [17544](https://reporting.cgiar.org/reports/result-details/17544?phase=4)]

Overall, the text emphasizes the need for context-specific strategies that address gender inequalities and promote sustainable agricultural practices to enhance resilience and productivity in the face of climate-induced challenges and socio-political instability. [[12221](https://reporting.cgiar.org/reports/result-details/12221?phase=4), [17567](https://reporting.cgiar.org/reports/result-details/17567?phase=4), [17544](https://reporting.cgiar.org/reports/result-details/17544?phase=4), [15899](https://reporting.cgiar.org/reports/result-details/15899?phase=4)]

Topic 9 - Soil Health and Salinity Management

The report presents a comprehensive overview of various initiatives and studies focused on soil health monitoring and management, particularly regarding soil salinity, utilizing satellite-based remote sensing technologies across different regions, including Tunisia, Egypt, and Ethiopia. [[15722](https://reporting.cgiar.org/reports/result-details/15722?phase=4), [9398](https://reporting.cgiar.org/reports/result-details/9398?phase=3), [9402](https://reporting.cgiar.org/reports/result-details/9402?phase=3), [12310](https://reporting.cgiar.org/reports/result-details/12310?phase=4), [18614](https://reporting.cgiar.org/reports/result-details/18614?phase=4)]

1. [[15722](https://reporting.cgiar.org/reports/result-details/15722?phase=4), [9398](https://reporting.cgiar.org/reports/result-details/9398?phase=3), [9396](https://reporting.cgiar.org/reports/result-details/9396?phase=3), [1238](https://reporting.cgiar.org/reports/result-details/1238?phase=1), [6823](https://reporting.cgiar.org/reports/result-details/6823?phase=4)] Soil Health Monitoring in Tunisia: The utilization of satellite-based remote sensors to monitor soil health in Tunisia is highlighted, emphasizing key indicators such as NDVI, SMI, NDSI, SBI, and BSI. [[15722](https://reporting.cgiar.org/reports/result-details/15722?phase=4)] This monitoring aims to enhance territorial management and identify vulnerable zones for targeted interventions. [[1545](https://reporting.cgiar.org/reports/result-details/1545?phase=1), [13226](https://reporting.cgiar.org/reports/result-details/13226?phase=4)]
2. Soil Salinization Challenges: The challenge of soil salinization as a significant form of land degradation is explored, with remote sensing proving to be a superior method for assessing soil salinity compared to traditional approaches. [[9398](https://reporting.cgiar.org/reports/result-details/9398?phase=3), [9396](https://reporting.cgiar.org/reports/result-details/9396?phase=3)] A review of existing studies emphasizes the need for improved methodologies and stakeholder collaboration, particularly in irrigated lands in Egypt. [[17812](https://reporting.cgiar.org/reports/result-details/17812?phase=4), [18614](https://reporting.cgiar.org/reports/result-details/18614?phase=4), [9396](https://reporting.cgiar.org/reports/result-details/9396?phase=3)]
3. Workshops and Collaborations: Recent workshops in Egypt and India focused on fostering South-South cooperation regarding soil salinity management. These gatherings aim to develop roadmaps for effective monitoring and mitigation strategies to enhance food security and sustainability.
4. Disaster Risk Management in Central Highlands of Africa: A review of disaster risk management in Rwanda, Burundi, and the DRC reveals a high risk of natural disasters exacerbated by climate change and land management practices. The study calls for comprehensive risk mapping and data collection to better inform disaster management policies. [[13226](https://reporting.cgiar.org/reports/result-details/13226?phase=4), [1545](https://reporting.cgiar.org/reports/result-details/1545?phase=1)]
5. Global Perspectives on Soil Salinity: Assessments of soil salinity dynamics in Uzbekistan and Egypt provide insights into the impact of climate change on soil conditions and agricultural productivity. Strategies for sustainable management are deemed crucial for addressing these challenges. [[9396](https://reporting.cgiar.org/reports/result-details/9396?phase=3), [12310](https://reporting.cgiar.org/reports/result-details/12310?phase=4), [1545](https://reporting.cgiar.org/reports/result-details/1545?phase=1), [16956](https://reporting.cgiar.org/reports/result-details/16956?phase=4)]
6. Innovative Practices and Mapping Efforts: Innovative techniques, such as a new soil leaching method in Egypt, show promise in reducing soil salinity. [[6823](https://reporting.cgiar.org/reports/result-details/6823?phase=4), [9396](https://reporting.cgiar.org/reports/result-details/9396?phase=3)] Additionally, hotspot mapping in Egypt and Morocco utilizes real-time geospatial data to inform agricultural practices and resource management strategies. [[1545](https://reporting.cgiar.org/reports/result-details/1545?phase=1), [1546](https://reporting.cgiar.org/reports/result-details/1546?phase=1)]
7. Environmental Impact Studies: Research in Ethiopia evaluates the effectiveness of soil and water conservation interventions in improving vegetation and reducing soil erosion, while a combined land degradation index is developed to monitor environmental changes in the Upper Blue Nile Basin. [[7551](https://reporting.cgiar.org/reports/result-details/7551?phase=3), [4745](https://reporting.cgiar.org/reports/result-details/4745?phase=3)]

Overall, the report underscores the importance of integrating remote sensing technologies, stakeholder collaboration, and sustainable management practices in combating soil salinity and enhancing agricultural resilience in various regions.

Topic 14 - Acid Soil Management for Crops

The Acid Soils Dashboard provides comprehensive data to researchers and extensionists regarding lime requirements, yield responses to liming, and profitability for various crops in sub-Saharan Africa. [[6807](https://reporting.cgiar.org/reports/result-details/6807?phase=4)] This resource aims to enhance understanding and management of acid soils, focusing on key crops such as cereals, legumes, and tubers. [[6807](https://reporting.cgiar.org/reports/result-details/6807?phase=4), [8320](https://reporting.cgiar.org/reports/result-details/8320?phase=3)] Recognizing the growing concern over soil acidity, particularly subsoil acidity, the dashboard serves as a crucial tool for assessing the profitability of liming and contributes to discussions on soil health investment.

In Ethiopia, soil acidity significantly hampers agricultural productivity, particularly in wheat-based systems. [[11454](https://reporting.cgiar.org/reports/result-details/11454?phase=3), [8320](https://reporting.cgiar.org/reports/result-details/8320?phase=3)] A recent study developed site-specific lime recommendations by evaluating various models, finding that the LiTAS model was most effective. [[8318](https://reporting.cgiar.org/reports/result-details/8318?phase=3), [6811](https://reporting.cgiar.org/reports/result-details/6811?phase=4)] The findings indicated potential yield increases of 22% and 19% for wheat and barley, respectively, when addressing soil acidity through liming. [[8320](https://reporting.cgiar.org/reports/result-details/8320?phase=3), [11454](https://reporting.cgiar.org/reports/result-details/11454?phase=3)] The economic assessment revealed that lime applications could lead to substantial cost savings compared to fertilizers, advocating for integrated soil fertility management. [[8320](https://reporting.cgiar.org/reports/result-details/8320?phase=3), [6807](https://reporting.cgiar.org/reports/result-details/6807?phase=4), [6815](https://reporting.cgiar.org/reports/result-details/6815?phase=4)]

Moreover, an analysis of the combined effects of climate change and soil acidity on crop suitability in Ethiopia showed that while certain crops might maintain or gain suitability, others face significant reductions, emphasizing the need for proactive measures against soil acidification. [[14090](https://reporting.cgiar.org/reports/result-details/14090?phase=4)]

The effectiveness of different soybean genotypes in acidic soils was also explored, revealing significant performance variations. [[582](https://reporting.cgiar.org/reports/result-details/582?phase=1)] Some genotypes exhibited better yields in limed conditions, while others were less affected by acidity, highlighting opportunities for breeding acid-tolerant varieties.

Overall, the studies underscore the necessity for localized research and tailored management strategies to enhance agricultural resilience and productivity in the face of soil acidity and climate change in sub-Saharan Africa. [[14090](https://reporting.cgiar.org/reports/result-details/14090?phase=4), [15852](https://reporting.cgiar.org/reports/result-details/15852?phase=4)]

Topic 4 - Agroecological Practices for Soil Conservation

The text discusses various initiatives and research efforts aimed at enhancing agroecological practices and soil conservation in Tunisia, particularly in the semi-arid regions of Kef and Siliana. [[6630](https://reporting.cgiar.org/reports/result-details/6630?phase=3), [16706](https://reporting.cgiar.org/reports/result-details/16706?phase=4), [1088](https://reporting.cgiar.org/reports/result-details/1088?phase=1), [18315](https://reporting.cgiar.org/reports/result-details/18315?phase=4), [16707](https://reporting.cgiar.org/reports/result-details/16707?phase=4)] The CGIAR Initiative on Agroecology has spearheaded the development of Agroecological Living Landscapes (ALL) by collaborating with local stakeholders to co-create innovative agricultural practices tailored to their needs. Key achievements include improved soil health and productivity through integrated agroecological innovations, such as the application of ammonium fertilizers, which enrich soil bacterial communities and enhance crop yields. [[1175](https://reporting.cgiar.org/reports/result-details/1175?phase=1), [18315](https://reporting.cgiar.org/reports/result-details/18315?phase=4), [16685](https://reporting.cgiar.org/reports/result-details/16685?phase=4)]

Over 230 farmers have adopted practices such as producing their own forage seeds, leading to better soil fertility and animal feed quality amidst challenges like drought and high fertilizer costs. [[16706](https://reporting.cgiar.org/reports/result-details/16706?phase=4)] Training and capacity-building efforts, including the introduction of composting techniques and the use of native legume species like Sulla, have further improved soil quality and livestock productivity.

The text also highlights the importance of participatory research and farmer engagement in implementing sustainable agricultural practices, emphasizing the need for adaptive strategies to combat climate change and promote environmental resilience. Various projects, including those focused on soil and water conservation, agroforestry, and biofertilization, have been initiated to address soil degradation, improve livelihoods, and enhance ecosystem health. [[6630](https://reporting.cgiar.org/reports/result-details/6630?phase=3), [16706](https://reporting.cgiar.org/reports/result-details/16706?phase=4), [7489](https://reporting.cgiar.org/reports/result-details/7489?phase=3), [1090](https://reporting.cgiar.org/reports/result-details/1090?phase=1), [18315](https://reporting.cgiar.org/reports/result-details/18315?phase=4)]

Overall, the initiatives reflect a shift toward more sustainable farming practices in Tunisia, integrating modern scientific approaches with traditional knowledge to foster community resilience and ecological balance in agricultural systems. [[6630](https://reporting.cgiar.org/reports/result-details/6630?phase=3), [16706](https://reporting.cgiar.org/reports/result-details/16706?phase=4), [1088](https://reporting.cgiar.org/reports/result-details/1088?phase=1), [18315](https://reporting.cgiar.org/reports/result-details/18315?phase=4), [18400](https://reporting.cgiar.org/reports/result-details/18400?phase=4)]

Topic 12 - Sustainable Agroecological Practices Initiative

The report on the Agroecology Initiative outlines the impact of natural farming practices in Andhra Pradesh, India, emphasizing community-managed natural farming (CMNF) as a sustainable alternative to chemical agriculture. Launched in 2016, CMNF aims to enhance soil health, biodiversity, and farmer livelihoods by utilizing indigenous microbial consortiums and eliminating chemical inputs. [[15542](https://reporting.cgiar.org/reports/result-details/15542?phase=4), [7148](https://reporting.cgiar.org/reports/result-details/7148?phase=3)] The initiative highlights the importance of biological sciences in creating resilient farming systems for smallholder farmers, who make up a significant portion of the agricultural workforce in India.

In Madhya Pradesh, the Krishi Kund practice has emerged as a cost-effective method for restoring degraded lands, utilizing organic amendments in small cylindrical pits to improve soil conditions and retain water. [[19890](https://reporting.cgiar.org/reports/result-details/19890?phase=4), [17454](https://reporting.cgiar.org/reports/result-details/17454?phase=4)] This approach not only enhances agricultural productivity but also helps mitigate rural migration among tribal communities.

The "Nature Positive Solutions" project in Maharashtra focuses on agroforestry systems to address environmental challenges and enhance nutritional security. It successfully established diverse models such as Wadi and Bamboo systems, leading to improved biodiversity and carbon sequestration. [[20036](https://reporting.cgiar.org/reports/result-details/20036?phase=4), [19984](https://reporting.cgiar.org/reports/result-details/19984?phase=4)]

The report stresses the urgent need for sustainable agricultural practices to counteract the rapid degradation of food, land, and water systems globally. It advocates for the development of Agroecological Living Landscapes (ALLs) that integrate ecological principles into farming, enhancing resilience and sustainability. [[7150](https://reporting.cgiar.org/reports/result-details/7150?phase=3), [20036](https://reporting.cgiar.org/reports/result-details/20036?phase=4)]

The Agroecological Homestead Model (AHM) in Madhya Pradesh exemplifies a holistic approach to improve nutrition and income for tribal farmers by utilizing degraded lands more effectively. Initial results show significant improvements in dietary diversity and soil health.

Recommendations from the report include leveraging traditional knowledge, enhancing women's involvement, and fostering collaborations among stakeholders to scale successful agroecological practices. The overall emphasis is on a systems-oriented approach that addresses the multifaceted challenges of agriculture, promoting sustainable livelihoods and environmental health while ensuring long-term resilience in rural communities. [[19984](https://reporting.cgiar.org/reports/result-details/19984?phase=4), [18](https://reporting.cgiar.org/reports/result-details/18?phase=1), [14563](https://reporting.cgiar.org/reports/result-details/14563?phase=4)]

Topic 10 - Agricultural Lime for Soil Health

The series of technical briefs focus on the use of agricultural lime to address soil acidity in various African countries, including Nigeria, Burundi, Kenya, Ghana, Tanzania, Ethiopia, Rwanda, Uganda, Madagascar, Sierra Leone, Malawi, and Zambia. These briefs highlight the importance of lime application as a strategy to improve soil health and agricultural productivity in acid croplands. Each document likely discusses specific soil conditions, the benefits of lime treatment, recommended application rates, and potential impacts on crop yields and farming practices tailored to the unique agricultural contexts of each country. Overall, the initiative aims to enhance sustainable agriculture and food security across the region by mitigating soil acidity issues.