WHITE PAPER

A Global Agenda for Soil Health

Disclaimer: *This white paper is based on discussions held at the "Foundations of Resilience – A Thought-Leadership Roundtable on Advancing Soil Health for Nature-Positive Food Systems", which IFA has organized on 9 December 2025, in the margins of UNEA-7. This paper reflects areas of convergence among participants and key outcomes, but does not represent the official position of any individual organization.*

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The Soil Health Spectrum: A Diagnostic of Lingering Issues

Healthy soil is a strategic public asset. More than 95% of global food production depends directly or indirectly on soils and supports water regulation, nutrient cycling, carbon storage, and biodiversity functions (FAO, 2022; FAO & ITPS, 2015). However, FAO and the Intergovernmental Technical Panel on Soils estimate that approximately one-third of the world's soils are moderately to highly degraded to some extent due to erosion, loss of soil organic carbon, nutrient imbalance, salinization, compaction, acidification, pollution, unsustainable land management, and climate-related pressures (FAO & ITPS, 2015).

The implications are systemic: Soil degradation reduces agricultural productivity, weakens resilience to climate extremes, and accelerates biodiversity loss, with cascading effects on food security, water systems, and rural livelihoods.

Despite this, soil health remains institutionally fragmented. Responsibility is often divided across agriculture, environment, and water ministries, with limited coordination, no consistent lead institution, and insufficient visibility in multilateral processes. As a result, soil health rarely attracts sustained political attention or dedicated finance at a scale.

Soil: Foundational Yet Institutionally Orphaned

Evidence and expert analysis consistently show that soil health is foundational to food security, climate mitigation and adaptation, and biodiversity outcomes. However, this foundational role has not been translated into coherent institutional ownership.

In most jurisdictions, soil protection is embedded within sector-specific policies and regulations rather than governed through an integrated framework. Financing is similarly fragmented, with soil-related outcomes often supported indirectly through agricultural government programs, rather than through dedicated instruments. The result in many countries is a fragmented policy architecture that limits effectiveness and accountability.

Addressing this gap requires deliberate institutional design, including cross-ministerial coordination mechanisms with clear mandates, stronger accountability for delivery, and the elevation of soil health within national and international governance frameworks.

Recent initiatives such as Directive (EU) 2025/2360 on Soil Monitoring and Resilience represent an important step toward greater policy coherence by establishing a common EU framework for soil monitoring, assessment, and resilience planning. However, improved measurement alone is unlikely to restore soil health without clear institutional mandates, financing mechanisms, implementation capacity, and enforcement.

The Data Challenge: Fragmented, Inaccessible, and Contested

A wealth of data on soil health exists across FAO, research institutions, national surveys, and private actors - yet it is not always synthesized into decision-ready information. Implementation and progress are constrained by:

- Fragmentation across institutions and geographies, with limited interoperability.
- Trust and credibility risk: without standardized methodologies and transparent governance, soil outcome claims face the same skepticism that has undermined confidence in other environmental markets.
- Resistance to openly and freely share soil data, including national-level data, research data, as well as data collected by the private sector.
- Ownership and incentive conflicts: In advanced precision-agriculture markets, soil data is a commercially valuable asset, creating tensions between farmers, equipment providers, and input firms.
- Capacity gaps in lower-income contexts, where basic soil testing and extension services remain scarce, leaving farmers without actionable guidance.
- Measurement, Reporting, and Verification (MRV) requirements have, in many cases, become so burdensome that farmers opt out of programs, unless legislation requires them to.

The Carbon Opportunity - And Its Limits

Soil carbon sequestration is gaining traction on climate agendas and is considered a genuine potential. However, several important caveats exist:

Sequestration is highly context-specific, with outcomes dependent on the:

- Soil type: Clay- and silt-rich soils can protect more organic carbon because minerals bind organic matter and physically shield it from microbes. Sandy soils usually have lower capacity and faster turnover.
- Climate zone: Warm/wet climates can decompose added biomass quickly, while cooler climates often accumulate soil organic carbon more readily.
- Management practice & baseline: Carbon gains largely come from increasing carbon inputs through roots or manure and/or reducing losses through erosion or intensive tillage. If the soil is already high in soil organic carbon or well-managed, gains are smaller. If it is degraded, the opportunity to increase carbon is higher.

Soil's capacity to store carbon is finite, with important implications for policy design in terms of:

- Diminishing marginal gains: In degraded soils, improved management and organic inputs can increase soil organic carbon relatively quickly in the early years. However, the rate of sequestration declines over time as soils move toward a new equilibrium
- Time-bound sequestration opportunity: In many production systems, soil organic carbon gains tend to occur over decadal timescales and often decline as soils approach a new equilibrium, although outcomes vary substantially depending on soil type, climate, baseline conditions, and management practices. Soil carbon sequestration should therefore be treated as a time-bound mitigation opportunity, not a permanent linear sink.
- Implications for crediting and incentives: Policies and carbon-crediting frameworks should avoid assuming a constant annual sequestration rate (e.g., X tCO_2/ha/year) over long periods. Crediting methodologies should reflect declining sequestration rates, account for saturation effects, and distinguish between **carbon stock increases** (sequestration) and **carbon stock maintenance** (retention of existing gains).

Carbon stored in soils can be re-released if conditions change, representing risks for policy and finance frameworks, such as the reversal risk - a period of drought, a return to intensive tillage, land-use change (including conversion or drainage), erosion, or wildfire can reduce soil organic carbon stocks and result in renewed CO_2 emissions.

Implications for measurement and accounting: If soil carbon is treated as a climate asset, policy and market frameworks need to address permanence risk through:

- long-term monitoring and verification,
- clear rules for reversals and liability,
- conservative baselines, and additionality criteria.

Valuing soils only through carbon can obscure most of their broader benefits, including water retention, resilience of agricultural productivity, nutrient cycling, and biodiversity support. This can narrow policy ambition and reduce investor interest in outcomes that matter for food systems and ecosystem health.

Farmer Economics: The Long Return on Investment Problem

Integrated soil fertility stewardship is intrinsically a long-term investment. Benefits from improved soil health often materialize over multi-year periods, commonly ranging from approximately five to ten years depending on baseline conditions, production systems, climate, and management practices — a horizon that often sits poorly with the short planning cycles, thin operating margins, and cash constraints that characterize farming in many contexts around the world. This temporal mismatch is further compounded by:

- Land tenure insecurity reduces the incentive to invest in assets that the farmer may not benefit from.
- ‘Asset-rich, cash-poor farm balance sheets that constrain access to transition finance.
- Leased land arrangements that create split incentives between landowners and operators.

Soil Health, Food Security and Nutrient Management: The Agronomic Imperative

Soil health is a critical food and nutrition issue, not just an environmental or agricultural one. Healthy soils are essential for producing enough nutritious food, yet policy often treats soils separately from food security and public health. This disconnect obscures a basic fact: soil degradation and poor fertilizer management can contribute to lower yields, increased production risk, and reduced nutritional quality in some contexts.

Global nutrient imbalances are also soil health challenges and require differentiated policy responses: Nutrient imbalances are not just input-efficiency issues; they are a core driver of soil health outcomes. In some regions, nutrient surpluses contribute to soil degradation risks and water quality impacts, while in many parts of Sub-Saharan Africa and South Asia, persistent nutrient deficits further deplete soil fertility, limit yields, and reinforce food insecurity. This is why undifferentiated fertilizer prescriptions can have unintended consequences: blanket reduction targets or restrictions that make sense in nutrient-surplus systems can undermine soil fertility and yields in nutrient-deficient systems, where application remains below agronomic needs.

Micronutrient depletion is a soil health issue amplifying malnutrition: Depletion of soil micronutrients, including zinc, iron, selenium, and boron, is an important but often overlooked driver of hidden hunger. Even when calorie production is sufficient, micronutrient-deficient soils can reduce crop nutritional quality, weakening the link between agricultural output and nutrition outcomes. Addressing micronutrient depletion through soil health restoration and targeted agronomic interventions to enrich fertilizers is a globally underused lever for improving both crop quality and public health.

Food security depends on climate-resilient soils. Higher organic matter and balanced nutrients improve soils’ ability to withstand heat, drought, and flooding, which reduces yield losses. Incorporating integrated soil fertility management, including tailored nutrient strategies, into Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAPs) aligns environmental goals with food security.

Building Blocks for an Inclusive Policy Architecture

A Finance Bridge for the Transition Period

The most pressing near-term priority is operationalizing blended finance and risk-sharing structures specifically designed to support the first five-to-seven years of transition, during which soil restoration investments may not yet generate stable economic returns.

Recommended mechanisms include:

- Structured debt repayment deferrals to allow for a transition period.
- Partial guarantees and first-loss facilities to de-risk private capital deployment in soil stewardship investments.
- Value-chain offtake agreements that provide farmers with revenue certainty in exchange for soil outcome commitments.
- New market development for rotation of crops and diversified production systems that reduce financial dependence on commodity monocultures.

The design principle for these mechanisms should be simplicity and farmer-centricity: instruments that protect farmers from downside risk during transition while preserving upside potential once soil health is restored.

Transformation of Data into Decision Infrastructure

Improving the usability, not merely the volume of soil data is a prerequisite for scaling investment and policy action. Priorities include:

- Interoperability standards that allow soil data held by different institutions to be combined and analyzed at scale.
- Governance frameworks that clarify data ownership, privacy rules, and conditions for public-good access.
- ‘Fitness for purpose’ standards calibrated to specific decision contexts: farm-level advisory services require different data precision than corporate supply-chain reporting or national policy monitoring. Compensation, support, and guidance to farmers are key to avoiding data request overload.
- Novel forms of soil testing and crop advisory tailored to the needs of smallholder farming systems, particularly in underserved regions such as Sub-Saharan Africa and parts of South and Southeast Asia.

Embedding of Nutrient Management in Soil and Food Security Policy

Achieving durable food security outcomes requires nutrient management to be embedded - not merely referenced - across the policy, investment, and institutional architecture for soil health. Specific priority actions include:

- The incorporation of nutrient efficiency indicators into national soil monitoring frameworks and reporting instruments, ensuring that both surplus and deficit conditions are made visible for corrective action and transition support.
- Adoption of 4R Nutrient Stewardship principles (using the right source, at the right rate, in the right place, at the right time) as a foundational framework within public extension services and development-finance-supported agricultural interventions, adapted to local agronomic and environmental conditions.
- Improved soil monitoring infrastructure in nutrient-deficient regions through rapid, non-destructive soil sensing and digital soil mapping, particularly in Sub-Saharan Africa and South Asia; stronger links between soil diagnostic data and actionable agronomic recommendations and input access programs, to address both macronutrient and micronutrient depletion.

  Alignment of food security goals with national climate adaptation plans and integrated soil fertility management makes the agronomic case for soil investment even more legible to policy actors, development banks, and private stakeholders that may not otherwise engage with soil stewardship frameworks.

Levers for Governments, Finance and Value Chain Actors – A Summary

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Build the enabling infrastructure for credible soil outcomes

- Improve interoperability standards, clarify data ownership and access rules, and establish governance frameworks that make soil information usable across public and private systems, following FAIR (Findable, Accessible, Interoperable, Reusable) data management principles. The goal is comparability and continuity over time to avoid further proliferation of disconnected projects and initiatives.

- Ensure MRV requirements are not so burdensome that they exclude smallholders or deter adoption. For soil carbon in particular, prioritize pragmatic MRV pathways that balance scientific rigor with cost, feasibility, and farmer time constraints.

Make soil stewardship economically viable for farmers

- Redesign incentives to reflect the economics of transition. Align payments, finance, and commercial incentives with the reality that soil health returns often accrue over multiple seasons, while many farmers face immediate cash-flow pressure. Blended finance and public-private co-investment can help bridge the gap between upfront costs and delayed benefits.

- Use risk-sharing mechanisms for farmers, such as insurance innovations, first-loss capital, and flexible repayment structures, so that farmers are not penalized for taking transition steps that may temporarily affect yields or increase management complexity. This is especially important where tenure insecurity and thin margins make long-term investments rationally "too risky," even when agronomically beneficial.

- Make stewardship investable through value-chain arrangements, such as longer-term contracts, premium structures tied to outcomes, and service bundles (advisory + inputs + finance). These arrangements can reduce uncertainty, lower transaction costs, and ensure that farmers who generate public and private benefits can reliably capture a share of the value created.

Align policies and markets around a bundled soil value proposition

- Move beyond carbon-only framing to bundled soil outcomes. Position soil stewardship as a multi-benefit investment that improves resilience. This framing is more relevant to a wider set of decision-makers than carbon alone and better reflects the full suite of soil functions.

- Translate soil benefits into mandates and incentives that ministries can act on. A bundled value proposition should be legible to agriculture ministries (productivity and resilience), finance ministries (risk reduction and investability), environment ministries (water and biodiversity), and development institutions (livelihoods and food security). That means linking soil outcomes to concrete targets, budget lines, and procurement/financing criteria, not just aspirational narratives.

- Elevate nutrient management as a cross-cutting policy priority with differentiated approaches. Treat nutrient management as central to soil outcomes and food security, embedded in soil health frameworks, food-system strategies, and development of finance instruments.

Together, these levers shift the burden from farm-level responsibility to system-level enablement. Farmers operate within contracts, price signals, input markets, and risk structures that often penalize diversification and long-term soil investments. Durable change requires coordinated action across the value chains to ensure that transition costs and risks are shared, and the benefits of improved soil function are consistently rewarded.

CONCLUSIONS

Lasting improvements in soil stewardship depend on policy architectures that align incentives, accountability, and measurement across the food system - not only at the farm level. A first building block is soil monitoring: agreed indicators (e.g., on ground cover/erosion risk, nutrient balances, compaction, and soil organic carbon where appropriate) and consistent data collection make soil condition visible, comparable, and governable. This enables conditional support mechanisms, where access to public payments, credits, subsidies, tax exemptions, or technical assistance is linked to minimum soil improvement pathways. In addition, these measures contribute to moving policy away from "paying practices" toward rewarding verified performance or credible proxies.

In parallel, corporate stewardship and value-chain accountability can help create durable demand for soil outcomes. As large food and agribusiness companies face rising expectations to identify, prevent, and disclose environmental and nature impacts and risks in their supply chains, they increasingly need credible evidence of progress. That pressure translates into procurement requirements, supplier engagement, and co-investment in measurement and transition. Soils provide companies with an opportunity to invest in stewardship programs and transform their engagement from voluntary CSR into a responsible business priority.

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