wbcsd

Soil Investment Guidance Report

Soil Investment Hub

Contents

Introduction

Soil loss and degradation due to poor land management and agricultural practices pose a critical threat to society, our planet and business operations everywhere. This report aims to support corporate investment into impactful, high-value, and long-term solutions that protect and improve soil health.

Companies all along the value chain depend on the ecosystem services of healthy soils to succeed – from production and processing to manufacturing and retail. Many companies are working to conserve and restore soil health in their value chains to mitigate climate risks and build long-term resilience. Yet the comprehensive action needed to protect soils globally requires concerted cross-sector engagement and collaboration to achieve system-wide impact and progress.

Carefully planned investments based on a company's main sustainability and materiality concerns can help establish new systems that reverse today's extractive agricultural systems. This is vital to create a future where company success is tied to social and environmental benefits, and where capital is regenerated and shared with more than just shareholders, to benefit workers, communities, suppliers, consumers and others.

WBCSD Soil Investment Hub

The Soil Investment Hub aims to scale corporate soil investment strategies by being a platform for private sector soil health commitments, and by providing guidance and tools to navigate the complex landscapes of technical standards and to qualify and quantify soil health investments. The Hub connects the private sector to existing initiatives and coalitions that can mobilize finance, engage with farmers, and drive value chain collaboration.

Purpose of this guide

This report builds on WBCSD report, The Business Case for Investing in Soil Health, which sets out the business case for investing in soils and the steps needed to accelerate action. This guide and decision-making tools enable company CEOs and sustainability officers to plan for effective soil investments which will generate financial, social and environmental returns for the company and other stakeholders in the value chain. We have incorporated feedback from 40 WBCSD member companies and other key stakeholders to provide insight on best-in-class soil health investments and corporate decision-making models.

In the following sections, we highlight specific types of soil investments and steps that companies can take to reach their soil and land targets. The report provides examples of soil investments from the industry and guidance for companies to plan for high-impact soil investments to address their prioritized material issues.

While many companies have published ambitious climate and agriculture targets, there is limited public information available about how resources and capital are allocated to achieve these targets. This report will provide clear types of soil investments companies can use. Within the Soil Investment Hub, companies can also use the Soil Investment Toolkit to find further resources for how to monitor and report on the impact of these investments for the company and stakeholders.

Intended audience

The intended audience for this report is companies who wish to better understand opportunities for soil investments and how to develop effective soil investment plans for their value chain. It will also be helpful for those engaged in developing and defining climate and Land Degradation Neutrality targets by providing guidance on how to allocate resources to reach these targets.

How to use this guide

1.
Read the Business Case for Investing in Soil Health section for an overview of the motivation for soil investments.

2.
Go to the Types of Soil Investment Flows section to find an overview of the 13 soil investment mechanisms and examples from WBCSD companies.

3.
Go to the Soil Investment Process section to review four phases of soil investment planning that will guide companies towards impactful investments based on their materiality considerations.

4.
Refer to the appendices for additional resources and background information regarding soil health and transformative investment considerations.

1 The business case for investing in soil health

1 The business case for investing in soil health

Soils form the basis of sound ecosystems and agricultural productivity that sustain the health of society and our planet.

Soil health is commonly defined as, "the continued capacity of soil to function as a vital living system, within ecosystem and land-use boundaries, to sustain biological productivity, promote the quality of air and water environments, and maintain plant, animal and human health,".[1] However, poor land management – from unsustainable agricultural practices, forest management and grazing – has caused widespread soil erosion and nutrient loss.[2] Globally, 75 billion tons of topsoil are lost annually and about 33% of global soils are considered moderately or highly degraded.[3,4]

The impacts on soil health create cascading effects with the potential to disrupt entire industries.[5] Soil degradation exacerbates wide-ranging global risks including biodiversity loss, reduced carbon storage and water retention, increased pollution of waterways and flooding.[6] Soils are also the largest terrestrial carbon sink,[7] yet 23% of global GHG emissions are from land – the majority caused by the conversion of natural ecosystems to human uses and agricultural production.[5,8] Without major reductions in emissions from food and agricultural production, it will be impossible to meet the Paris Agreement's global climate goals.[9] Therefore, investments in soils and those that steward the land are investments in the long-term resilience of company operations and profitability, as well as society **(see Appendix A for further detail on soil risks and opportunities for business).**

The 2018 WBCSD report, The Business Case for Investing in Soil Health, details multiple benefits of investing in soils, from enhancing crop productivity and livelihoods to climate mitigation, improving water resources and protecting biodiversity.[10] In this report, we further detail how companies can plan for soil investments that will have the most material impact on the business, environment and society.

In its report, The Reality of Materiality, WBCSD provides an overview of materiality approaches for business.[11] The Global Reporting Initiative (GRI) defines materiality as, "the organization prioritizes reporting on those topics that reflect its most significant impacts on the economy, environment and people, including impacts on human rights."[11] This approach encourages companies to assess materiality from the business case and societal impact perspective and acknowledges that societal benefits can often have financial benefits for the company.

There are several materiality and reporting frameworks available for companies to track environmental and social impacts across the value chain (e.g., GRI, SASB, CDP, TCFD). However, few include specific soil health outcomes that can result from investments in soils. This guidance report, and wider work of the WBCSD Soil Investment Hub, will identify materiality impact categories that fit within these frameworks and are specific to the outcomes which can be generated through investments in soils.

Climate smart agriculture and agroecology

It is well-recognized that nature-based solutions – also called climate smart agriculture (CSA) – contribute significantly to climate mitigation and help address other environmental risks such as biodiversity loss and land degradation.[12,13] Agroecological principles characterize the value of nature-based solutions as practices based on diverse agricultural practices and millennia of Indigenous scientific knowledge, culture and food traditions.[14]

The Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES) Global Assessment on Biodiversity and Ecosystem Services stated that nature-based solutions are estimated to provide 37% of climate change mitigation until 2030.[15] Agroecological systems maintain the rights of Indigenous and producer communities to control and maintain their land and food sovereignty and to create value through diversity, knowledge sharing, responsible governance, and circular and solidarity economies.[14,16,17] Agroecology and CSA are recognized globally by groups such as IPBES, IFAD, FAO, IUCN, and others as integrated and cost-effective approaches to address a myriad of climate and social risks that arise from simplified and disconnected agricultural systems.

In 2018, WBCSD published business guidance for target-setting across the three pillars of CSA: productivity, resilience and mitigation.[13] Furthermore, soil investments in CSA can also address social issues such as human rights and social and environmental justice. The public may perceive investments without these components as marketing investments with little to no environmental or social benefit, commonly referred to as "greenwashing".[18]

37%

Of climate mitigation needed between now and 2030 can be provided by nature-based solutions

2 Types of soil investment flows

2 Types of soil investment flows

There are several different types of capital flows that companies can use to invest across asset classes and strategies to achieve long-term, sustainable impact for soil health.

For example, companies can invest in producers and suppliers to support CSA and procurement strategies. Companies can also invest in private research organizations, government policies and start-ups to generate innovative solutions for soil health at scale. These investments (i.e., capital or resources that companies can allocate to improve soil health) can generate financial, environmental, and social value for the company and stakeholders across the value chain (see Figure 1 for an example from a manufacturing consumer packaged goods (CPG) company).

Across WBCSD member companies, we found over 50 soil investment cases which we divided into 13 mutually exclusive categories. Capital used to invest in soil health can support the adoption of on-farm regenerative practices – such as no or reduced tillage and cover cropping – through financing field trials, loans to producers for machinery or inputs, and funding for technical assistance. In addition to grants and low-interest loans, companies can incentivize conservation practices through ecosystem service payments and carbon markets. Companies can also allocate funding to build consumer demand and awareness for the importance of soil health through marketing and education.

Each type of investment mechanism will have a distinct connection to material impacts and types of financial, environmental and social returns. These material impacts also create different levels of returns over short-term to long-term time horizons, which may be specific to the company's place in the value chain (see Table 2 for examples of each soil investment mechanism from WBCSD companies across various industries and geographies).

Figure 1: Soil investment flows

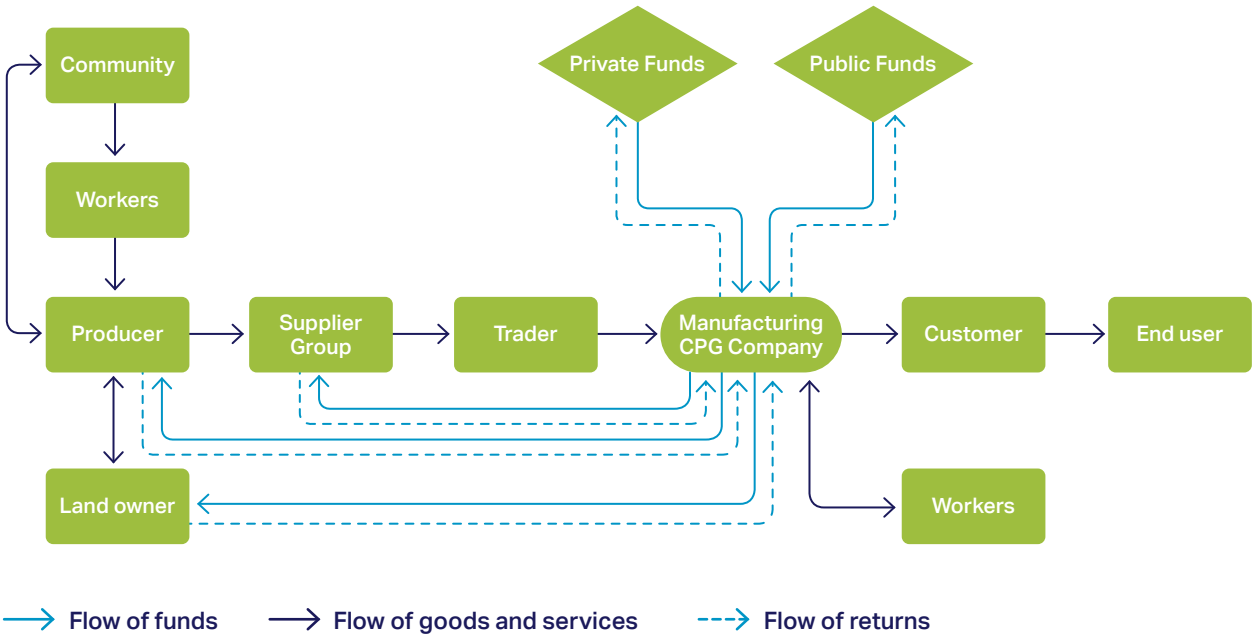


Table 1: Description of soil investment mechanisms

Mechanisms	Description
Capacity building with farmers or suppliers	Capacity building with farmers or suppliers works to create and share knowledge so that growers are better equipped to practice effective sustainable soil management and suppliers are able to identify, find and source more sustainable ingredients.
Capital grants	Grants are capital contributions for producers, suppliers, contractors and other stakeholders who provide a service or contribution that support the company in their soil and sustainability goals, for example grants that cover new equipment and other farm transition costs.
Capital loans and lending	These investments may include expending capital, such as flexible loans and blended financing, for producers or suppliers along the value chain to invest in improved practices and infrastructure which can conserve, restore and regenerate soil health. Outcomes such as improved yield, efficiency and resilience will support the return on investment.
Carbon credits and offsetting	Companies may choose to participate in carbon markets or pay for carbon credits, either publicly or privately funded.
Company research and pilot programs	Companies can invest in research, both internally or with external partners. Research investments can include pilot products, projects or farms that the company hopes to replicate and expand in order to improve practices and/or the measurement of impact across the value chain.
Direct soil investment	With a direct soil investment, companies acquire their own land or soil assets to deliver direct impact on the health of soils as part of their operations.
Ecosystem services payment schemes	Companies can pay land stewards and growers for the services provided by their land, such as watershed protection, biodiversity, soil conservation, carbon sequestration and others, either through payments or market schemes.
Education and marketing	These investments help to market soil health practices and related products to consumers to create demand. This may include educating consumers, employees and supply chain players about the value of soil health practices and investments.
Monitoring, reporting, and verification (MRV) investment	MRV investments can help companies track and communicate verifiable results from their soil investments and targets. This can be used to bolster the impact of other soil investments by monitoring outcomes and sharing knowledge.
Policy	Investments to enhance the policy environment through advocacy (e.g., Food Policy Alliance, lobbying dollars) and through financial/climate/nature disclosures (e.g., LDN, TNFD).
Start-ups	Companies may invest in start-ups, such as those that develop innovative new technologies, which can work to assist growers in the sustainable management of soils.
Sustainable procurement and insetting	Sustainable procurement targets investments through the purchasing of agricultural goods that meet specific sustainability standards or requirements.
Technical support to investors	Technical support links investors to valuable soil projects by facilitating collaboration, tracking progress, improving operational processes and maximizing impact.

Table 2: Examples of soil investment mechanisms from WBCSD member companies

Company	Soil health investment	Type of investment	Description
Bayer Input Brazil, USA	Bayer Carbon Initiative	Carbon credits and offsetting Investment target total USD $5.8 million	Bayer provides a yearly cash payout for the verified and validated practices enrolled farmers have implemented, by the acre. Practices include beginning or continuing to practice no-till/strip-till and/or cover cropping on enrolled acres and providing relevant documentation.
Cargill Trader USA	Soil and Water Outcomes Fund	Ecosystem Services Payment	The Soil and Water Outcomes Fund provides financial incentives directly to farmers who transition to on-farm conservation practices that yield positive environmental outcomes such as carbon sequestration and water quality improvement. It provides new market opportunities and revenue streams for farmers by selling these environmental outcomes to the public and private beneficiaries.
Danone Manufacturer USA	Soil Health Program	Capital grants Investment target total USD $6 million	Funding is provided directly to farming partners for adopting regenerative agriculture practices. There are now 82,000 acres enrolled in the Soil health program, with goal to reach 100,000 acres by 2022.
General Mills Manufacturer USA	Regional Conservation Partnership Program (RCPP)	Policy	General Mills provided support for the Regional Conservation Partnership Program (RCPP) funding as part of the United States Department of Agriculture (USDA). General Mills lists their public policy actions in their sustainability reporting.
IDH NGO Global	Technical Assistance Manager of the AGRI3 Fund	Technical Support Investors	As Technical Assistance Manager of the AGRI3 Fund, IDH will structure and implement the best technological packages to meet the fund's goals. It will catalyze more and better investments to play a crucial role in risk reduction and pipeline development for investments that promote sustainable agriculture and forest protection.
Manulife Investment Management Timberland and Agriculture Landowner Global	Land management	Direct soil investment	Manulife Investment Management Timberland and Agriculture is contributing to climate stability, stating, "many of our farms use regenerative agriculture practices such as cover-cropping and no-till or low-till farming to maintain/enhance soil health. Such practices can preserve or increase soil organic matter, water content and fertility, and reduce input costs for fertilizers and tilling." They also state that 100% of the forests they manage are certified sustainable.

Table 2: Examples of soil investment mechanisms from WBCSD member companies continued

Company	Soil health investment	Type of investment	Description
Nestle Manufacturer France	Living Soils Initiative	Company Research and Pilots	Nestle is piloting and investigating landscape regenerative agriculture programs and engaging suppliers and other stakeholders to accelerate the adoption of conservation agriculture practices by farmers in their supply chain.
OCP Input Ivory Coast, Guinea, Nigeria, Ghana, Kenya, Burkina Faso, Tanzania, Togo and Senegal	OCP School Labs (OSL)	Education and Marketing	OCP engages farmers to tailor their products to fit each soil and each crop to meet real farmer's needs. For example, OCP has initiatives for farmers to expand their productivity in a sustainable and resilient fashion. OCP School Labs educate OCP farmer customers in Africa to use their fertilizers sustainably.
PepsiCo Manufacturer Global	Sustainable Farming Program	Capacity Building Farmers	The Sustainable Farming Program (SFP) is a means for engaging with growers to build capability, address relevant risks and encourage continuous improvement through fundamental agricultural practices that span the broad aspects of sustainability. The SFP Continuous Improvement Process is a cyclical process geared towards assessing, and then addressing, sustainability opportunities at the farm level within PepsiCo's agricultural supply chain.
Rabobank Bank Global	AGRI3 Fund	Capital loan Investment target total USD $1 billion	The AGRI3 Fund aims to mobilize additional public and private capital at scale to contribute to sustainable agricultural value chains and avert deforestation.
Unilever Manufacturer Global	Responsible Sourcing Policy (RSP), Procurement Framework, Reg. Ag Code for suppliers	Sustainable Procurement and Insetting	The RSP includes a set of Mandatory Requirements which all suppliers need to meet to be able to do business with Unilever. This includes environmental impacts, such as "business is conducted in a manner which embraces sustainability and reduces environmental impact," and social impacts, such as "land rights of communities, including Indigenous peoples will be protected and promoted."
UPL Input Global	Radicle Carbon and Soil Challenge	Start-ups Investment target total USD $1.25 million	The Radicle Carbon and Soil Challenge by UPL and Radicle Growth sets out to invest USD $1.25 million in two start-up companies that can positively impact and reduce the carbon footprint and improve soil health of the food value chain.
Walmart Retail Global	Project Gigaton	MRV	Through Project Gigaton, Walmart aims to avoid one billion metric tons (a gigaton) of greenhouse gases (GHG) from the global value chain by 2030.

3 Soil investment process

3 Soil investment process

Effective soil investments can play a vital role in establishing new production and supply systems that generate economic, social and environmental returns. The following sections outline the steps companies can take to plan for ambitious and effective soil investments.

Phase 1

Materiality assessment with soil health considerations

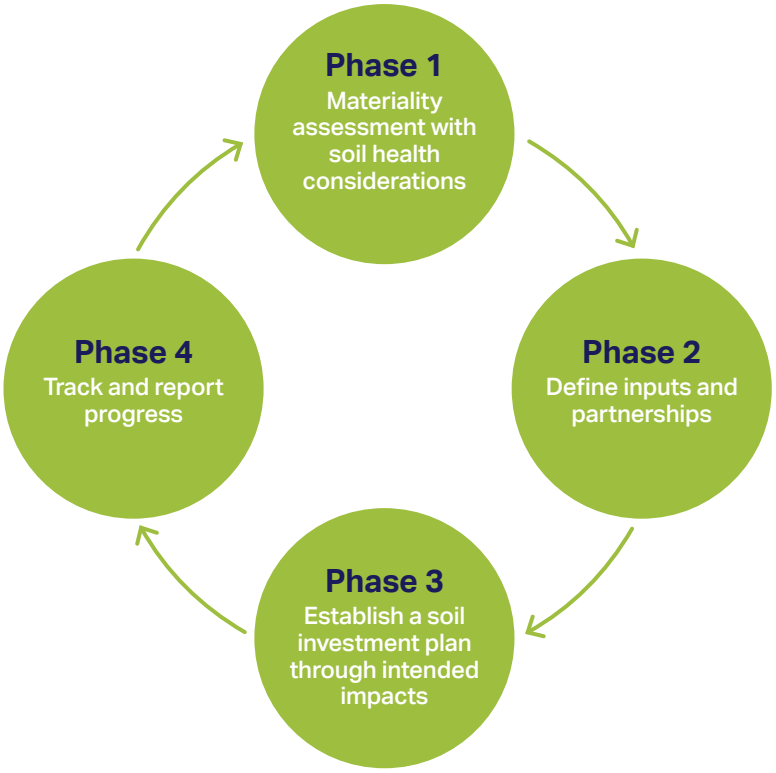
For companies to identify the most impactful soil investments, they should begin with a materiality assessment. This will define the social and environmental topics that matter most to their business, stakeholders and the land and soils in their value chain. There is increasing focus on materiality in reporting frameworks and accounting standards, such as the Global Reporting Initiative's (GRI) G4 guidelines and the Sustainability Accounting Standards Board (SASB) in the US.[19] However, few of these reporting frameworks provide for specific impacts on soil health.

As companies invest in soils as a strategy for reducing their climate and nature impact and improving social outcomes, materiality assessments will help determine which soil investments will have the most material impact within their value chains. This will help the companies prioritize the material topics and corresponding soil investment types. Including these considerations in the materiality assessment of the company will also lock-in soil health considerations as part of the mainstream business processes and across all business operations.

Steps companies should take within the materiality assessment process include identifying material topics through research on environmental trends and challenges, engaging internal and external stakeholders, and identifying risks and areas of opportunity.[11,19] By way of an example, the path to rapidly cut emissions relies on comprehensive soil health action from companies across their entire operations and value chains. The materiality assessment should, therefore, include soil health along the value chain of the company.

The section below details what materiality assessment considerations may include **(see Appendix D for further soil considerations in materiality)**.

Figure 2: Soil investment process



Defining sustainability priorities and company needs across value chains

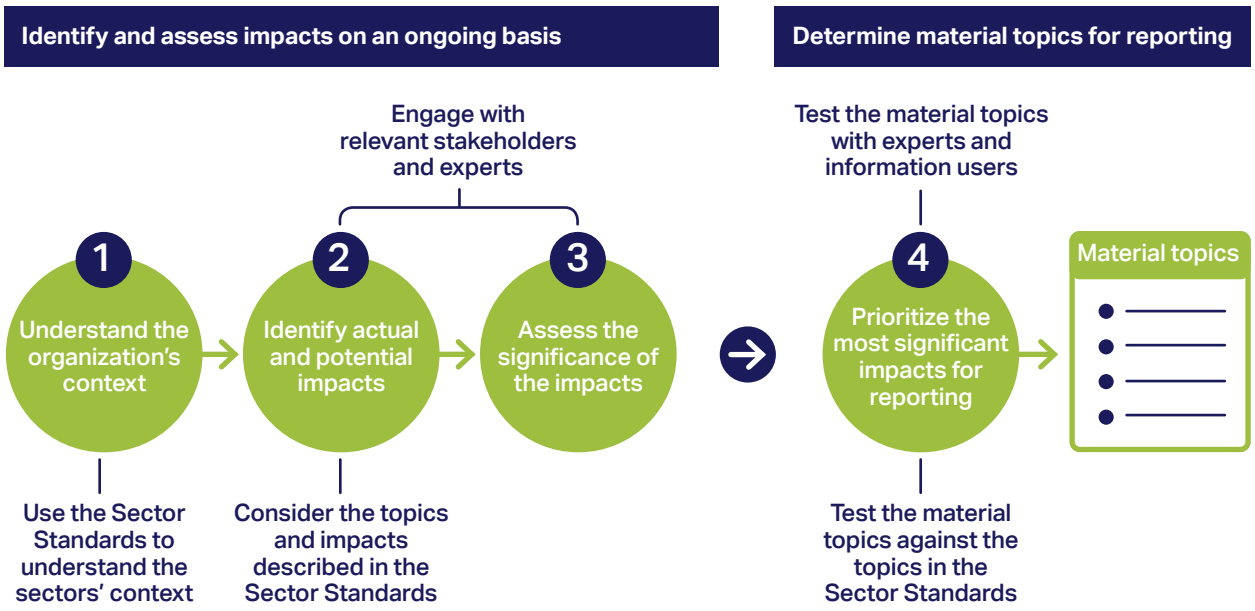
If soil investments do not address the top material priorities of the company, then investments may not accrue substantial returns for the company or address underlying risks. This highlights the importance of companies establishing strong internal processes for allocating capital for soil investments.

Factors to explore in the company's materiality assessment include accountability, biodiversity, climate, crop yield and diversity, economic performance, health and safety, human rights, land management, livelihoods, soil conservation and water. These material topics are high-level categories that show the interconnected systems that impact, and are impacted by, soil health. For example, specific soil health considerations can have wider ramifications for climate, water, livelihoods and beyond.

Moreover, these topics are adapted from materiality frameworks such as GRI, Science Based Targets, Global Impact Investing Network (GIIN), CDP, and others. By streamlining these frameworks, we can provide specific focus on the impact on soils and the systems that affect soil health – such as producer livelihoods and land management.

These topics may adapt and change as reporting standards are developed. Also, within each high-level materiality topic, companies may choose specific metrics and indicators to track the impact of their investments. For example, a company that enacts a capital loan for a producer to transition to soil health practices may want to evaluate the change in net-income for the producer and savings from reduced input use, both long-term and short-term.

Figure 3: Process to determine material topics



Source: Adapted from GRI 3 - Material Topics 2021[20]

Table 3: Materiality impact categories

Materiality impact category	Description	Sources risk
Accountability	Accountability includes indicators such as governance, verification, policy and risk.	CDP Forests, Financial Stability Board's (FSB's) Task Force on Climate-related Financial Disclosures
Biodiversity	Biodiversity includes indicators such as conservation priority characteristics, ecological restoration management area, species conservation status.	GRI, GIIN
Climate	Climate includes greenhouse gas (GHG) emissions avoided or sequestered and GHG disclosure indicators.	GRI, Science Based Targets, Greenhouse Gas Protocol
Crop yield and diversity	This category includes indicators that measure total number of different types of crops grown and product yield per hectare.	GIIN
Economic performance	Economic performance includes financial indicators such as revenue growth, total expenses and changes in net income.	GIIN
Health and safety	Health and safety includes worker health, safe work environment and worker training indicators.	GRI (occupational and customer health and safety), Leading Harvest
Land management	Land management includes non-agricultural indicators such as forest management, special site management and land use change.	Land Degradation Neutrality, UNCCD, NDPE IRF, FAO Voluntary Guidelines on Responsible Governance of Tenure
Livelihoods	Livelihoods indicators include producer profitability, price premiums, fair wages, employee training and land tenure indicators.	GIIN, Leading Harvest
Soil conservation	Soil conservation includes soil monitoring, nutrient management, and other practices that impact the soil and quality of soil.	Leading Harvest, GIIN, FAO SSM Protocol
Water	Water includes water consumption and water quality indicators.	GRI

Phase 2

Define inputs and partnerships

Once the company has defined its top material topics and priorities for soil health, it should explore the resources, sources of capital and partnerships available to amplify impact and funding sources.

Possible sources of capital may include shareholders, debt finance and public/private finance facilities. Companies looking to enhance soil investments should have conversations with shareholders, banks and public partners. This will help determine the available capital inputs that can be allocated to various soil investments. Companies should also consider internal capacity available to monitor soil investments and impacts.

Companies may also establish strategic partnerships to bundle financing and de-risk soil investments. Partnering with other investors, governments and companies can provide valuable alignment and help to create an enabling environment for comprehensive soil investments. For example, Danone North America partnered with rePlant Capital. The financial services firm will dedicate up to 40% of its USD $50 million impact investing fund to provide low-cost loans to Danone farmer partners to convert their farms to soil health or organic practices.[21] These partnerships can provide added value by facilitating dialogue with local stakeholders and ensuring fair distribution of both costs and benefits of the soil investments across the supply chain.[10,12] Companies can support this enabling environment through transparency and shared learning with soil health partners.[10]

Phase 3

Establish a soil investment plan through intended impacts

Companies should outline the intended impacts, both financial and non-financial, from the material topics and corresponding soil investments. The Soil Investment Toolkit is designed to help a company define the soil investment types that correspond to its top material priorities and identify indicators and metrics to measure the impact of each investment.

While soil investments have great potential for improving sales and revenue and reducing costs for businesses, it is important to mention that social, environmental and long-term returns, considering the current soil biodiversity and climate crises, are also crucial considerations that affect the finances of the company **(see Appendix B for more detail on innovative returns on investment)**.

Companies can employ multiple soil investment mechanisms to work together to address materiality topics and sustainability goals. For example, PepsiCo announced new Positive Agriculture targets in April 2021. Agriculture targets include: to spread regenerative farming practices across 7 million acres; eliminate at least 3 million tons of GHG emissions by the end of the decade; improve the livelihoods of more than 250,000 people in its agricultural supply chain; and sustainably source 100% of its key ingredients.[22]

To reach these goals, PepsiCo announced soil investments including: the Sustainable Farming Program (SFP) to build farmer capacity; investing in a start-up for circular, low-carbon and nutrient-rich potato fertilizer technology; sustainable procurement investments for 100% of key ingredients; and MRV investments to certify sustainable palm oil production in their supply chain, among others.[22] This is an example of progress towards transparency regarding how soil investments are spent and how they generate progress towards wider sustainability goals. As more companies report on their soil investments to reach climate and sustainability targets, the knowledge base for best practices and impacts achieved will continue to improve (see Table 2 of soil investment examples).

Phase 4

Track and report progress

Expectations for companies to report on the social and environmental impacts of their operations are rapidly evolving. Companies can use robust reporting frameworks to track the impact of soil investments and get ahead of new legislation. Initiatives such as CDP environmental disclosures, The Sustainability Consortium (TSC) THESIS, UNCCD LDN fund and Know the Chain supply chain benchmarking, among others, provide the infrastructure to report on land and supply chain climate impacts.

Transparency and knowledge sharing across companies can also support robust reporting frameworks. The Soil Investment Hub and Soil Investment Toolkit will provide specific indicators and metrics that connect selected material impact topics and soil investment types. These will help companies define baseline scenarios and the added value of each investment.

The overlapping crises of soil and biodiversity loss and climate change call for urgent and comprehensive action on soil. Companies that have established the infrastructure to set ambitious targets and report on progress will unlock further finance opportunities to deliver impact across their value chains. To fully evaluate impacts and opportunities for improvement, companies should analyze the success of their soil investments based on the impacts across all company operations and the entire value chain.

Soil Investment Toolkit

This report provides guidance for the steps a company can take to conduct a materiality assessment, define soil material impact priorities, set targets and track progress. Companies can also use the Soil Investment Toolkit to plan for soil investments and impact reporting.

The Soil Investment Toolkit is a planning tool that identifies the most appropriate soil investment mechanisms (e.g., loan, capacity development, etc.) based on the material issues identified by a company and provides a set of indicators to measure the impact of the investment.

The toolkit is designed for company sustainability officers to measure and track progress of soil investments.

The toolkit sits atop a database of 13 investment mechanisms and around 150 indicators and metrics to track the impact of soil investments. Business can use this tool to share knowledge on best practices for each specific soil investment type, based on their place in the value chain, and to collaborate for collective action.

By providing tools for companies to create investments that address a number of social and environmental priorities, each investment can help transform systems away from extraction from soils to a future of regenerating systems of capital for healthy ecosystems and communities.

4 Summary

4 Summary

Soil health investments can bring valuable financial returns for companies while building social and environmental resilience. Investments can deliver diverse benefits for the company's stakeholders and materiality – from producers and suppliers to customers and consumers – which will, in turn, generate financial value for the company.

Losing or degrading soil due to poor land management and agricultural practices is a critical and current threat to business operations everywhere. It is urgent for companies to begin generating soil investments and sound outcomes to reverse these climate and biodiversity crises.

This guidance report has outlined the steps companies can take to plan high-value soil investments. Companies can choose from the thirteen soil investment mechanisms to allocate resources at scale to meet sustainability targets and address key materiality concerns. Furthermore, the Soil Investment Toolkit will provide specific indicators and metrics for companies to track and communicate progress and impact. This addresses a key gap for soil investments today by encouraging transparency and accountability for companies to report progress and monitor how each investment helps to achieve their targets.

Soil investments should work to establish new systems where soil nutrients are regenerated, rather than extracted. This must be part of a global push for economic and agricultural transformations that reward companies for generating social and environmental benefits. In this way, companies investing in meaningful systems that regenerate soil health, community livelihoods and climate resilience will be more successful and profitable than their counterparts in the long term.

Appendices

A. Business case for investing in soil health

The risks of soil loss to companies are multi-dimensional, while investments in soils can provide new opportunities for transformation and innovation for companies within a changing climate.

For each dimension of soil health (see Figure 4), there are corresponding risks to companies due to soil loss as well as opportunities for company growth and innovation through investments (see Table 4 for examples).

Figure 4: Dimensions of soil health

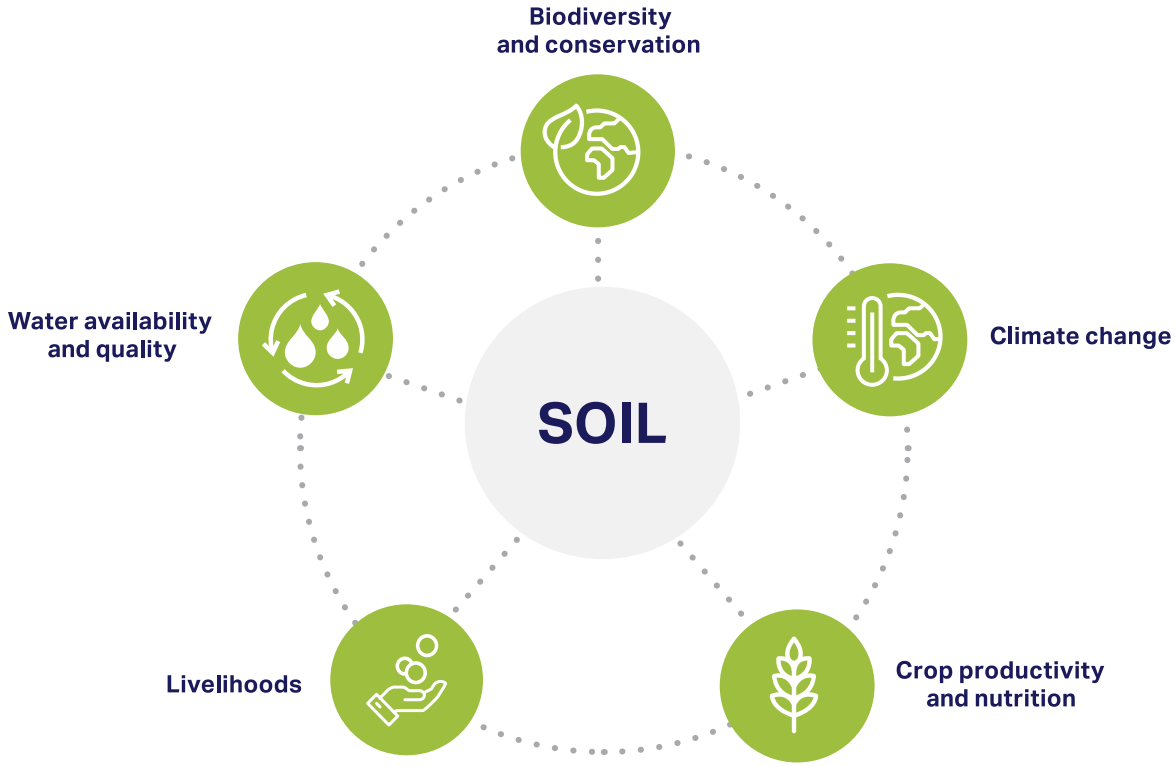


Table 4: Examples of risks and opportunities related to soil health

Soils	Risks (of inaction)	Opportunities for companies
Biodiversity and conservation 	**Operational:** Aquatic "dead zones" due to nitrogen and phosphorus, shortages due to pollinator collapse, soil and crop diseases, pests **Regulatory:** Regulations that limit the use of certain fertilizers and pesticides, potential human rights and Indigenous land rights violations **Reputational:** Driving biodiversity and ecosystem loss poses a reputational risk	Improved soil infiltration capacity Integrated pest management, lower input costs New products that enhance soil biodiversity, rather than degrade it
Climate change 	**Operational:** Economic and environmental disruption due to climate change impacts **Regulatory:** Mandatory cuts to GHG emissions, unreliable metrics and reporting for carbon stocks, Task Force on Climate-related Financial Disclosures (TCFD) **Reputational:** Public scrutiny of company climate impacts	Achieving targets to cut direct emissions and supply chain emissions (avoided and reduced emissions) Soil carbon stocks Consumer demand for sustainable products
Crop productivity and nutrition 	**Operational:** Disrupted supply chains, trade disruptions and costs, unavailable or high-cost commodities, higher production costs **Regulatory:** Taskforce on Nature-related Financial Disclosures (TNFD) **Reputational:** Product shortages, cost increases for customers, poor agricultural practices, and environmental degradation	Crop productivity and resilience Farmer and supply chain resilience Improved crop quality New climate smart products and markets Higher consumer demand Establish agroecological systems
Livelihoods 	**Operational:** Loss of local agricultural knowledge, productivity loss due to shortages of farmers and farm labor **Regulatory:** Reduced agricultural livelihoods due to trade, subsidies or other government policy **Reputational:** Exacerbating poverty, loss of peasant and land-based livelihoods and culture, social license to operate	Lower use of inputs leads to higher net income for farmers Digital tools and capacity building Improved local input and relationships
Water availability and quality 	**Operational:** Disrupted supply chains from flooding and drought, water scarcity, water pollution **Regulatory:** Loss of license to operate in areas with flood or drought **Reputational:** Lowered demand for high-water consuming products	Enhanced livelihoods in water stressed geographies Improved revenues and lowered maintenance and disaster costs

B. Innovations in returns on investment

From "business as usual" to a business future of regenerating systems

Conventional accounting systems that maintain a business-as-usual approach may focus solely on short-term and linear financial returns while externalizing the intangible, non-financial or qualitative social and environmental impacts of operations. This has led to unsustainable, extractive agricultural systems and the degradation of natural resources.[12] Through well-planned and transformative soil investments, businesses can establish new economic systems which will support a broad range of financial and non-financial returns on investment. These investments will work to create a future where company success is tied to human and environmental benefits, and where capital is regenerated and shared with more than just shareholders but also with workers, suppliers, consumers, and beyond.

True cost accounting and regenerative economies

Recently, researchers and global actors have called for new economic systems that give value to regenerative and non-financial success.[12] For example, True Cost Accounting models work to incorporate environmental and social impacts onto the balance sheets and decision-making models of companies and policymakers.[23,24,25,26] In 2018, WBCSD published a discussion paper, "True Cost of Food: Unpacking the value of the food system". It looks at how to improve the contribution of food systems to sustainability and human health by increasing economic efficiency and full cost accounting. There has also been increasing research into the implementation of true cost accounting in circular and regenerative economies.

These are new economic models that seek to regenerate resources, products, and materials in order to stay within planetary boundaries and regenerate natural systems without waste and pollution, according to the Ellen MacArthur Foundation circular economy principles.[27] Other groups that have touted the value of circular economies include Kate Raworth's Regenerative Economics, Capital Institute's Regenerative Capital, the World Economic Forum (WEF) Nature-positive economy and Ellen Macarthur Foundation's Circular Design for Food, among others.[12,28,29]

C. Soil health practices, barriers, and trade-offs

Soil health

The best way to measure and define soil health varies by region and biome.[30] Major threats to soil health include organic matter and biodiversity decline, compaction, pollution and erosion, all of which affect the water retention and ecosystem services that soils provide.[12] Soils are a main global reservoir for both diversity and carbon.[31] Soils store more carbon than the atmosphere and all vegetation combined.[32] However, the diversity of microbes and changing temperatures affect soil health metrics and soil carbon sequestration potential.[32]

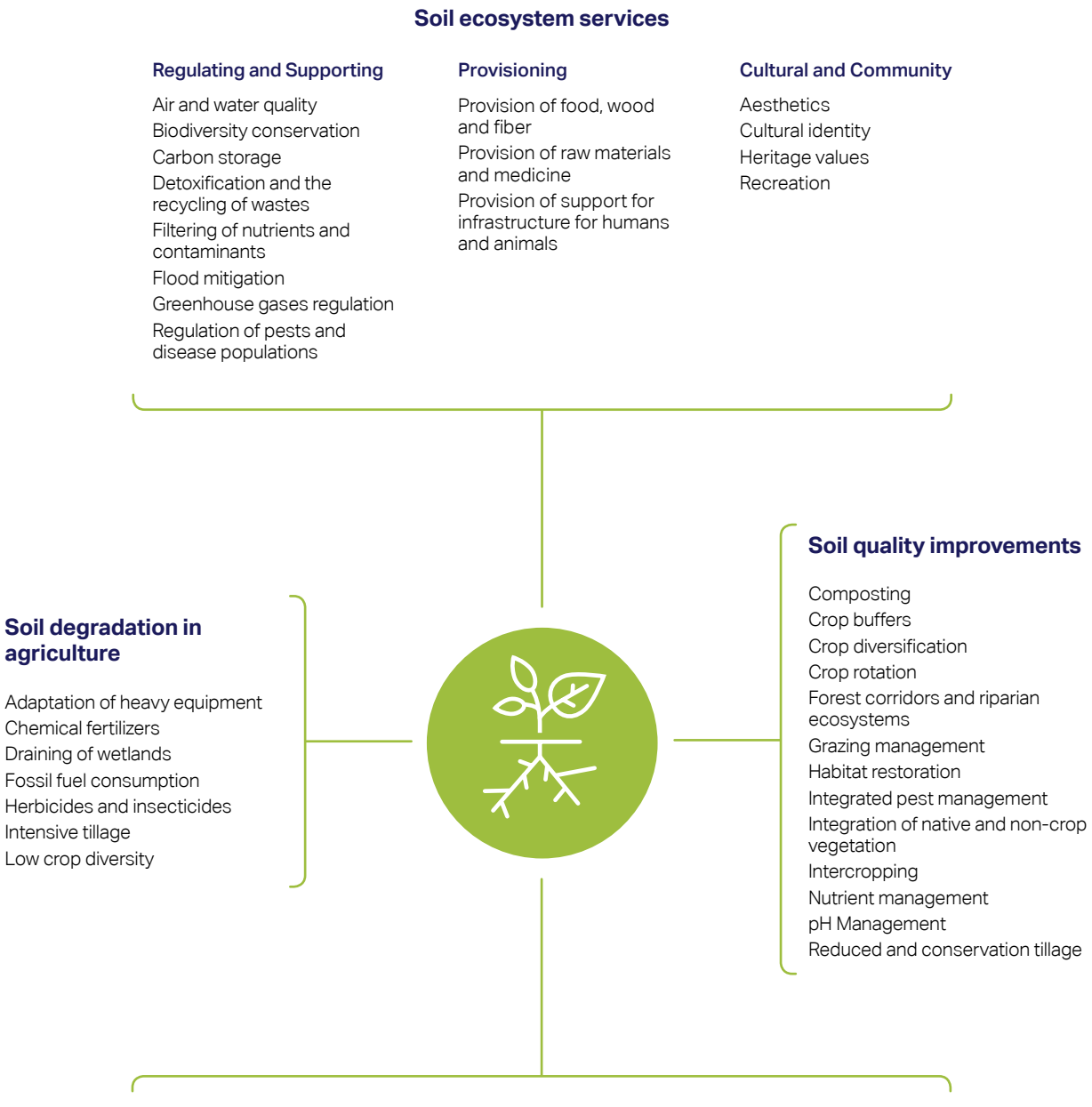
This means that companies and researchers must incorporate the complexities of soil health practices and physical, chemical and biological measurements into their targets to fully realize soil benefits.[1] For example, reducing soil disturbance (tillage) and maintaining plant cover with cover crops may improve the formation of beneficial mycorrhizal associations and regenerate soil organic matter.[31] Other practices such as increased tree cover, improved residue management, improved grazing management and improved grass species have also shown associations with improved soil functions.[31] Diversifying agricultural practices has also been shown to improve yields, increase profits, reduce chemical input use and improve soil lifespans in many scenarios.[31,33,34,35]

Barriers and trade-offs

In the transition to soil health practices, questions regarding land use, land availability, ownership and local socio-economic factors can provide complex considerations regarding trade-offs and barriers that producers may face. For example, transitions to soil health practices may require additional up-front costs for land, equipment and training. Access to capital and technical assistance can aid producers and suppliers in balancing these trade-offs and barriers. Research shows that these transitions can improve yields and net income once established.[33]

A company looking to enact extensive soil health investments may also have to incorporate trade-offs into their decision-making. Soils can be high-risk investments if unstable indicators, such as carbon sequestration, are the only expected outcomes. Investments that focus on whole-system approaches are likely to balance the trade-offs and risks.

Figure 5: Main ecosystem services provided by soils[1,12,37–40]



D. Other materiality considerations for soils

Climate and Scope 3 Emissions

The 2019 IPCC Special Report on Climate Change and Land found that 23% of global GHG emissions are from land use, a majority of which are from the conversion of natural ecosystems to human uses and agricultural production.[5,8] The CDP has also reported that supply chain emissions (Scope 3 emissions) are on average 11.4 times higher than operational emissions.[36] For food and beverage companies, Scope 3 sources are typically closer to 90% of a company's emissions, primarily from sourcing agricultural products.[5] Therefore, reductions in supply chain emissions are crucial to meet net zero goals. Setting Scope 3 emissions targets has become a business norm, according to the CDP.[36]

Global habitable agriculture land use for grazing and feedstuff production

Soil carbon sequestration

Healthy soils are a vital carbon sink and transitioning agricultural landscapes to sustainable soil management (SSM) practices can greatly improve carbon sequestration, crop yields, farmer livelihoods and other soil ecosystem services. Carbon credits may help to mobilize funding for soils, but there are logistical and methodological challenges. For example, soils can only sequester finite amounts of carbon and the methods for measuring the impermanence of carbon in soils is challenging. These methodological challenges result in a lack of trust among investors and a lack of harmony across soil organic carbon reporting and verification systems.[41]

A systematic review of soil carbon protocols found that none of the existing protocols is sufficient to guarantee positive carbon outcomes.[42] A study from Oxfam regarding soil carbon offsets also found that, "using land alone to remove the world's carbon emissions to achieve 'net zero' by 2050 would require at least 1.6 billion hectares of new forests, equivalent to five times the size of India or more than all the farmland on the planet."[43] Oxfam therefore demands that, "companies cut emissions in their own operations and supply chains first and foremost."[43]

Land management

The management of the land across company supply chains creates global impacts. Ecosystem loss and degradation due to deforestation and land conversion for top commodities such as beef, soy, palm oil and wood fiber exacerbates climate change and its effects. The CDP found that these commodities accounted for 27% of global forest loss between 2001 and 2015. Within that same time period, cattle alone accounted for 36% of tree cover loss associated with agriculture, according to findings from the World Resources Institute (WRI).[44] These practices also occupy a large portion of the habitable land area used for agriculture globally.[45] Grazing and feedstuff production alone use 80% of habitable agricultural land.[45]

Companies have a responsibility to reduce land conversion to conserve forests, grasslands, wetlands and peatland ecosystems.[5,8] They should drive innovation and support sustainable transitions from these high-risk production systems. While there are many land-based climate solutions that companies may enact, preventing destruction and degradation of forests and other ecosystems before they are lost will have the largest impact on mitigating climate change.[5,36]

Geographic regions

If a company has operations in geographies that are particularly vulnerable to climate shocks and ecosystem degradation, soil investments must prioritize these areas. Some biomes are close to reaching irreversible tipping points with global impacts if they are exceeded.[28] For example, the Amazon is rapidly becoming a carbon source rather than a carbon sink due to deforestation and ecosystem stress from climate change.[46] Other carbon sink biomes such as grasslands and peatlands are also under threat.

A 2021 report by WWF found that between 2018 and 2019 an estimated 2.6 million acres of grassland were plowed, primarily to make way for row crop agriculture. Within the Northern Great Plains, nearly 70% of these new conversions were for just three crops: corn, soy, and wheat.[47] Peatlands are another key global carbon sink, holding more than 40% of global soil carbon, and they have already declined by 15%.[8,48]

By prioritizing resources for areas at high risk of soil carbon loss and with high rehabilitation potential, companies can take crucial steps to halt irreversible climate impacts.[49] It is important to note that simply avoiding sourcing from these vulnerable areas will not improve local conditions or affect overall demand for the agricultural products.[5] Therefore, companies should work with other stakeholders to improve local conditions to address the long-term climate risks to the company.[5]

Social context

Investments in soils should be adaptable to the conditions specific to the producers and their communities. Engagement across the value chain must include consideration of socio-economic and political pressures, as well as specific soil conditions and cultural diversity.[10,12] These context-specific considerations rely on local knowledge and connections and companies should establish enabling conditions for small-scale producers and Indigenous communities to guide local priorities.[12,28,31]

70%

Of the Northern Great Plains new conversions were for three crops: corn, soy, and wheat

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About Croatan Institute

Croatan Institute is an independent, nonprofit research and action institute whose mission is to build social equity and ecological resilience by leveraging finance to create pathways to a just economy. Since our launch on Earth Day in 2014, we have worked collaboratively with more than 125 organizations, including environmental nonprofits, community development organizations, farmers and land stewards, impact investors, foundations, and government agencies, on complex problems at the intersection of finance, social equity, and ecological resilience. Our team has prioritized equity and inclusion, building relationships of trust with practitioners in the field and with movements for social and environmental change to expand the footprint and impact of our work.

The Institute's team includes a group of committed, interdisciplinary scholars, scientists, financial activists, advocates, and analysts who have developed a reputation for delivering rigorous research and actionable insight working on issues at the intersection of finance and social equity and inclusion, climate change solutions, farming and forestry, food systems, institutional accountability, business and human rights, and resilient communities, as well as by developing useful frameworks and data analytics for sustainable and impact investing.

In 2019, Croatan Institute published "Soil Wealth: Investing in Regenerative Agriculture across Asset Classes", which quantifies the current investment landscape surrounding regenerative agriculture to cultivate an understanding of how investors can allocate investments across asset classes to further efforts to mitigate climate change, improve soil health, and build community resilience through regenerative agriculture. Croatan Institute is also developing the concept of Rural Regenerative Organic Agricultural Districts (ROADs) to help agricultural producers and landowners finance soil wealth using land-secured financing mechanisms and other place-based investing approaches.

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