THE BUSINESS CASE FOR INVESTING IN SOIL HEALTH

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Contents

Foreword | 4

Executive summary | 5

Introduction | 6

1 **Securing and enhancing crops and supply chains** | 9

2 **Water resources and risks** | 12

3 **Climate change mitigation** | 16

4 **Biodiversity and conservation** | 20

5 **Supporting livelihoods with soil health** | 24

6 **Enabling environment - policy, finance and partnerships** | 27

Conclusions | 30

Next steps for investing in soil health | 31

Foreword

As the Chair of WBCSD, I am honored to present this landmark publication from the Climate Smart Agriculture project, born out of the dedicated collaboration of over 30 renowned researchers, practitioners and experts around the world, representing widely respected organizations. This report is another key piece in our effort to catalyze action from the business community to ensure the world will be able to sustainably feed a population of 9.5 billion people in 2050.

This report is a must-read for anyone involved in the food and agriculture sector for a number of reasons:

1. Soil health is a pressing global issue, needing immediate attention and action

The science is clear and the economic case strong: soil health is the foundation of our food system, it boosts the resilience of farms and supply chains to the effects of increased climate variability; and increasingly we are realizing that healthy soils have a critical role to play as a natural carbon sink if we want to meet the Paris Climate Agreement targets. The global potential for the cumulative increase in carbon stocks over 20–50 years could offset about one-quarter of the annual increase in global CO_2 emissions.

2. Now is the time to step up to shape the global agenda

The world is finally waking up to the need to mobilize nature-based solutions to address the imminent challenges of climate change. Global soils contain two to three times more carbon than the atmosphere. If we work with nature, we can reduce our greenhouse gas emissions, maximize carbon sequestration and adapt to the effects of a changing climate. The multitude of sessions focusing on land and agriculture at the 2018 Global Climate Action Summit strongly demonstrated that the world will be counting on land-based solutions.

3. Understand the business case - whatever your role is in the food and agriculture sector

Case studies from 10 companies across the agricultural value-chain on five continents demonstrate a compelling business case for investing in soil health, with the ambition to secure broad engagement of the global business community to take action on this issue at scale.

4. Understand why it's worth investing, despite this being a long-term investment

Regenerative practices in support of soil health are critical for maximizing both agricultural production, resilience and climate change mitigation. The carbon accumulation in soils would continue 20 to 30 years after the implementation of good practices if they are maintained, so making the case for committing to such long-term investment is critical. The examples exposed in this report allow actors in the agriculture and land use sector to understand and adopt approaches to take action.

5. Leverage new finance options

Increasingly, the long-term investments needed to make changes to key areas, such as irrigation, replanting, forestand ecosystem protection and soil health can be leveraged through innovative new finance streams. The report presents examples of emerging solutions bridging the gap between the needs of farmers and the limitations of banks such as the Agri3 Fund born out of the collaboration between UN Environment, Rabobank, IDH and the Dutch Development Bank.

As part of our commitment to re-imagine global agriculture, I envisage this defining work becoming the reference and basis for companies to mainstream large scale investment in soil health preservation and regeneration practices through understanding the environmental, social and business benefits.

Sunny Verghese,
Co-Founder and Group CEO, Olam, WBCSD Chair.

Executive summary

Increasingly, global companies are realizing that soils present a number of profound risks, but also timely opportunities.

Investing to improve soil health is not only an opportunity to increase crop productivity, secure supply chains and meet the growing food needs of our global population, but it is also an opportunity to protect and improve our precious water and biodiversity resources and enhance the livelihoods of the one in three people worldwide who work in agriculture.

Soil health also forms a key part of our action on climate change. Healthy soils can help us withstand the effects of climate change that we are locked into, whilst avoiding soil and land degradation and increasing soil carbon stores could help us deliver our commitments to reduce emissions and limit global warming to 2 ºC.

This publication originates from a series of conversations on soil health between business practitioners, researchers and experts, supported and facilitated by the WBCSD's Climate Smart Agriculture project. The momentum and urgency of this dialogue has driven the development of this publication and collaboration between more than 30 authors, representing leading organizations from around the world.

The purpose of this publication is to:

- highlight the multiple dimensions of the business case for investing in soil health;
- demonstrate how businesses across continents and sectors have already begun to invest; and,
- identify the key opportunities and next steps for scaling up action and investment in soil health.

The business case for investing in soils is diverse and abundant. It can include maintaining or increasing revenues, reducing or avoiding costs, enhancing reputation, or opening up finance opportunities.

Whilst an investment may be primarily focused on one outcome (e.g. for enhancing crop productivity or livelihoods, climate mitigation, improving water resources, or protecting biodiversity), the chapters demonstrate that an investment in soils for any one of these outcomes delivers multiple benefits. The strongest business case is likely to be built on both multiple arguments and consider the range of co-benefits.

Successful investments in soil health are frequently supported by strong partnerships: whether across value chains, landscapes or sectors. An investment in soil health delivers both private and public benefits, but adapting action to local social, environmental and economic contexts is key. Sharing costs and risks and mobilizing local knowledge, expertise and capacity helps ensure success.

Investing in soils is a long-term endeavor. An investment in soils is unlikely to yield immediate returns as soils can take decades to recover. **Yet, short-term investments can deliver long term returns.** Farmers and land managers can face barriers to changing practice, such as perceived risk or initial costs. Short-term investments that share risks and costs, or providing innovative finance options help overcome those barriers and lead to longer-term returns.

Four key next steps are identified:

1. Lower the hurdles to practices that promote soil health: for example, by exploring value-capture systems that suports the grower in offsetting the initial cost of implementing sustainable agricultural practices that promote soil health.

2. Take advantage of the national context and act locally: alignment with national soil health policies and the United Nations Convention to Combat Desertification (UNCCD) commitments such as the Land Degradation Neutrality baselines could open up financial options and technical support you can get for your projects in-country.

3. Build partnerships for soil health: explore supply chain cooperation, public-private partnerships and landscape alliances that spread costs, promote innovation and knowledge exchange and ensure place appropriate solutions.

4. Start now: the basis is there for piloting science-based solutions for integrating soils in reporting, accounting and supply chain assurance. For example, start by incorporating soil carbon into current carbon accounting and setting up cost-effective soil health monitoring early on for clear demonstration of results.

Introduction

Businesses are built on soil.

Soils underpin value chains by supporting crop productivity, biodiversity and livelihoods and they play a crucial role in two of the top business risks: water crises and climate change (1) (Figure 1). If we are to have sustainable businesses, economies and societies, they will be built on healthy soils.[1]

Globally, soils are under threat.

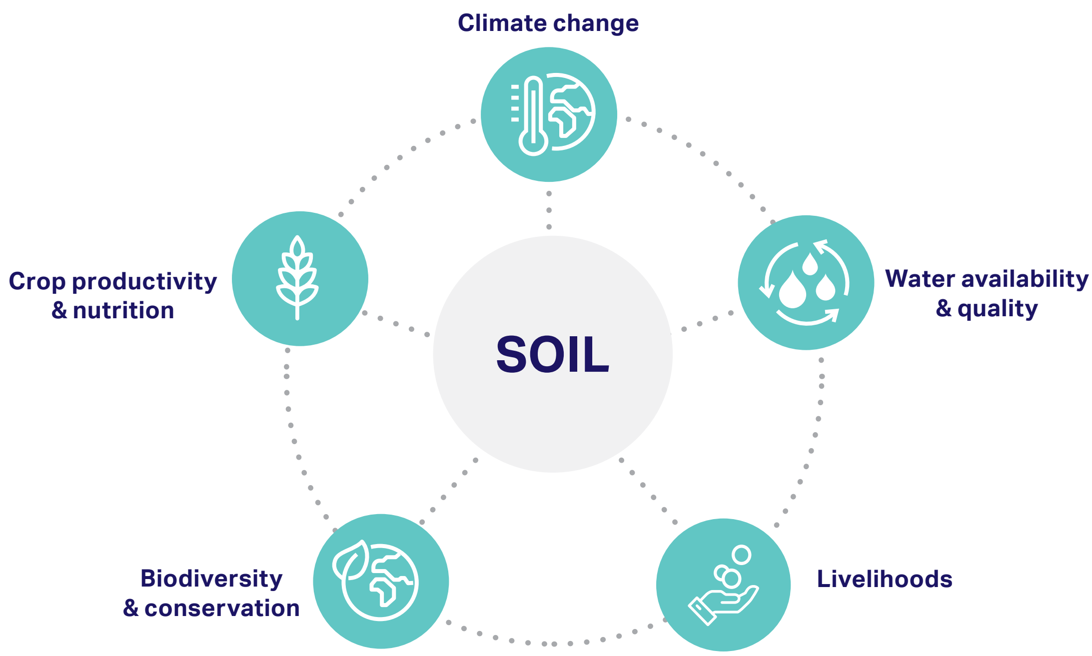
We face an urgent situation where a third of soils globally is moderately or highly degraded (2). This degradation is set to accelerate as land use pressures increase in line with demands for food, fibers and biofuels. Rising temperatures and frequency of extreme drought and rainfall events under climate change potentially threaten soils. Deforestation, urbanization or poor agricultural management drive soil erosion, loss of soil organic carbon, compaction, salinization, desertification and contamination.

Businesses, societies and ecosystems: we all pay the price of soil degradation.

Soil degradation destroys ecosystems and the services they provide to societies and economies. Whilst the effects of crop failure, loss of livelihoods, water pollution and ecosystem collapse will be felt by local farmers, foresters, communities and ecosystems, the long-term nature of soil degradation and the global effects of its contribution to climate change and biodiversity loss mean that future generations and the wider public also pay.

Businesses too will be paying the price of soil degradation and increasing land use pressures and climate change will enhance business risk. Soil and land degradation can cause agricultural commodity price volatility leading the business community to either bear the cost and reduce margins, or pass costs onto consumers. Fertility loss, loss of livelihoods and water stress from soil degradation means moving operations and adapting supply chains. At a global level, soil degradation means increased exposure to climate change risks in business.

Figure 1:
Soils support a wide range of services that underpin our societies, businesses and value chains.



[1] Here we use the term 'soil health' in its broadest sense. Whilst soil health can have multiple definitions and metrics in varying contexts, like human health, soil health can be recognised not only by a lack of negative symptoms but also by a wide range of positive outcomes.

Soils belong in the boardroom and on the balance sheet - they present risks and returns for every business.

The multifunctionality of soils presents numerous risks, but conversely investment in soil health offers numerous returns. Investing in soils can mitigate climate change and its associated risks, increase resilience to climate and water stress, promote biodiversity, and enhance livelihoods. These deliver benefits across the business, from maintaining or enhancing revenues and reputation, reducing costs, increasing resilience, or opening up new finance and investment opportunities.

Some businesses are already investing. However, there is an urgent need to increase and scale up internalization of soil externalities through valuation to account for the risks and benefits and further build the business case needed to drive investment.

Global frameworks set the scene for soil health.

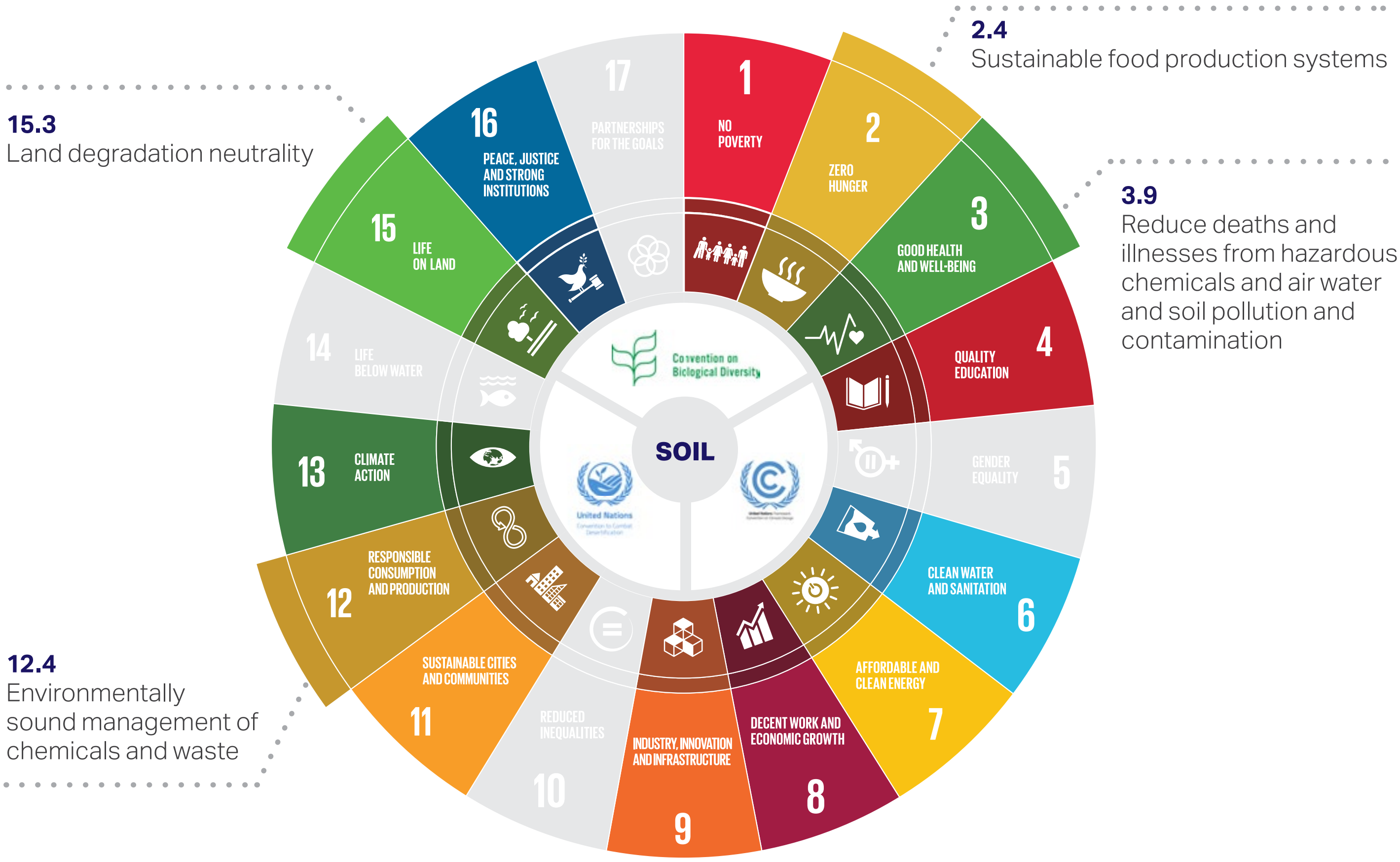
Soils sit at the intersection of the three UN conventions on climate change (UNFCCC), biodiversity (CBD) and desertification (UNCCD) and are increasingly seen as a focal point for advancing and integrating these programs (Figure 2).

In 2017, the Land Degradation Neutrality Fund was launched by the UNCCD to leverage USD $300 million to support private sector projects that combat land degradation, sequester carbon and improve livelihoods. Also in 2017, following the Koronivia decision on agriculture at COP23, soils are due to become part of the Nationally Determined Contributions (NDCs) and a key part of the global response to climate change. This builds on the momentum of the 4 per 1,000 initiative to increase soil carbon storage. A voluntary initiative launched by France during COP21, 4 per 1,000 has gained commitments from more than 250 civil society, public and private sector organizations to engage in a transition towards agriculture where soil carbon is increasing for climate mitigation and resilience benefits.

Soils are also explicitly mentioned in four of the Sustainable Development Goal (SDG) targets (Figure 2). Targets 2.4 and 12.4 focus on reducing contaminants to soils to reduce harm to human health, but the more relevant targets for this report are Targets 3.9 and 15.3. These relate to combating land degradation to support sustainable food production and terrestrial ecosystems respectively: acknowledging that soil degradation forms a substantial threat to these. Investments in soil that reduce land degradation deliver directly to SDG 3 and SDG 15.

However, soils play an integral role in delivering to many more SDGs, with some arguing that they deliver to 13 of the 17 (3) (Figure 2).For example, integrating soils into the nationally determined contributions will be central to target 13.2 if we are to mitigate and adapt to climate change in a manner that doesn't threaten food production as stated in indicator 13.2.1.

Figure 2:
Soils sit at the center of the UN conventions on desertification, climate change and biodiversity and delivers the key to solutions to many of the SDGs, with four specific relevant targets.



Making the business case for investing in soil health.

Business commitment to soils is key to achieving sustainability. Globally, businesses have a major influence on land management, either directly through operations (including owned, leased or managed land) or indirectly through value chains, markets and finance.

This report sets out the key building blocks of the business case for investing in soil health. We recognize that any business case for investing in soil health is multi-dimensional: an investment in soils means an investment in crop productivity and quality, water, climate mitigation and adaptation, biodiversity and livelihoods. Investing in soils may be primarily motivated by any of these return areas, but we believe the strongest case will capture all or a combination of the co-benefits.

It's important to note that investing in soils is a long-term endeavor. An investment in soils is unlikely to yield immediate returns, but a short-term investment in supporting practice change can lead to longer term returns.

In the chapters that follow, we highlight the multiple dimensions of the business case for investing in soils in turn. Each chapter identifies the key components for building the business case around revenues, costs, resilience, finance and investment as well as reputation while highlighting examples where the business case is already being made with business case studies. These are followed by a chapter on the supportive environments and partnerships needed to scale up investment, recognizing new regulatory and market-based mechanisms and ways of working are needed to transform the way we manage our soil resources for multiple benefits. We conclude by bringing the multiple dimensions of the soil business case together with our key recommendations for mobilizing investment in soil health and a sustainable future.

1

Securing and enhancing crops and supply chains

Framing the issue

Healthy soils are central to crop productivity. They are the medium for supplying the essential nutrients, water, oxygen and root support that plants need. Loss of soils or degradation of soil quality threatens crop productivity. With a third of our global soil resource thought to be moderately or highly degraded, protecting and enhancing soil quality is key to securing future crops and supply chains (2).

Every harvested crop removes valuable nutrients from the field, leading to a gradual loss of soil fertility. If soils are to remain fertile, these nutrients must be replaced by recycled farm products (e.g. livestock manure or crop residues) or commercial fertilizers. Poor farm management leads to neglected and degraded soils that prevent production of nutritious crops at acceptable yields. Some factors are beyond the farmer's control, but maintaining the soil in a healthy condition only results from deliberate management decisions - decisions that are critical for sustaining the abundant and income-generating harvest of healthy crops.

Plants require the proper proportions of at least 14 essential plant nutrients from the soil, all of which must be available from the right source, applied at the right rate, present at the right time, and located in the right place (4R Nutrient Stewardship,[2] IPNI, 2012). However, even when optimal nutrient management practices are used, poor soil physical and biological conditions can prevent crops from reaching their potential and fertilizer from being effectively used.

A farmer's soil must have good physical characteristics to allow crop roots to access water and nutrients. The soil's surface should be protected from crusting and erosion to maximize water infiltration, and the soil below the surface should be free from compacted layers that pose a barrier to root growth and water movement. The soil should be a proper habitat for a diversity of soil organisms beneficial to crop growth. Farm practices that provide balanced plant nutrition, encourage soil to remain unplowed when possible, leave crop residues in the field, and keep soils protected with cover crops all contribute to improving soil properties. These practices promote conditions where either inorganic or organic fertilizer can be most effectively used for crop growth.

[2] https://www.nutrientstewardship.com/

Investment in action

Nutrien: overcoming degraded soils in Zimbabwe

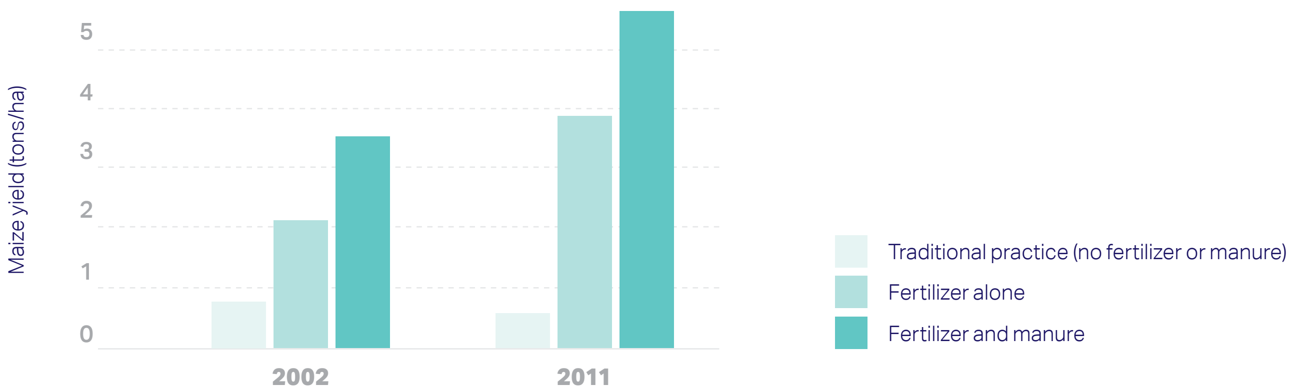
Widespread soil degradation in sub-Saharan Africa is largely a result of prolonged crop cultivation without adequate return of organic matter or plant nutrients to replenish the soil. These degraded soils are typically inherently infertile, sandy, and highly susceptible to erosion and nutrient loss, thus requiring care (8).

The average farm size in Zimbabwe is 2 hectares (ha), with maize the dominant crop. Maize yields remain very low (less than 1 ton maize/ha) in these fragile and highly degraded soils and yields gradually decrease over time when left without human intervention. With appropriate fertilizer application, maize yields initially increased to 2 tons/ha. Crops growing on degraded soils clearly benefit from fertilizer additions, but the soil properties are so poor that nutrient additions alone cannot overcome the constraints of the degraded condition (9).

When cattle manure supplements the applied fertilizer, the manure slowly begins to improve soil physical, chemical, and biological conditions. This improvement allows plants to more fully take advantage of the added fertilizer and maize yields were boosted to 3.5 tons/ha. When both manure and fertilizer were consistently used together over a ten-year period, maize yields further increased to 5.5 tons/ha (10).

Although cattle are the main livestock in the area, fewer than 40% of the farmers own cows. The scarcity of manure makes it especially important to use this resource carefully along with proper fertilization to build healthy soils. Larger plants with increased yields produce more leaves, stems, and roots that are returned to the soil, resulting in a cycle of more organic matter and enhanced root growth.

Graph 1:
Maize yields increased over ten years by application of both fertilizer and manure to restore degradated soils.



Main takeaways

1

Supporting crop productivity is not only about managing plant nutrition: wider soil health is important to allow crops to access water and nutrients and increases climate resilience.

2

Businesses need to promote and enable soil management practices in holdings, operations and supply chains that improve soil physical, chemical and biological properties to maintain and improve fertility.

3

Helping farmers overcome barriers to changing practice can be key. Whilst farmers financially benefit from practice changes that boost crop productivity and resilience in a longer-term, initial costs and perceived risks in changing practice may need to be overcome.

Building the business case

	RELEVANT BUSINESS SECTORS	Agribusinesses and businesses with soil underpinning supply chains (e.g. food, fibers, biofuels, fashion industries).
	REVENUES	Poor soil conditions limit crop yields and financial returns for farmers and agri-businesses. Healthy soils can improve crop quality and value in supply chains.
	COSTS	Failure to implement sustainable soil management practices, including climate smart agriculture, may lead companies to incur higher production costs in the long term. Soil health can improve the efficiency of fertilizers reducing costs.
	RESILIENCE	Healthy soils promote crop productivity and resilience, in turn boosting farmer and supply chain resilience.
	REPUTATION	Soil conditions that limit water and nutrient storage, as well as poor agricultural practices, can lead to unacceptable increase the losses of nutrients to the environment (66) and damage costs and reputational loss.
	CO-BENEFITS	Practices that increase the soil's capacity to support crops also can increase carbon storage (sequestration) in soil, helping meet climate commitments (11).

2

Water resources and risks

Framing the issue

Water stored in soils supports 90% of the world's agricultural production (12). The health of our soil is a critically important component in the production of food and the promotion of water and food security. Organic matter in soil increases its ability to store water and is directly related to the biodiversity in the soil (soil biodiversity is discussed in more detail in Chapter 4).

When soil biodiversity decreases so does its capacity to infiltrate and thus capture and store water (Bossio et al 2010). Eroded and compacted soil holds less water, and therefore less nutrients. This affects the ability of crops to grow to their full yield potential and increases the need for irrigation and nutrient inputs - increasing the risks of water scarcity and nutrient pollution in waterways.

Compacted soil is also more likely to flood and the negative effects of water shortages are amplified by poor soil health, reducing infiltration of water into the ground and deeper into aquifers.

Decline in soil health and decreased water quality and availability affect companies' operations and production. As a result, companies are increasingly taking action locally to improve soil health and water quality. Through improved and sustainable management of land and water resources, infiltration of water into soil can be improved, helping reduce standing surface water and the potential for flooding. Sustainable farming practices can increase soil health and biodiversity, including organic carbon content. This can contribute to increasing the storage of water in soils, contributing to crop and natural vegetation growth and biodiversity and support groundwater recharge. Sustainably managing land can also reduce surface erosion of soil into reservoirs, energy generating systems such as hydropower dams, public water supply, and industrial uses. This helps to reduce operation and maintenance costs and improves the longevity of investments.

Water-intensive industries are beginning to take action in the catchments that they operate in, cooperating with local populations to maintain irrigation channels and reforestation, and increasingly provide support to protect local soils by working with local farmers and landowners to promote conservation agriculture and other sustainable land management practices.

Investment in action

Mahindra: managing water scarcity by managing soils

In India, Mahindra, a global federation of companies with an operational presence in over 100 countries, has been acting on soils to improve water availability in its operational regions and local communities.

Through a recent soil and water conservation project in Madhya Pradesh in India, nearly 10,000 ha of farmed land was treated with a "Ridge to Valley" approach, where conservation efforts, such as the installation of sediment traps and ponds, are first implemented high in the watershed near the "ridge", and progressively rolled out measures to the "valley" bottom. Crucially, the local community is engaged throughout the approach, as local knowledge and commitment is essential to effectively locate and implement measures.

This form of management can help slow the flow of water, reducing soil erosion and resultant silting of water infrastructures downstream.

In the project area, which covered 32 villages and 20,000 people, only 24% of the farmed land was irrigated and water was only available seven months per year prior to the project. As a result of the initiative, 4,071 farmers benefited from a two-meter rise in average groundwater levels, whilst allowing a doubling of land under irrigation and as a result, a doubling of per capita income.

Fonterra: improving water quality with soil and nutrient management

In New Zealand, the world's largest processor and exporter of dairy products, Fonterra, is working with their shareholder farmers and local communities to show leadership in sustainable management of soil and water resources.

The more than doubling of dairy production in the last 20 years in New Zealand has increased pressure on land and water. As a result of this pressure and community concerns, Fonterra is working with partners on the Sustainable Dairy: Water Accord and has committed to deliver environment plans to all suppliers by 2025.

Fonterra suppliers have fenced grazing cattle out of 98% of their waterways and annual farm inspections result in continued improvements in effluent, soil and nutrient management. Recent water quality trend analysis has shown improving trends for several indicators in New Zealand and this has been attributed to improving land management (13).

Main takeaways

1. Healthy soils can infiltrate and store more water resulting in reduced flood and drought risks and improved water quality downstream.
2. Reduction in soil losses and increasing nutrient retention in soils benefits water quality and downstream water infrastructure, users and ecosystems.
3. Maintaining soil health for water benefits requires partnership with local communities and land managers who have invaluable local knowledge and skills.
4. Further building the scientific evidence base around the link between soil health, and water would help build awareness and capacity for investing in soil management for water.

Building the business case

RELEVANT BUSINESS SECTORS	Agribusinesses, businesses with soil underpinning the supply chain (e.g. food, fibers, biofuels, fashion industries), water utility companies, water-intensive industries (e.g. energy generators, mining and manufacturing) and businesses exposed to flood risks.
REVENUES	Reducing water scarcity through soil management can improve crop productivity, increasing revenues for agri-businesses. Healthy soils can improve crop quality and value in supply chains.
COSTS	Cost savings on irrigation can be made through soil management for water scarcity. Reducing erosion in catchments increased longevity and reduced maintenance costs of energy and water infrastructure. Improving soil health and reducing water quality issues reduces costs of water treatment.
RESILIENCE	Investing to improve water retention in the landscape can alleviate wider water scarcity risks and flood risks.
REPUTATION	Poor soil management can lead to sediment and nutrient loss and damage to waterways and biodiversity, increasing the risk of damage costs, reputational loss, and loss of license to operate for businesses. Acting to improve soil health in watershed partnerships improves stakeholder relations and enhances license to operate.
CO-BENEFITS	Increasing soil health and reducing soil erosion for water quality and availability benefits also supports crop productivity and can lead to soil carbon gains and enhanced biodiversity. There are considerable gains for civic amenity, recreation and tourism from improved waterways management.

3

Climate change mitigation

Framing the issue

The upper meter of the world's soils contains about three times as much carbon as the world's vegetation and almost twice as much as the atmosphere (14). Even proportionally small changes in the amount of soil carbon could have large effects on the carbon dioxide (CO_2) concentration in the atmosphere with resultant impacts on the rate of climate change (15).[3] The importance of maintaining soil carbon stocks for mitigating greenhouse gas emissions, adapting to climate change and contributing to food security is recognized in the SDGs and in the Paris Climate Agreement (16).

Soil health can contribute to climate mitigation by helping avoid greenhouse gas (GHG) emissions and/or by increasing the total amount of carbon in soils, removing CO_2 from the atmosphere.

Avoiding emissions associated with agriculture is key as agriculture is responsible for up to 25% of GHG emissions, which includes indirect emissions due to land conversion (17). Investing in soil health to maintain agricultural productivity (see Chapter 1) may reduce further land conversion into agriculture and associated losses of GHG (18). Emissions can also be avoided in field by reducing tillage, cover cropping, agroforestry and nutrient management. Careful management in forestry activities can also help maintain and build stocks of soil carbon, avoiding unnecessary losses during harvest and potentially increasing the rate of forest regrowth and carbon sequestration (19).

Increasing global soil carbon stocks to help mitigate climate change is gaining global attention, as demonstrated by the 4 per 1000 initiative launched as the COP21 in Paris in 2015. As mentioned above, global soils contain two to three times more carbo than the atmosphere. If this carbon level was increased by 0.4%, or 4‰ per year, in the top 30-40 cm of soils, the annual increase in CO_2 in the atmosphere would be stopped.

Measuring and verifying changes in soil carbon stocks currently presents challenges, but business solutions are being developed and trialed (see Investment in action). The rates of changes in soil organic carbon are slow, 10-20 years, and stocks are spatially variable so that detection of changes in carbon stocks following modified management practices requires measurements to be made over many years. Further, the capacity of soils to store carbon, at least of stabilized carbon, is not infinite and the scale of opportunity varies with soil type and management practices (20). It's essential to consider the impacts of management practices on all greenhouse gases. That includes methane emissions, predominantly from animals, rice and peat wetland systems, and nitrous oxide emissions from the soil after additions of organic and inorganic fertilizers.

Maintaining or increasing soil organic carbon as part of climate action provides many other benefits, such as increasing the resilience and sustainability of agricultural production, stabilizing crop yields, and providing other associated ecosystem services (21).

[3] Soil carbon stocks depend on the balance of carbon inputs - principally from photosynthesis as plant inputs but also from manure – and carbon losses - from erosion, dissolved carbon in water flows and CO_2 released from soil respiration. Climate and management can alter the size and relative contributions of these inputs and outputs and thereby change soil carbon stocks.

Investment in action

Yara: environmental and climate compatible agriculture (ECCAg): example of smallholder maize production in Tanzania

Maintaining the productivity of existing cropland is important for sustainable farm businesses and value chains, but is also key for climate. Keeping soils productive helps avoid cropland expansion and land use change and associated negative consequences, including GHG emissions. This issue is particularly important in sub-Saharan Africa, where soil nutrient depletion due to long-term cropping without appropriate replacement of nutrients removed from soil by harvested crops has caused severe soil degradation, soil acidification and carbon loss. Numerous studies and soil analyses confirm the severity of soil nutrient depletion.

These soils can be returned to a healthy soil status through a balanced fertilization of all plant nutrients required by the crop in combination with best agronomic practices such as liming and the addition of organic material when available. A public-private partnership “Environment and Climate Compatible Agriculture” (ECCAg) was set up to demonstrate the importance of balanced fertilization for restoring and maintaining soil quality and reducing GHG emissions in smallholder maize farms in the south-western highlands of Tanzania. Initial soil analyses confirmed deficiency of multiple nutrients including phosphorus, sulphur, boron and zinc. The ECCAg project applied a tailored fertilizer program for maize at five smallholder farms during four growing seasons (2011-2014) in comparison with common farmer practice.

The improved program increased maize yields on average by 83% with a mean grain yield of 5.9 tons/ha in the ECCAg treatment compared to 3.2 tons/ha with farmer practice, which is already two times more than the national average yield of 1.6 tons/ha. The balanced mineral fertilizer application improved plant growth and produced more plant residues available for nutrient recycling and soil organic matter improvement. GHG emissions were calculated including the production and supply of farm inputs e.g. fertilizer. GHG emissions per field increased with higher fertilizer use. Low yields with current farmer practice, however, lead to continuous expansion of cropping area in order to keep up with the increasing demand. If the additional yield obtained in the ECCAg treatment need to be produced with current low-yielding farmer practice, more cropland is required and the GHG emissions caused by the land use change outweigh the fertilizer emissions by far (4-12 times). Also in economic terms the investment in soil fertility through balanced fertilizer use pays off. The ECCAg treatments were on average about two times more profitable for the farmer than current farm practice.

Meeting the food demands of Tanzania’s projected 2050 population of 130 million people will either require 9 million ha of additional maize land, or increasing crop yields on existing land to 5-6 tons/ha. This study confirms that a strategy to improve balanced fertilization has substantial benefits for GHG emissions above a low-intensity agricultural farm management approach.

Corporate Carbon: Soilkee soil carbon solutions for mitigating climate change in Australia

Soil organic carbon is directly related to agricultural productivity – the higher the soil carbon levels, the greater the productivity. This is a function of soil carbon improving water holding capacity and nutrient availability for soils, in addition to improving conditions for soil biological activity. There are a number of active management practices that can build soil organic carbon levels and deliver soil carbon credits.

Australia currently holds a unique M-M-M global position with regards to soils in that it has the measurement platform, mechanisms and market to make soil carbon commercially viable. The Measurement of Soil Carbon Sequestration in Agricultural Systems method establishes a soil carbon sampling and measurement basis for projects across all areas of agriculture, including grazing, dryland cropping, horticulture and viticulture. There are also an ever-increasing number of soil innovators demonstrating mechanisms to build soil carbon. Furthermore, the Australian Government's Emissions Reduction Fund provides up to 10 year offtake contracts for carbon credits from projects such as soil carbon, effectively de-risking the market side of a business value proposition.

We have invested into pasture cropping projects in Victoria Australia using a new invention call the Soilkee Renovator. Soilkee provides a combined cultivation, aeration and multi-species seeding solution to improving grazing systems. It works through activating a number of virtuous cycles: partial cultivation of 17 % of the treated area down to 75mm creates an initial mechanical intervention to improve water infiltration partial green manuring effect provides soil microbiology with an additional food source and improves activity mixed species planting of winter growing plants provides additional forage for livestock the 'salad bowl' created by the mixed species plantings also improves animal nutrition by providing a greater range of feed options for livestock to select additional root biomass from planted annuals improve soil organic matter and assist with water retention nitrogen fixation from planted legumes increases nitrogen availability for plants.

The advantage of Soilkee is that it provides a programmable 'treatment' program for farmers to follow with measurable results. Furthermore, growing additional feed has benefits for any farming systems operating under a certification program such as organic or biodynamic in that it removes the risk of requiring additional off-farm inputs that also need to be certified.

The first project using the Soilkee system has gone through an audit under the grazing method of the Australian Emissions Reduction Fund and showed a measured sequestration increase of 11.2 tCO_2e per hectare over a 12-month period. The intention is to take this result and replicate it with another 200 projects to be registered over the next 24 months, and then to continue scale up in other countries.

Main takeaways

1. Soil health can help mitigate against climate change by providing avoided emissions and negative emissions.
2. Increasing the soil organic matter content of agricultural soils for mitigating climate change is a win-win option for farmers and value chains: building soil organic matter increases productivity and resilience to climate change.
3. Prioritizing the development and implementation of approaches to measuring and verifying changes in soil carbon stocks opens up opportunities for insetting or offsetting corporate carbon emissions.

Building the business case

RELEVANT BUSINESS SECTORS	Agribusinesses and businesses with soil underpinning supply chains (e.g. food, fibers, biofuels, fashion industries).
REVENUES	Any business can invest in soil carbon sequestration. Climate change is a major global threat to businesses, economies, ecosystems and society.
RESILIENCE	Climate change is a major risk to businesses and society. Negative emission technologies are vital to meeting the Paris Agreement and keeping global temperature increases to below 1.5°C and soils are a nature-based opportunity for helping achieve this.
REPUTATION	Managing carbon in soils is an important component of corporate responsibilities on climate. Unsustainable soil management results in CO_2 losses from soils, whilst investing in soil health can sequester carbon, mitigating climate change. Current carbon accounting.
CO-BENEFITS	Improving soil organic matter can create a range of other benefits including increased soil fertility and crop yields, improved water retention and quality, and biodiversity.

4

Biodiversity and conservation

Framing the issue

More than a third of the earth's total land area is used for agriculture and grazing, with agricultural land conversion and intensification constituting a grave threat to biodiversity (22). Unsustainable forestry activities can also pose a threat to biodiversity (23).
At the same time, biodiversity - or at least certain species groups - play a critical role in agriculture and forestry, providing pollination, pest and disease suppression, nutrient cycling and other services integral to sustainable production (24). Investing in soil health can help reduce the environmental impact of agriculture and forestry, sustain and even increase productivity and in turn reduce pressure on the planet's biodiversity (25).

Nutrient and sediment runoff from agriculture and, to a lesser extent, forestry threaten aquatic life in water bodies worldwide. Agriculture is responsible for more than 50% of the nitrogen and phosphorus delivered from land to ocean globally (26), contributing to hundreds of "dead zones" affecting more than 200,000 km^2 of the planet's seas (27). Investing in soil health can increase infiltration capacity, improve soil structure, and enhance the ability of soils to retain nutrients, delivering crop and water benefits (28) (see chapters 1 and 2) and reducing pollution pressures on aquatic ecosystems. In agricultural landscapes, investments to mitigate soil erosion, nutrient loss and maintain soil health (e.g. planted buffers, grassed waterways or shelterbelts) can simultaneously support biodiversity by increasing landscape heterogeneity (29). Field margins and buffers also provide habitat for pollinators and pest predators that benefit agricultural production (30).

Soil biodiversity can also directly benefit agriculture and forestry. Healthier, more biodiverse soils support mycorrhizal networks crucial to plant health and host beneficial organisms that can suppress soil-borne diseases and pests (31-33). This can reduce yield losses while also enabling reduced use of pesticides. The connections between soil management, soil biodiversity, and disease and pest suppression merit additional research to better understand the mechanisms and conditions whereby soil biodiversity can deliver beneficial ecosystem services (34-36). Finally, biodiverse soils act as a repository of genetic diversity, sustaining forms of life that in addition to their own intrinsic value may prove beneficial to society in the future as a source of medicine, crop protection, or other uses.

Climate change is a major threat to biodiversity and mitigating climate change with soils potentially reduce biodiversity loss (see Chapter 3). While there is considerable potential to improve soil health and contribute to the sustainable intensification of agriculture and forestry, the implications for biodiversity remain uncertain. Increasing yields and efficiency do not guarantee that intact forests and savannahs will be spared from land conversion – intensification must be paired with policies and programs for conservation (18). This is especially the case because many of the environmental benefits of soil health are not reflected in the price paid for products (i.e. they are externalities, such as carbon sequestration, nutrient management) and do not directly deliver an economic return to producers (25).

Investment in action

Syngenta: working with farmers to reduce erosion, protect soil, and improve biodiversity in olive orchards

With the launch of the Good Growth Plan in 2013, Syngenta committed to improving the fertility of 10 million ha of degraded farmland by 2020.[4] The company has subsequently worked with partners to develop and promote local solutions farmers could easily adopt. One early success was in Andalusia in Spain, where the company supported olive farmers in adopting vegetative cover in their orchards.

Olives for oil production are one of Spain's most important crops, accounting for 45% of global production. Andalusia has 1.6 million ha under olive cultivation, producing nearly a third of the world's olive oil.

Approximately 40% of Spanish olives (> 10%) are grown on steep slopes, traditionally with bare soil, resulting in high rates of soil erosion that can approach 100 tons ha/year.[5]

Syngenta partnered with Asaja Sevilla (a farmer association), the Andalusian environmental authorities and a group of producers to introduce vegetative ground covers. The practice helped producers reduce erosion by up to 70% by replacing bare ground with vegetation and improving soil water-holding capacity.[6, 7]

Additionally, vegetative covers can benefit biodiversity by providing food and shelter to soil micro- and macro-fauna. The reduced soil temperature can help some pest-predating insects and parasitoids flourish in the soil.[8] Finally, cover cropping helps increase soil carbon sequestration.

Building on this success, Syngenta started the "Multifunctional Covers" (MFC) campaign. MFCs, which integrate flowers into cover vegetation, also provide nectar sources for pollinating insects. More than a hundred farmers are participating in the initiative, supporting agricultural biodiversity enhancement.

This success resulted from a multi-stakeholder initiative that included work on demonstration farms as well as field days showcasing the advantages of vegetative covers in real conditions. Local environmental subsidies linked to the region's rural development plans were also leveraged.[9] Partly due to the success of this project, there are now 838,000 ha of cover crops in Spanish olive orchards, representing nearly a third of the crop in Spain.

4 Four years into the soil commitment, we have implemented 157 projects in 41 countries, benefiting a total of 7.5 million hectares: Rescue more farmland commitment of The Good Growth Plan.
5 Traditionally olives were planted in the least productive plots, while the more productive fields in the valleys and plains were dedicated to extensive crops like cereals or sunflower.
6 Vegetal covers can reduce the loss of soil in the Andalusia region by up to 70% and erosion up to 95%, depending on the extent of cover adoption and site conditions.
7 In general, cover cropping protects the soil from erosion and direct sunlight, reduces soil-based water evaporation and field run-off of sediments and chemicals that can contaminate local water bodies.
8 For example Chrysoperla, a very efficient predator of Prays oleae (one of the most devastating olive pests) is found under vegetal cover.
9 The Regional Government of Andalusia through their rural development plan, offers a subsidy "sustainable systems in olives" to promote cover cropping.

Mondi: investing in soil health and biodiversity to create sustainable forestry landscapes

In South Africa, Mondi manages large plantations interwoven with conservation corridors and nodes of natural habitat. The management of this mosaic – what Mondi calls "ecological networks" – is central to protecting biodiversity and the ecosystem services that sustain long-term productivity.

Mondi has cooperated with Stellenbosch University for more than 10 years to understand how biodiversity can be conserved in ecological networks (37).
This research has revealed how maintaining areas of biodiverse native habitat, as well as appropriate grazing and fire management practices, can conserve biodiversity and ecological function, while supporting the ecosystem services necessary for long-term plantation productivity (38-46). The findings informed Mondi's Working Forest Concept, launched in 2016.

More recently, the collaboration has started to investigate the role of soil health in plantation landscapes. The aim is to understand how different harvesting and silvicultural practices impact soil biodiversity, on the premise that soil biota are essential for soil health and long-term production.

This work tests two assumptions:

1. that high levels of biodiversity in native habitat can benefit soil health in adjacent plantation areas, and

2. that careful management of logging residue can minimize forestry impacts on soil health.

One of the most important measures to ensure sustained productivity is the conservation of organic matter. Fine biomass residue is an essential organic matter input. However, fine biomass is also fuel. If managed carelessly, it will burn in a wildfire and cause significant damage to the stand and to the natural environment through impacts on species habitat, oxidation of organic matter and increased erosion and sedimentation.

While this research is ongoing, early findings suggest:

1. that soil fauna recover rapidly after restoration of soils,

2. that control of alien, invasive bramble (Rubus spp.) is critical to protect soil fauna and pollinator habitat (47) and

3. that small and large corridors of native habitat are important for sustaining beneficial species, such as dung beetles, butterflies and ants (42).

Ongoing research also aims to assess the impact of plantation management on soil fauna recovery, arthropod diversity, leaf litter detritivores, water stress and soil formation. This innovative partnership between a public research university and a private multinational will hopefully shed light on how plantation forests can integrate native habitat and new management practices to build soil health and protect biodiversity into the future.

Main takeaways

1

Soil degradation has consequences for biodiversity as it drives land degradation and conversion, pollutes waterways, contributes to climate change, and decreases soil biodiversity.

2

Maintaining and improving soil health and reduce land conversion, pollution and biodiversity loss can benefit farmers, agribusiness, and farm communities by maintaining agriculture's social license to operate.

3

Healthy, biodiverse soils can reduce costs by limiting the need for soil amendments.

4

The science of soil biodiversity is rapidly evolving. Proactive attempts to maintain and improve soil biodiversity can limit unpleasant surprises to farmers, agribusiness, and society.

Building the business case

	RELEVANT BUSINESS SECTORS	Any sector can invest in soils to maintain and enhance biodiversity. Global biodiversity loss is a threat that affects us all.
	REVENUES	Proactive efforts to manage for biodiversity can help producers and agribusiness maintain their social license to operate thus maintaining revenues.
	COSTS	Pressure to protect biodiversity (including soil biodiversity) in working landscapes may impose new costs. Management practices that sustain and enhance soil health and biodiversity may allow for greater cost efficiency by limiting inputs needed to maintain yields.
	RESILIENCE	Development and promotion of management practices designed to protect soil biodiversity may help avoid unnecessary and unanticipated impacts to a complex, poorly-understood system.
	REPUTATION	Conservation of ecosystems and biodiversity is of reputational value and driving losses forms a significant reputational risk.
	CO-BENEFITS	Management practices that sustain and enhance soil biodiversity may contribute to higher and/or more stable yields, as well as co-benefit neighboring communities and the general public in the form of carbon sequestration, water purification, and flood attenuation.

5

Supporting livelihoods with soil health

Framing the issue

Negative impacts of declining soil health on livelihoods are most prominently felt by millions of smallholder farmers in the developing world who depend on low-input agriculture due to resource constraints. Here, poverty can be seen as both a cause and effect of environmental degradation (48). Declining soil health and productivity due to degradation of smallholder farmland is a major threat to food and income security. It also makes rural people more vulnerable to impacts of climate change (49).

Soil degradation is not only an issue for smallholder livelihoods, however. Inadequate care for soils in intensive agriculture has long been masked by using significant inputs of commercial fertilizers, pesticides and fossil fuels, and awareness is growing that soil health is declining along with ecosystem services that depend on it. With stricter regulation on the use of agrochemicals in recent years (e.g. in the European Union) farmers increasingly emphasize that investments in soils are needed to sustain what they perceive as the "foundation of their livelihoods".

Factors that determine whether improved soil management practices result in livelihood benefits are diverse and context specific (50) (48). Availability of land or labor, land tenure and market access affect farmers' motivation and capacity to invest in soil health, as well as the level of awareness of long-term soil-productivity relationships or access to technical support and extension services. Moreover, investments in soil health do not always lead to immediate economic returns but may take several years to show measurable effects (51).

To create synergies between soil health and livelihood benefits it's also crucial that technology choice and service support are tailored to the social and cultural context. What works well in one context may not in another. Some options for increasing soil health can offer double wins in terms of farm productivity and resilience and economic resilience. For example, management technologies that integrate crops, trees and livestock can improve resilience to production and market risks through product diversification (52).

Farmers and business investors need to be prepared to choose, learn and adapt in participatory ways, in order to adapt management practices to their production systems and socioecological context (51). Adequate technical support and follow up is critical and coordinated efforts among farmers and other local actors may be needed to maximize positive impacts across spatial scales e.g. on soil and water conservation (53). That way, positive impacts on soil resources and livelihoods can be achieved simultaneously, in the short and longer term.

Investment in action

Olam: improving livelihoods and sustainable business

Agricultural production and sourcing operations are at the core of Olam's global agri-business. Promoting sustainable agriculture is key to improving livelihoods and business success, and customers are increasingly demanding sustainable produce. Olam therefore aims to lead the shift towards optimized fertilizer use and away from resource extraction and aim for net positive impact at scale, based on the creation and restoration of natural and social capital within living landscapes.

Investing in soil quality is key to simultaneously improve water use efficiency, improve crop productivity, farmer income, livelihood, trade volume and quality. An example is Olam's Sustainable Sugarcane Programme in Madhya Pradesh & Maharashtra, India, running since 2013 with support from IFC, Hindustan Unilever Foundation, Solidaridad and New Holland. In its first phase (2013-16), the program reached 21,500 smallholders cultivating 20,500 ha of sugarcane. The second phase (2017-20) is reaching 26,500 growers managing 27,000 ha. Farmers are trained on practices to improve soil health including the use of organic inputs and fertilizers. Whereas soil health is considered the foundation for productivity improvement, farmers also get exposed to improved crop varieties, novel row spacing, companion cropping technologies, and improved irrigation and water conservation technologies (e.g. crop mulching). Through the program, use of organic inputs more than doubled and crop yields increased by more than a third. Total crush volume of the sugarcane went up by 25% during the first three years.

Olam increasingly adopts digital tools to track and tailor farmer practices and progress across numerous crops. Data generated reveals that the bottom 50% of the farmer community supplies less than 15-20% of the trade volume, mainly due to farm size.

Unfortunately, many farmers in this bottom group have very limited resources, ambitions or time to invest in soil health. Their small plots and low yields make cash credits risky. Olam's farm support tools (OFIS) focuses on stepwise improvements within farmer limitations, but (public) partnerships are often required to support this bottom segment to generate additional income outside the farm.

Main takeaways

1. Successful strategies for improving livelihoods through soil health need local adaptation and experimentation that enables farmers to make stepwise progress as function of their objectives and resources.
2. Carefully design interventions to ensure short-term impacts and economic returns while building soil health over the longer term.
3. Careful scoping, diagnosis and participatory design may help to minimize risks of poor technology uptake.
4. Multi-stakeholder approaches may be needed to achieve synergies and sustainable solutions across the landscape.

Building the business case

RELEVANT BUSINESS SECTORS	Agricultural and soil supply chain companies (e.g. food, fibers, biofuels, fashion industries), particularly those reliant on smallholder farmers.
REVENUES	Soil degradation leads to progressively lower yields or increased risk of crop failure with detrimental impact on livelihoods, food and income security, and business relationships with buyers.
FINANCE & INVESTMENT	There are opportunities for business innovations (e.g. in finance, insurance, delivery of extension services, digital agronomy) to unlock the potential of smallholder agriculture and facilitate investment in soil health and high-quality inputs that can benefit farmer livelihoods.
RESILIENCE	Building farm and landscape resilience to the impact of severe weather events through soil health benefits local livelihoods and in turn business resilience.
REPUTATION	Improving livelihoods through improving soils can lead to benefits for surrounding communities and improved relations with local stakeholders for businesses.
CO-BENEFITS	Management practices that sustain and enhance soil biodiversity may contribute to higher and/or more stable yields, as well as co-benefit neighboring communities and the general public in the form of carbon sequestration, water purification, and flood attenuation.

6

Enabling environment - policy, finance and partnerships

Framing the issue

As land-use pressure continues to grow with rising demands for food, the need for conservation, reduced soil degradation, and healthy soils becomes increasingly important (49) (2). Such growing demands on land require policies that balance environmental, social and economic goals, constituting one of the core challenges. With the aim of creating more favorable environments that facilitate progress towards sustainable development, there is a range of factors that should be incentivized, including regulatory frameworks, access to financial support, and partnerships (54).

The adoption of legally-binding regulatory frameworks on soil protection have already been implemented in some countries, including the Australia, Switzerland and the United States (55) (25). Encouraging regulatory frameworks in the form of standards, labels, and certifications have proved to reduce negative impacts on soil (56). For example, the International Organization for Standardization developed standards for establishing good practices to combat land degradation and desertification under ISO 14055-1 (57); whereas Food and Agriculture organization of the United Nations (FAO) also developed guidelines for Sustainable Soil Management (58) and land tenure (59).

International agendas also support stakeholders in mainstreaming soil into their decision-making processes, enabling environmental enrichment at different levels.

The 2030 Agenda for Sustainable Development through its target 15.3, for example, promotes achieving a Land Degradation Neutral world, with Soil Organic Carbon as one of the key indicators for monitoring. As of today, 119 countries have made the political commitment to translate this global goal into their national policy frameworks, set national voluntary targets and implement associated measures with the support of the UNCCD Target Setting Programme (60).

Creating an atmosphere that attracts environmentally and socially responsible investment in soil health is another important pillar. Private sector investment models are increasingly shifting towards more sustainable production practices. These trends can be further promoted by providing the right economic incentives to agricultural producers and consumers by means of market-based economic instruments (e.g. taxes, subsidies, permits, payments for ecosystem services, etc.) (61) (62). Rewarding innovators (including financial institutions and mechanisms) that lead the transition towards sustainable soil practices should be encouraged.

The role and aspirations of the financial sector are also evolving as investors and savers demand their capital provide not only financial returns but also social and environmental impacts. While some well-established managers of capital sources exist to finance land-based projects, attracting further capital for sustainable soil management remains challenging. This is in part due to high risks caused by timing differences between initial investments and cash flow generated by sustainable agriculture projects. This requires specialized financial structures that identify financial barriers and provide both tailored technical assistance and repayment grace periods.

The promotion of public-private partnerships can play a key role in unlocking investments for soil health. Rabobank and UN Environment recently formed a public-private partnership to address these unique challenges. Through a USD $1 billion facility, the partnership finances forest protection and sustainable agriculture projects beyond what is commercially viable. It identifies and minimizes barriers to sustainable agriculture on existing degraded land, improving productivity and thus avoiding deforestation. In 2017, the Land Degradation Neutrality Fund (LDN Fund) was launched with the support of UNCCD. The LDN Fund is an impact investment fund blending resources from the public, private and philanthropic sectors in support of achieving LDN. The LDN Fund seeks to channel resources towards land-based private sector projects contributing to addressing land degradation through sustainable land management and land restoration projects (63).

Other capital sources that could be further incentivized to invest in soil include pension, insurance, and sovereign wealth funds, public expenditures and foundations.

Investment in action

Midwest Row Crop Collaborative (MRCC): enabling soil health through partnership

MIDWEST ROW CROP COLLABORATIVE

The Midwest Row Crop Collaborative (MRCC) is a diverse coalition working to expand agricultural solutions that protect air and water quality and enhance soil health while meeting our global demand for food. Partners span the food supply chain in both the public and private spheres, including Bayer, Cargill, Environmental Defense Fund, General Mills, Kellogg Company, Land O'Lakes, McDonald's, PepsiCo, The Nature Conservancy, Unilever, Walmart and World Wildlife Fund. Working in three pilot states (Illinois, Iowa and Nebraska), the MRCC works to measure and deliver improved environmental outcomes at a meaningful scale throughout the Upper Mississippi River Basin. The power of the MRCC collaborative lies in bringing together thought leaders and investment to achieve scale.

MRCC supports a major initiative by the National Corn Growers Association: the Soil Health Partnership, a farmer-led initiative that promotes the adoption of soil health practices to ensure productive and sustainable agricultural systems. Over 100 farms across 12 states conduct research on cover cropping, nutrient management, and conservation tillage, and host field days to share their learnings. This network leverages farmer knowledge and relationships to influence change. SHP works to support farmers in better understanding how to be resilient in the face of climate change, and to potentially mitigate some of the effects by promoting practices that sequester carbon and reduce nitrous oxide emissions.

Rabobank: financial solutions for soil health

Rabobank

Working directly on the farm allows the hurdles growers face to be better understood. Along with the added challenges of logistics and the learning curve associated with the adoption of new practices that promote soil health, there are economic barriers. Many sustainable agriculture proposals are denied by finance policies due to the longer-term investment requirements and the perceived higher risk associated with the investment horizon.

As a member and co-chair of the WBCSD Climate Smart Agriculture working group, Rabobank has joined the Soil Health Partnership conversation as yet another important partner to provide technical support and explore potential financial solutions. A holistic vision of the entire supply chain and engagement with the Soil Health farmers is key to identifying and understanding the hurdles to adoption of soil health practices, prioritizing their importance and applying financial solutions.

The power of Soil Health Partnership supports its farmer focus through a strong science base. These two themes function together, applying farmer knowledge, modern agriculture tools and experience to meaningful on-farm research trials. The initiative also benefits from its ability to draw from a variety of partner technical experts and scientists. A regionally focused, farmer-driven dialogue is crucial when it comes to developing systems-based solutions. Soil Health Partnership offers a strong case for the benefits of a regional scope when it comes to addressing global goals and challenges.

Main takeaways

1

Encourage public-private partnerships that are crucial to support investment, innovations and technology and knowledge exchange around modern agriculture practices.

2

Support science-based regulatory frameworks that incentivize producers to adopt sustainable soil management practices and guide consumers to demand sustainably produced products.

3

Routinely incorporate sustainable soil management into policy frameworks (considering market-based economic instruments) and create the appropriate institutional structures.

4

Stimulate good tenure and governance that promotes equity and attracts long-term sustainable soil investments. Responsible governance of land tenure systems leads to more sustainable and prosperous outcomes, building stability, investor confidence, and peace.

5

Elevate the significant, long-term cost-saving benefits of soil health management practices, catalyzing the opportunity for the farm financial system to collaborate with farmers.

6

There are opportunities for business innovations (e.g. in finance, insurance, delivery of extension services, digital agronomy) to unlock the potential of smallholder agriculture and facilitate investment in soil health and high-quality inputs that can benefit farmer livelihood.

Conclusions

An investment in soils delivers to multiple priorities.

This report has summarized the benefits that improving soil health can deliver for many of the priority challenges our global society faces. Acting now on soil health means acting on climate change, biodiversity loss, food and water security, and poverty.

The case studies demonstrate that businesses are beginning to act. However, scaling-up these initial investments and activities is a priority.

Whilst each chapter has taken one area of benefits as a focus, and investments may be primarily aligned with one of these areas (e.g. water scarcity), each chapter has also shown that an investment in soil health delivers multiple co-benefits. For example, increasing soil carbon sequestration for climate, increases soil organic matter which can enhance water retention and filtration, help support biodiversity, and increase crop productivity and climate resilience, resulting in benefits for farmer livelihoods.

The business case for soil health is built on multiple grounds.

This report has demonstrated that the business case for investing in soil health can be made on many arguments: on maintaining or increasing revenues, reducing or avoiding costs, enhancing reputation, or opening up finance opportunities.

The strongest business case will be built on both multiple arguments and consider the range of co-benefits.

Three strong messages that emerge from the chapters:

1

Investing in soil health is relevant for a wide range of business sectors. Soil health increases resilience and reduces key global risks such as climate change, water scarcity and biodiversity loss. It also opens up new finance and innovation opportunities.

2

Investing in soil health is an activity that safely provides positive returns. Crop productivity and resilience benefits were identified as co-benefits to all investments. Climate change is happening and the severity of the impacts remains uncertain. Land use and water resource pressures are also rising. Building resilience to withstand the effects of climate change and other pressures makes good business sense.

3

The business case has already been made for some companies. The range of case studies provided by businesses throughout the chapters demonstrates that investment is already happening and returns are being made.

Next steps for investing in soil health

We recommend the below next steps for taking action in investment in soil health:

1

Lower the hurdles to practices that promote soil health

- Explore value-capture systems that provides value to the grower, offsetting the initial cost in implementing sustainable agricultural practices that promote soil health.
- Develop scalable and transferable methodologies for assessing and improving soil health in smallholder agricultural settings as smallholders often face the hardest barriers to practice change.
- Encourage lease or concession conditions that offer a discount or rebate for improved soil health at the end of period.

2

Take advantage of the national context and act locally

- Check national soil health policies and national UNCCD commitments, for example Land Degradation Neutrality (LDN) baselines and plans, because alignment could open up financial options and technical support you can get for your projects in-country.
- Practices and frameworks should be adapted to geography as socio-economic pressures, local priorities and soil conditions vary regionally. Collaboration with scientists in developing solutions is key.

3

Build partnerships for soil health

- Explore supply chain cooperation and spread costs and/or risks along the supply chain.
- Encourage public-private partnerships that support investment, innovations technology and knowledge exchange around sustainable agricultural practices that promote soil health.
- Develop and engage in partnerships in local landscapes with other sectors and actors when investing in soil health to benefit from local knowledge and ensure delivery of long-term results with broad benefits.

4

Start now

- Innovate and pilot science-based solutions for integrating soils in reporting, accounting and supply chain assurance. For example, start by incorporating soil carbon into current carbon accounting.
- Work to understand whether soil carbon sequestration could be a part of a corporate insetting strategy through pilot projects to assess and enhance soil health on-the-ground.
- Set up cost-effective soil health monitoring early on for clear demonstration of results from soil health indicators that could also help unlock finance and support continual improvement.

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