Uniting the Food and Beverage Sector behind a Global, Outcome- and Science-based Framework for Regenerative Agriculture

Running title:
A global framework for regenerative agriculture

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Abstract

The global food system confronts significant challenges driven by increasing demand and environmental degradation. Regenerative agriculture emerges as a solution to mitigate negative environmental impacts while maintaining or enhancing productivity. Despite its potential, the adoption of regenerative agriculture remains limited due to several factors, including the absence of a unified definition and the need for context-specific approaches.

To address these challenges, the Sustainable Agriculture Initiative Platform (SAI Platform) collaborated with industry stakeholders to develop a global framework for regenerative agriculture. The framework aims to establish universally relevant impact areas, define regenerative agriculture outcomes that guide the context-specific adoption of farming practices, and utilise science-based metrics for reporting.

Through consultations with member organisations, farmer communities, academics, and civil societies, a framework process flow was established and outcomes across the four impact areas of soil health, biodiversity, climate, and water were defined.

The framework's process flow aims to emphasise the need for understanding local contexts by identifying key environmental risks, prioritising outcomes, implementing practices, and assessing progress. This is with the intent to create flexibility to accommodate diverse farming systems globally.

The framework defines regenerative agriculture as an outcome-based approach that enhances environmental impact areas while supporting farming business development. It includes ten regenerative agriculture outcomes and associated metrics to measure progress across impact areas. Practices are selected based on their ability to improve outcomes, allowing for contextual adaptation.

To qualify as engaged or advanced in regenerative agriculture, farms must follow specific steps outlined in the framework and demonstrate progress against selected outcomes. The framework emphasises continuous improvement and transparency in reporting.

While the framework serves as a starting point, ongoing collaboration and refinement are necessary to address evolving challenges and diverse agricultural contexts. SAI Platform commits to further research, data collection, and stakeholder engagement to promote regenerative agriculture globally.

Introduction

The global food system faces unprecedented challenges: On one hand, global food demand is projected to increase more than 50% between 2010 and 2050 (van Dijk, Morley, Rau, & Saghai, 2021). This is exacerbated by the fact that increasing disposable incomes and changing dietary patterns in many parts of the world will grow the demand for resource-intensive foods, such as animal-based products by 70% in the same period (Searchinger, et al., 2019). On the other hand, climate change and the ongoing degradation of agriculture's natural resource base are threatening food production today and are projected to have an increasingly negative impact on productivity in the future (Godfrey, 2021).

Business as usual is not an option moving forward. Agriculture currently contributes to around 25% of greenhouse gas emissions (Poore & Nemecek, 2018) (Hong, 2021), 70% of freshwater withdrawal (The World Bank, 2022), and is responsible for 80% of the ocean and freshwater eutrophication (Poore & Nemecek, 2018) globally. In all these domains, current levels of resource degradation exceed planetary boundaries (Folke, et al., 2021) (Zabel, et al., 2019) (Richardson, et al., 2023). Furthermore, extensifying agriculture is not an option either, as the conversion of natural ecosystems to farmland to meet the growing demand for agricultural products is a primary driver of habitat and biodiversity loss (Dasgupta, 2021), whilst also releasing carbon stocks into the atmosphere (Benton, 2021).

Considering this, regenerative agriculture has emerged as a paradigm to reduce and reverse the negative impact of farming on the environment whilst maintaining or improving productivity (Rhodes, 2017). Regenerative agriculture is based on an emerging consensus that farming systems, which positively contribute to restoring natural ecosystems and enhancing soil health, are vital to the long-term health and resilience of the whole food and beverage sector, from growers to consumers (Kelley, 2021). Many organisations in agricultural value chains have endorsed the paradigm of regenerative agriculture in the last decade and devoted resources to transitioning their supply chains, and to research across the world to better understand the concepts (Giller, Hijbeek, & Sumberg, 2021).

However, despite the increase in interest in regenerative agriculture, relatively limited action has taken place on the ground and the wide-scale ambition for regenerative agriculture to drive systemic change across farming systems has yet to materialise. The fact the concept is difficult to adopt in farming operations puts the environment at risk of further degradation (Stevenson, et al., 2019), whilst also making it increasingly difficult for many organisations in agricultural value chains to meet their sustainability commitments (Giller, Hijbeek, & Sumberg, 2021).

One reason for the limited adoption of the concept of regenerative agriculture is the lack of a single, agreed definition. Descriptions vary between adopting practices (e.g., use of cover crops), achieving outcomes (e.g., improving soil health), or a combination of both (Newton, Civita, Frankel-Goldwater, Bartel, & Johns, 2020). This leads to challenges such as:

- A dilution of the concept and the loss of credibility through "greenwashing" (Newton, Civita, Frankel-Goldwater, Bartel, & Johns, 2020),
- Confusion amongst consumers with increasing food eco-standards and labels (Moon, Costello, & Koo, 2017),

- Difficulties developing globally applicable regulations and incentive mechanisms (Goswami, 2017) (White, 2019),
- A risk of a continued disconnect along the lines of existing ideologies for sustainable farming (Giller, Hijbeek, & Sumberg, 2021).

Another reason for the lack of adoption lies in the fact that farming operations are heavily dependent on the agroecological, and socio-economic context of a given location. Frameworks that are designed for a global context therefore need to allow for translation into locally applicable transition plans that consider these realities on the ground (Giller, Hijbeek, & Sumberg, 2021). However, approaches that focus only on the implementation of specific practices tend not sufficiently to allow for such contextualisation. This was for instance observed with other farming concepts, such as conservation agriculture (Palm, Blanco-Canqui, DeClerck, Gatere, & Grace, 2014). Likewise, frameworks that focus on outcomes often do not provide sufficient guidance on how globally standardised outcomes are specified and measured at a local level (Giller, Hijbeek, & Sumberg, 2021).

The Sustainable Agriculture Initiative Platform (SAI Platform) is a non-profit network that brings together over 180 member companies and organisations in the food and beverage industry to jointly define sustainability standards for their supply chains and share best-practice examples for sustainable sourcing. In 2021, SAI Platform and 33 of its member organisations[1] recognised the urgency to agree on a definition for regenerative agriculture and an aligned approach across the food and beverage industry to define outcomes and metrics to measure progress towards regenerative farming systems. This pre-competitive collaboration led to the development of an industry-wide global framework for regenerative agriculture. This framework aims to minimise duplication of standards and develop a shared vision for regenerative agriculture to avoid confusion for farmers and suppliers about which standards to follow. The framework, which is presented in this article, has the ambition to be globally applicable but to allow for the adaptation to the local contexts of crops and livestock farming systems. Such flexibility was integrated to help farmers transition to regenerative agriculture independently of their different global contexts. With the endorsement coming from the food and beverage industry and by working with farming communities and academia, this framework aims to become a credible and science-led approach to report on regenerative agriculture outcomes. To allow for transparency and a science-based dialogue, this methods paper describes the development process of the framework as well as the implementation thereof.

[1] 33 Founding Members have committed to leading an industry-wide push to improve the regenerative capacity of farms around the world:
AB Sugar, Ahold Delhaize, Arla Foods, Barry Callebaut, Bayer, Bonduelle, Cargill, The Coca-Cola Company, Dairy Farmers of America, Danone, Diageo, Döhler GmbH, FrieslandCampina, Griffith Foods, Ingredion, Kellogg Company, Kepak Group, Koppert, KraftHeinz, Mars Inc., McCain Foods Ltd., McCormick & Company Inc., McDonald's, Nestlé, Nordzucker, Ocean Spray, PepsiCo, Starbucks, Südzucker AG, Syngenta, Treatt, Unilever, Yara.

Methodology

The development of SAI Platform's Regenerating Together global framework for regenerative agriculture was based on a sequenced approach consisting of several rounds of consultation with SAI Platform's member organisations, farmer communities, academic partners, and civil societies. The first step was to agree on basic design principles for the framework. This was followed by a landscape analysis of existing frameworks against these design principles and to incorporate elements of existing frameworks to guide the development of the process flow and content of the hereby presented framework for regenerative agriculture.

Design principles

Focus groups with member organisations were coordinated to agree on design principles for an industry-wide framework for regenerative agriculture. During focus group sessions, five design principles were agreed:

1. **Develop universally relevant impact areas and outcomes.** Impact areas to report performance on regenerative agriculture outcomes should be applicable for all land-based farming systems, including beef, crop, and dairy production. They should represent all major domains of environmental sustainability, going beyond the predominant approach to only focus on greenhouse gas emissions.
2. **Focus the approach on the farmer.** The overall ambition of the hereby presented framework is to support the implementation and reporting of regenerative agriculture transitions. To foster local relevancy and farmer adoption, the framework is built on a process that prioritises outcomes based on a context analysis of the targeted production system. This will highlight areas of higher environmental and production risk at a local level and support farmers in selecting appropriate practices for the context of their operations.
3. **Prioritise outcomes rather than farming practices.** As farming practices may not be equally relevant, applicable, or effective for different farming systems, the hereby presented framework was designed to be impartial about what practices farmers adopt if they lead to an improved performance against selected outcomes. This allows for flexibility in the approach to achieve desired outcomes and empowers farmers to focus on what is right for them and their context.
4. **Use science-based metrics and reporting methodologies.** The outcomes that are proposed with the hereby presented framework should be science-based, measurable and meaningful indicators to monitor and assess the performance of farming towards regenerative agriculture. They should allow for reporting through globally accepted and relevant metrics.
5. **Focus on the farm, rather than the commodity.** With regenerative agriculture aiming to be a holistic approach that includes diverse production systems, performance against outcomes should be addressed and measured at a farm level and/or field level rather than crop level. It is important to acknowledge the impact certain practices can have at a landscape level. Additionally, assessments should take the full rotation with multi-year monitoring to adequately assess and report on progress.

Analysis of existing frameworks

To develop the proposed framework, SAI Platform engaged in literature research to map existing regenerative agriculture frameworks, standards, initiatives, certifications, and farm-level accounting tools, which are summarised in Appendix 1. Reviewed frameworks were mapped against the design principles outlined in the previous section of the publication to guide the establishment of framework definitions, process flow, and outcomes. The framework process flow and outcomes were subsequently confirmed by a further round of focus group discussions and subsequently reviewed by SAI Platform member organisations and their suppliers in various production systems across over 20 countries (Figure 1) to collect feedback from farmers and farm advisors on the applicability of practices and outcomes at farm level.

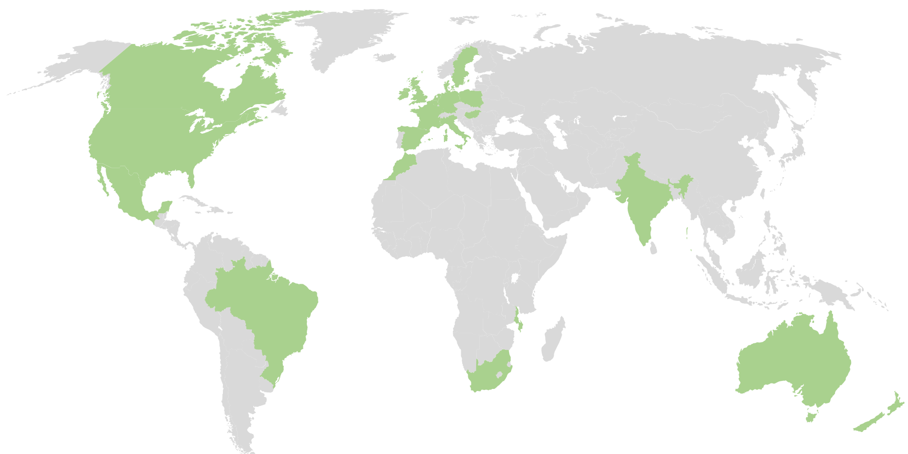


Figure 1: Countries covered (green colour) by the global review of SAI Platform's Regenerating Together global framework for regenerative agriculture.

Framework definitions

To cover major environmental impact areas, the following definition for regenerative agriculture was developed: "*Regenerative agriculture is an outcome-based farming approach that protects and improves soil health, biodiversity, climate, and water resources while supporting farming business development*."

This allowed for the segmentation of environmental impact into four areas of water, soils, biodiversity, and climate. These impact areas were then further segmented into globally applicable outcomes and metrics that lie within these impact areas and that can be prioritised based on the local context. Finally, the prioritisation of outcomes then informs the adoption of locally selectable practices to achieve improved performance against prioritised outcomes. This allows for both contextualisation at the local level and reporting at the global level. The definitions of these terms are listed in Table 1.

The definitions of the four impact areas follow the definitions of SAI Platform's Sustainable Agriculture Principles (Sustainable Agriculture Initiative Platform, 2023) and are listed in Table 2. The overview of outcomes to report performance against is provided in Table 3.

Impact areas. Scope of the intended long-term effects of an intervention or project. Impact areas include climate, soil, biodiversity, and water. **Outcomes.** Quantitative parameters that measure and/or reflect changes over time. They include metrics that most closely track the protection and/or improvement of each impact area and are scientifically based. **Practices.** On-farm interventions, management changes or practices, which contribute to regenerative outcomes. This can be demonstrated through causal relationships based on scientific research.

Table 1: Definitions for the main components of SAI Platform's Regenerating Together global framework for regenerative agriculture.

Whilst the focus is on reporting on environmental outcomes, the hereby presented framework builds on the premise to improve, or at a minimum, maintain farmer livelihoods. The definition's inclusion of "farming business development" aims to underline farmer profitability and crop yield as foundational bases for regenerative farming systems and acknowledges that thriving farm communities and workforces, as well as securing food and nutrition security, are critical in supporting regenerative outcomes.

Impact Area	Definition
Soil Health	An agricultural sector that ensures land use is appropriate given the characteristics of the terrain, maintains soil fertility and health, prevents damage, and provides benefits to the surrounding environment, and, whenever possible, ensures the land acts as a greenhouse gas sink.
Water	An agricultural sector that ensures water resources are optimally managed; water balance is maintained for the catchment, water runoff and pollution is minimised, water is managed for economic benefit, and equitable access to water is assured for all users (human and wildlife).
Biodiversity	An agricultural sector that maintains and enhances the biodiversity of the area as well as surrounding ecosystems, promotes the health of pollinators, ensures diversity of genetic material (commercial and wild) and hinders invasive species.
Climate	An agricultural sector that minimises greenhouse gases and air pollution, acts as a greenhouse gas sink (when possible), enables adaptations to a changing climate and supports the resiliency of farmers and farming communities.

Table 2: The definitions of the four impact areas of SAI Platform's Regenerating Together global framework for regenerative agriculture.

Framework process flow

Based on best practices of SAI Platform's Farm Sustainability Assessment and other standards and processes, a four-step process was developed to help farms continuously improve over time. The four-step process of implementing the framework is shown in Figure 2 and described below:

1. Create an understanding of the local context and identify key environmental risks of a given farm or production system.
2. Select and prioritise outcomes to report progress against across the four impact areas of regenerative agriculture, based on the local context.
3. Select and implement practices to achieve improved performance on prioritised outcomes.
4. Monitor and verify practice adoption and progress on outcomes.

An illustration of the framework process flow is also featured in a case study presented in Annex 4.

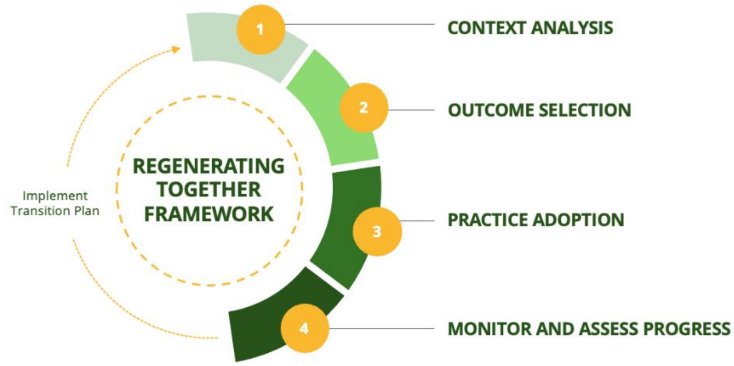
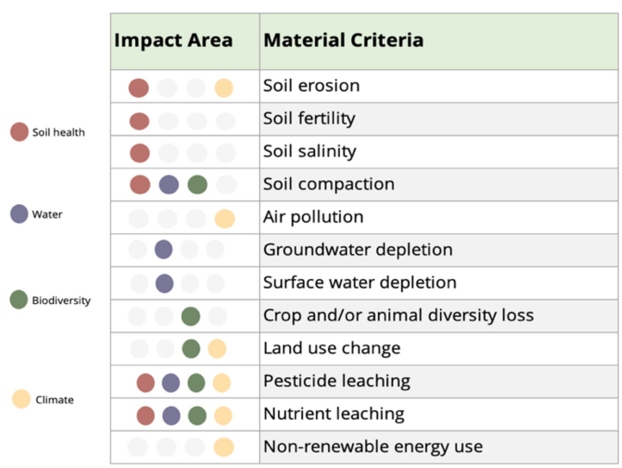


Figure 2: The four-step process to implement SAI Platform's Regenerating Together global framework for regenerative agriculture.

1. Context Analysis

The first step of implementing the framework is to analyse the context of the farm or production system and identify the most material environmental and production risks on a farm and landscape level. Such risks fall into two categories, namely production risks derived from environmental factors, such as weather or water availability, or environmental risks that result from currently used farming practices, such as biodiversity loss or excess water abstraction. This high-level environmental analysis is performed at a farm or supply shed[2] level by a subject matter expert in collaboration with farmers to ensure that both farm- and landscape-level priority risks have been considered. Creating a shared understanding of material risks between farmers and companies that source from them and agreeing on shared outcomes to prioritise reporting performance against, increases the likelihood of adoption of transition plans by all stakeholders involved.

The context analysis investigates 12 materiality criteria across the four impact areas (Figure 3). These criteria are scored between 1 - 3 based on pre-defined evaluation criteria (Annex 2).



Impact Area	Material Criteria
Soil health, Climate	Soil erosion
Soil health	Soil fertility
Soil health	Soil salinity
Soil health, Water, Biodiversity	Soil compaction
Climate	Air pollution
Water	Groundwater depletion
Water	Surface water depletion
Biodiversity	Crop and/or animal diversity loss
Biodiversity, Climate	Land use change
Soil health, Water, Biodiversity, Climate	Pesticide leaching
Soil health, Water, Biodiversity, Climate	Nutrient leaching
Climate	Non-renewable energy use

Figure 3: Context analysis with material risk criteria against the four impact areas.

[2] The supply shed is a group of farms that together implement SAI Platform's Regenerating Together global framework for regenerative agriculture. They can consist of farms in a geographic region with similar production systems.

2. Outcome Selection

10 regenerative agriculture outcomes have been identified as meaningful and measurable indicators to report performance against the four impact areas. The outcomes have been selected from the review of existing frameworks for regenerative agriculture (Annex 1) and expert consultations. They are accompanied by globally applicable metrics to guide the collection and reporting of data to report on progress in transitioning to regenerative agriculture (Table 3).

Regenerative Agriculture Outcomes	Metrics
Maximise soil organic carbon content	% of SOC per area
Maximise soil cover	% of soil cover, spatial and temporal
Optimise available water holding capacity	Volume of water per volume of soil
Optimise water use	Blue water withdrawal per unit of production
Protect on-farm habitats and ecosystems	% natural or restored habitat
Enhance crop and livestock diversity	Total # of species cultivated
Maximise fertiliser use efficiency	Nitrogen application per unit of production
Maximise pesticide use efficiency	EiQ per unit of production
Minimise air pollution	Particle concentration (µg per m3 of air)[4]
Minimise greenhouse gas emissions	CO2eq per unit of production

Table 3: Regenerative agriculture outcomes and associated metrics. Metrics were selected to be globally applicable and measurable at the farm level.

The context analysis suggests the prioritisation of outcomes to report performance against. This is done by multiplying the risk score from the context analysis with the strength of the causal connection between each material criterion and regenerative agriculture outcomes. To do so, each risk criterion is linked to one or more outcomes based on evidence gathered from literature research (Table 4) and expert opinion. It is encouraged, however not mandatory, to select the suggested outcome to prioritise, given justification. The purpose is to provide decision-support, whilst acknowledging and encouraging the knowledge of local subject matter experts.

3. Practice selection and adoption

The hereby presented framework aims to support farmers in establishing and implementing transition plans to adopt regenerative agriculture practices and improve performance on prioritised regenerative agriculture outcomes. Transition plans are developed by selecting and implementing appropriate farming practices to address material risks and work towards improved performance on selected outcomes.

To do so, the framework process suggests practices for improved performance against selected outcomes, based on existing evidence from literature and data. Table 5 provides a universal overview of connecting regenerative agriculture practices and outcomes. This was created through reviewing and summarising existing literature that links practices to regenerative agriculture outcomes. An overview of the reviewed literature, mapped by the outcomes that are covered by practices, is featured in Annex 3. It is important to underline that the list of practices provided in Table 5 is not exhaustive and farmers and farm advisors are free to select other practices if they lead to improved performance against selected outcomes.

As the framework is implemented, we anticipate a body of evidence to emerge that will validate further causal relationships between practices and outcomes for diverse farm archetypes and production systems.

		Regenerative Agriculture Outcomes									
		Maximise soil organic carbon	Maximise soil cover	Optimise available water holding capacity	Optimise water use	Protect on-farm habitat/ecosystems	Enhance crop and livestock diversity	Maximise fertiliser use efficiency	Maximise pesticide use efficiency	Minimise air pollution	Minimise greenhouse gas emissions
Material Criteria	Soil erosion	*	**	**	0	0	0	0	0	0	0
	Soil fertility	*	*	*	0	0	*	**	0	0	0
	Soil salinity	*	0	0	*	0	0	*	0	0	0
	Soil compaction	*	**	0	0	0	0	0	0	0	0
	Organic matter management	**	*	0	0	0	0	*	0	*	0
	Groundwater depletion	*	*	**	**	0	0	0	0	0	0
	Surface water depletion	*	*	**	**	0	0	0	0	0	0
	Crop and animal biodiversity loss	0	0	0	0	0	**	0	0	0	0
	Land use change	0	0	0	0	**	0	0	0	0	0
	Pesticide leaching	0	0	0	0	0	*	0	**	0	0
	Nutrient leaching	*	0	*	0	0	*	**	0	0	**
	Non-renewable energy use	0	0	0	0	0	0	0	0	*	**

Table 4: Table to indicate the connection between risk criteria (vertical) and regenerative agriculture outcomes (horizontal). Asterisks indicate the strength of the correlation between a risk criterion and an outcome: ** direct, positive correlation between outcome and risk criterion with strong evidence from existing literature, * indirect connection, 0 no connection or connection not proven.

		Regenerative Agriculture Outcomes									
		Maximise soil organic carbon	Maximise soil cover	Optimise available water holding capacity	Optimise water use	Protect on-farm habitat/ecosystems	Enhance crop and livestock diversity	Maximise fertiliser use efficiency	Maximise pesticide use efficiency	Minimise air pollution	Minimise greenhouse gas emissions
Principles and Practices	Minimum tillage	*	0	*	*	0	0	0	0	*	*
	Reduced traffic	*	*	*	0	0	0	0	0	*	*
	Soil conditioners	*	0	*	0	0	0	*	*	0	0
	Organic material recycling	*	0	0	0	0	0	*	0	*	*
	Cover crops	*	*	*	0	0	0	0	0	0	0
	Mulching and crop residues cover	*	*	*	0	0	0	0	0	0	0
	Intercropping	*	0	0	*	0	0	*	*	0	0
	Diversified crop rotation	*	0	0	0	0	0	*	*	0	0
	Protection of on-farm habitat	*	0	0	0	*	*	0	0	0	0
	Agroforestry and silvopastoral systems	*	0	0	0	*	*	0	0	0	0
	Hedgerows and green buffers	*	0	0	0	*	*	0	0	0	0
	Riparian buffers	*	*	*	0	*	*	0	0	0	0
	Diversified animal production	0	0	0	0	*	*	0	0	0	0
	Herd management	0	0	0	0	0	0	0	0	0	*
	Integrated pasture management	*	*	*	0	*	*	*	0	0	0
	Integrated nutrient management	0	0	0	0	*	*	*	0	0	*
	Integrated pest management	0	0	0	0	*	*	0	*	0	0
	Irrigation technology	0	0	0	*	0	0	0	0	0	0
	Electricity from onsite renewables	0	0	0	0	0	0	0	0	*	*

Table 5: Matrix to depict the connections of practices and principles (vertical) towards improved performance of farming against the regenerative agriculture outcomes included in SAI Platform’s Regenerating Together global framework for regenerative agriculture. * Indicate positive connection, 0 no connection or connection not proven. An overview of literature sources consulted to build these connections between practices and outcomes is featured in Annex 3.

4. Monitor and assess progress

The hereby presented framework considers regenerative agriculture as a process for continuous improvement against environmental performance indicators. To demonstrate improvement, progress needs to be measured over time and against a baseline. To allow for farmer participation independently of individual starting points in regenerative agriculture transitions and to capture the distinct levels of farmer engagement and progress, two performance levels have been proposed (Figure 4).

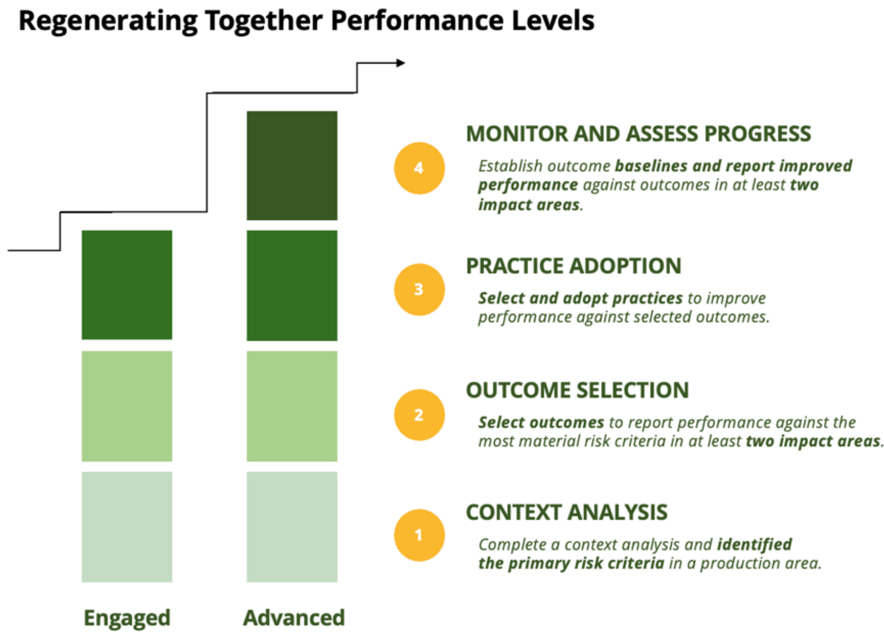


Figure 4: Performance levels for farms engaged and advanced in regenerative agriculture.

To be considered **engaged in regenerative agriculture**, the first three modules of the framework implementation are followed. A context analysis is first conducted where the primary risk criteria in their production area are identified. Thereafter, the two most relevant outcomes are selected to report performance against the most material risk criteria. Once outcomes are selected, practices that improve the performance of selected outcomes are chosen and implemented. It is encouraged to establish baselines for practice adoption to measure progress, which is captured in their transition plan.

To be considered **advanced in regenerative agriculture**, the 'engaged' requisites have been met, baselines for outcomes have been established, and improved performance against outcomes in at least two impact areas reported. The level of improvement will be context-specific and will be set at a local level by technical subject matter experts.

Discussion

Operationalising the concept of regenerative agriculture at scale is a formidable challenge. It requires translating global concepts and guidelines into locally applicable transition plans that – whilst driving for desired environmental outcomes – ensure the social and economic viability of farming. Doing so requires strong commitments from all stakeholders across global agricultural value chains.

The hereby proposed framework has the ambition to contribute to facilitating the adoption of regenerative agriculture worldwide. To do so, the framework focuses on two aspects that have so far hindered the shift to regenerative agriculture. They are:

i) The lack of a globally agreed definition of regenerative agriculture (Newton, Civita, Frankel-Goldwater, Bartel, & Johns, 2020), and

ii) The need for an approach to translate global concepts into local transition plans (Giller, Hijbeek, & Sumberg, 2021).

By representing over 180 members and fostering agreement on regenerative agriculture outcomes within the food and beverage sector, SAI Platform is endeavouring to develop a globally agreed definition and framework for regenerative agriculture. We therefore see the hereby presented framework as a starting point to foster agreement beyond the food and beverage sector and across levels of agricultural value chains.

However, we are aware that the food and beverage industry represents only one link within agricultural value chains. We, therefore, propose this paper to serve as a basis for further consultations and engagement with stakeholders and to evolve as new evidence emerges. With the release of the first version of our framework and communicating the methodology behind it, we aspire to engage in a dialogue to evolve a shared vision for regenerative agriculture. This is with the intent to avoid imposing, but proposing a view of what regenerative agriculture can be and what outcomes we can expect from it. As the proposed approach aims to be farmer-focused, a further intent is to continue to investigate means to support farmers in their transition and to integrate locally applicable social and economic elements into the framework. This approach calls for close collaboration specifically between farmers, industry, civil societies, the public and the financial sector.

Through the context analysis module in the framework process, we aim to provide an approach to translate a global framework into locally applicable action plans. However, to pay justice to the context-specificity of farming, further efforts are required. Firstly, a better understanding needs to be created of how progress on outcomes can be locally measured in a robust and scalable way. This includes the identification of appropriate metrics and measurement solutions, as well as data sampling protocols. For many of the proposed outcomes, directly measuring progress against them will remain difficult. The inclusion of such farming systems into regenerative agendas will therefore require a better understanding of how the adoption of practices will lead to desired outcomes, segmented by crops and farming context. To do so SAI Platform, together with its members and partners, is committed to producing datasets that connect practices to outcomes for specific production systems. Initial datasets will allow for segmentation between arable crops, fruits and vegetables, perennial crops, pasture-based livestock, and housed livestock. They will follow the approach developed by Giller et al. (2023) to connect practices to outcomes for cocoa and coffee agroforestry systems. As we build and implement the hereby presented global framework for regenerative agriculture, we are committed to further specifying and broadening the scope of farming systems covered by these datasets to offer more regional and crop-specific segmentation. This will allow for a more tailored selection of practices to achieve progress on desired outcomes and a more robust and scalable approach to indirectly measuring progress towards regenerative agriculture.

We intend for this framework to be the base for SAI Platform members and other organisations across agricultural value chains to drive action towards regenerative agriculture and to share feedback and learning to allow for continuous improvement. A shift to more sustainable – or regenerative – agriculture is urgently needed. With the hereby proposed framework, we want to contribute to making this shift happen and to engage with farmers, academia, civil societies, the public sector, and industry in doing so.

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Annex 1

Matrix of regenerative agriculture programmes assessed by the SAI Platform literature review in 2022. The list is adapted from the list released by the Textile Exchange (Kelley, 2021)

Matrix of regenerative agriculture programmes

◆ Depends on project

✓ Denotes that the type of service is offered, indicator is covered by research or indicator is assessed by practice-based standard

✓ Specifically denotes that the indicator is assessed by outcome-based standard

Category	Organisation	Region	Agricultural System: Crops	Dairy	Beef	Small-Scale	Large-Scale	Initiative Type / Functionality: Project Development	Outcome-based Standard	Practice-based Standard	Continuous Improvement	Self-Assessment	2nd Party Verified	3rd Party Verified	Legislation-backed	Farm-level Accounting Tool	Soil Carbon Measuring Tool	Carbon Accounting	Carbon Credit Provider	Conservation, Research, Advocacy, Advisory
SAI P Industry Solutions & ...	European Roundtable for Beef Sustainability (ERBS)	Europe	–	–	✓	–	–	–	✓	–	✓	✓	–	–	–	–	–	–	–	–
	Farm Sustainability Assessment (FSA)	Global	✓	–	–	–	–	–	–	✓	✓	✓	–	✓	–	–	–	–	–	–
	Sustainable Dairy Partnership (SDP)	Global	–	✓	–	–	–	–	–	✓	✓	✓	–	✓	–	–	–	–	–	–
	One Planet Business for Biodiversity (OP2B)	Global	✓	✓	✓	–	–	–	✓	–	✓	✓	–	–	–	–	–	–	–	–
Industry Regen Ag Frameworks	Danone Regenerative Agriculture Scorecard	Global	✓	✓	✓	–	–	–	✓	✓	✓	✓	–	–	–	–	–	–	–	–
	General Mills Regenerative Agriculture Self-Assessment	Global	✓	✓	✓	✓	✓	–	–	✓	✓	✓	–	–	–	–	–	–	–	–
	McCain	Global	✓	–	–	–	–	–	✓	–	✓	–	–	–	–	–	–	–	–	–
	Nestlé Regenerative Agriculture Farm Assessment Tool	Global	✓	✓	–	–	–	–	✓	–	✓	✓	✓	–	–	–	–	–	–	–
	PepsiCo Positive (Pep+) (Note: no framework atm)	Global	✓	✓	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Unilever Regenerative Agriculture Principles	Global	✓	✓	–	✓	✓	–	✓	–	✓	✓	–	–	–	–	–	–	–	–
Standards, Initiatives and Certifications	Audubon Conservation Ranching Programme	US	–	–	✓	✓	✓	–	–	✓	–	–	–	✓	–	–	–	–	–	✓
	Certified Regenerative by AGW	US	–	✓	✓	–	–	–	✓	–	✓	–	–	✓	–	–	–	–	–	–
	Coffee Sustainability Reference Code (Global Coffee Platform)	Global	✓	–	–	✓	✓	–	✓	–	✓	–	✓	✓	–	–	–	–	–	–
	IntegraTrust iScore	SA	✓	✓	✓	✓	–	–	✓	–	✓	–	–	–	–	–	–	–	–	–
	Land to Market (Savory Institute EOV)	Global	✓*	✓	✓	✓	✓	–	✓	–	✓	–	✓	–	–	–	–	–	–	–
	Natural Capital Coalition & TEEBAgriFood (Food & Beverage Sector Guide)	Global	✓	✓	✓	–	–	–	–	–	–	✓	–	–	–	–	–	–	–	✓
	Organic Certification (NOP, NPOP, EU)	Global	✓	✓	✓	✓	✓	–	–	✓	–	–	–	✓	✓	–	–	–	–	–
	Rainforest Alliance (Note: Sustainable Ag Standard 2020 full compliance ≈ Regen Ag; Regen Ag Coffee Scorecard)	Global (Tropics)	✓	–	–	✓	✓	–	✓	✓	✓	✓	–	✓	–	–	–	–	–	–
	Regen1	US (CA)	✓	✓	✓	–	–	–	–	✓	✓	✓	–	–	–	–	–	–	–	–
	Rege[N]ation Certification (Intertribal Agriculture Council)	US	✓	✓	✓	–	–	–	–	✓	–	–	✓	–	–	–	–	–	–	–
	regenagri (Control Union / transitioning to stakeholders)	Global	✓	✓	✓	✓	✓	–	–	✓	✓	–	–	✓	–	✓	–	✓	✓	–
	Regenerative Organic Certification™ (ROC) (Regenerative Organic Alliance)	Global	✓	✓	✓	–	–	–	–	✓	✓	–	–	✓	✓	–	–	–	–	–
	Regenified	US (?)	✓	✓	✓	–	–	–	✓	✓	–	–	–	✓	–	–	–	–	–	–
	Soil Carbon Initiative	US	✓	✓	✓	–	–	✓	✓	✓	✓	–	–	✓	–	–	–	–	–	–
	Terra Genesis Regenerative Outcome Verification (ROV) (Note: also Project Developer)	Global	✓	–	–	✓	–	✓	✓	–	–	–	–	✓	–	–	–	–	–	–
	The Economics of Ecosystems and Biodiversity	Global	✓	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	4 per 1000	Global	✓	✓	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	–	–	✓
Farm-Level Accounting Tools	Cool Farm Tool (Cool Farm Alliance)	Global	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	✓	–	✓	–	–
	Delta Framework	Global	✓	–	–	–	–	–	–	✓	–	–	–	–	–	–	–	–	–	–
	Ecosystem Services Market Consortium	US	✓	✓	✓	–	–	–	–	–	–	–	–	✓	–	✓	✓	✓	✓	–
	Fieldprint Platform / Continuous Improvement Accelerator (Field to Market)	US	✓	–	–	–	–	–	–	–	–	–	–	–	–	✓	–	✓	–	–
	Global Farm Metric (Sustainable Food Trust)	Global	✓	✓	✓	–	–	–	✓	–	–	–	–	–	–	✓	–	–	–	–
	MySoilCapital (Soil Capital)	UK, FR, BE	✓	–	–	–	–	–	–	–	–	–	–	–	–	✓	–	✓	✓	–
	SMART-Farm Tool (Sustainable Food Systems/FiBL) (Tool: SAFA)	Europe	✓	✓	✓	–	–	–	–	✓	✓	–	–	–	–	✓	–	–	–	–
Potential Partners / Stakeholders	EIT Food Regenerative Agriculture Revolution	Europe	✓	–	–	✓	–	✓	✓	–	✓	✓	–	–	–	–	–	–	–	–
	Earthworm	Global	✓	–	–	–	–	✓	–	–	–	–	–	–	–	✓	✓	–	–	✓
	FoodDrinkEurope	Europe	✓	✓	✓	✓	✓	✓	–	–	–	–	–	–	✓	–	–	–	–	–
	Rabobank	Global	✓	✓	✓	–	–	✓	–	–	–	–	–	–	–	–	–	✓	✓	–
	The Sustainable Trade Initiative (IDH)	Asia, Africa, LATAM	✓	–	–	✓	–	✓	–	–	–	–	–	–	–	–	–	–	–	✓
	International Trade Centre (ITC)	Developing Countries	✓	✓	✓	✓	–	✓	–	–	–	–	–	–	✓	–	–	–	–	–
	Regen10	Global	✓	✓	✓	–	–	✓	–	–	–	–	–	–	–	–	–	–	–	–
	ReNature	Global	✓	✓	✓	–	–	✓	–	–	–	–	–	–	–	–	–	–	–	✓
	ReGrow	Global	✓	–	–	–	–	✓	–	–	–	–	–	–	–	✓	✓	✓	–	–
	South Pole	Global	✓	–	–	–	–	✓	–	–	–	–	–	✓	–	–	–	✓	–	–
	The Nature Conservancy	Global	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	–	–	–	–	✓
	World Farmers Organisation	Global	✓	✓	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	–	–	✓
	World Wildlife Fund	Global	✓	✓	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	–	–	✓
	Worldbank	Global	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	–	–	–	–	✓
	International Union for the Conservation of Nature (IUNC)	Global	✓	✓	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	–	–	✓
Research Institutes	Consultative Group on International Agricultural Research (CGIAR)	Global	✓	✓	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	–	–	✓
	University of Leeds	Global	✓	✓	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	–	–	✓
	Wageningen University and Research	Global	✓	✓	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	–	–	✓
	Cal State Chico	Global	✓	✓	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	–	–	✓
	Global Soil Laboratory Network (GLOSOLAN)	Global	✓	✓	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	–	–	✓
	Research Institute of Organic Agriculture (FiBL)	Europe	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	✓	–	–	–	✓
	Rodale Institute	US (CA, GA, IA, PA)	✓	✓	✓	–	–	–	–	✓	–	–	–	–	–	–	–	–	–	✓
	Soil Foodweb Institute	Global	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	–	–	–	–	✓
	Soil Health Institute	North America	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	–	–	–	–	✓

* mixed livestock-cropping system; pure cropping system not included

Organisation	Soil: Soil Carbon	Soil Health	Soil Biodiversity	Biodiversity: Plant Biodiversity	Animal Biodiversity	Water: Water Quality	Water Availability	Climate: GHG Emissions	Energy Use	Other Carbon Storage	Social Aspects: Farmer Livelihoods	Legal Compliances	Markets and Resources	Health and Safety	Working and Living Conditions	Animal Welfare: Animal Welfare	Other Roles: Consultancy/For Profit	NGO/Educational	Scientific Research	Founder/Funder/Investor	Demonstration Project / Case Studies (IWS)	Supply Chain Integration	Other
European Roundtable for Beef Sustainability (ERBS)	–	–	–	–	–	–	–	✓	–	–	–	–	–	–	–	✓	–	–	–	–	–	–	–
Farm Sustainability Assessment (FSA)	✓	✓	✓	✓	–	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓	–	–	–	–	–	–	–
Sustainable Dairy Partnership (SDP)	–	✓	✓	✓	✓	✓	✓	✓	–	–	✓	✓	✓	✓	✓	✓	–	–	–	–	–	–	–
One Planet Business for Biodiversity (OP2B)	**✓**	✓	**✓**	**✓**	–	–	**✓**	–	–	–	**✓**	–	–	–	**✓**	–	–	–	–	–	–	✓	✓
Danone Regenerative Agriculture Scorecard	**✓**	**✓**	**✓**	**✓**	**✓**	**✓**	**✓**	✓	–	–	–	–	–	–	–	**✓**	✓	–	–	–	–	–	✓
General Mills Regenerative Agriculture Self-Assessment	**✓**	**✓**	**✓**	**✓**	**✓**	**✓**	**✓**	✓	–	–	–	–	–	–	–	**✓**	–	–	✓	–	–	–	✓
McCain	**✓**	**✓**	**✓**	**✓**	–	**✓**	**✓**	–	–	–	**✓**	–	–	–	–	–	–	–	–	–	–	–	–
Nestlé Regenerative Agriculture Farm Assessment Tool	**✓**	**✓**	**✓**	**✓**	**✓**	**✓**	**✓**	✓	–	–	–	–	–	–	–	–	✓	–	–	–	✓	–	✓
PepsiCo Positive (Pep+) (Note: no framework atm)	✓	✓	✓	✓	–	✓	✓	✓	–	–	✓	✓	–	–	–	✓	–	–	–	–	✓	–	✓
Unilever Regenerative Agriculture Principles	**✓**	**✓**	**✓**	**✓**	**✓**	**✓**	**✓**	**✓**	**✓**	–	**✓**	–	–	–	–	–	✓	–	–	–	✓	–	✓
Audubon Conservation Ranching Programme	–	–	✓	✓	✓	✓	✓	–	–	–	–	–	–	–	–	✓	–	✓	–	–	–	–	–
Certified Regenerative by AGW	**✓**	**✓**	**✓**	**✓**	**✓**	**✓**	**✓**	**✓**	–	–	–	–	–	–	–	**✓**	–	–	–	–	–	–	–
Coffee Sustainability Reference Code (Global Coffee Platform)	**✓**	**✓**	**✓**	**✓**	–	**✓**	**✓**	**✓**	**✓**	–	✓	**✓**	**✓**	**✓**	**✓**	–	–	✓	–	–	–	–	–
IntegraTrust iScore	–	–	–	**✓**	–	–	**✓**	**✓**	–	–	–	–	–	–	–	–	–	✓	✓	–	✓	–	–
Land to Market (Savory Institute EOV)	**✓**	**✓**	**✓**	**✓**	**✓**	–	**✓**	–	–	–	–	–	–	–	–	–	✓	✓	✓	✓	–	✓	–
Natural Capital Coalition & TEEBAgriFood (Food & Beverage Sector Guide)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	✓	✓	–	✓	✓	–
Organic Certification (NOP, NPOP, EU)	–	✓	✓	✓	✓	✓	✓	–	–	–	✓	–	–	–	✓	✓	–	✓	–	–	–	–	–
Rainforest Alliance (Note: Sustainable Ag Standard 2020 full compliance ≈ Regen Ag; Regen Ag Coffee Scorecard)	**✓**	**✓**	–	**✓**	–	**✓**	✓	**✓**	**✓**	–	**✓**	**✓**	–	**✓**	**✓**	–	–	✓	–	–	–	–	–
Regen1	✓	✓	✓	✓	–	✓	–	–	–	–	✓	–	–	✓	✓	✓	✓	–	–	–	–	–	–
Rege[N]ation Certification (Intertribal Agriculture Council)	–	✓	✓	✓	✓	✓	✓	–	–	–	✓	–	–	–	–	–	–	✓	–	–	–	–	–
regenagri (Control Union / transitioning to stakeholders)	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	–	–	–	–	–	–	✓	–	–	–	–	✓	–
Regenerative Organic Certification™ (ROC) (Regenerative Organic Alliance)	✓	✓	✓	✓	✓	✓	✓	–	–	✓	✓	✓	✓	✓	✓	✓	–	✓	–	–	–	✓	–
Regenified	**✓**	**✓**	**✓**	**✓**	**✓**	–	**✓**	–	**✓**	–	–	–	–	–	–	**✓**	–	–	–	–	–	**✓**	–
Soil Carbon Initiative	**✓**	**✓**	**✓**	✓	✓	✓	**✓**	**✓**	–	–	–	–	–	–	–	–	–	✓	–	–	–	–	–
Terra Genesis Regenerative Outcome Verification (ROV) (Note: also Project Developer)	✓	✓	✓	✓	–	–	✓	–	–	–	✓	–	–	–	–	–	–	✓	–	–	–	–	–
The Economics of Ecosystems and Biodiversity	–	✓	✓	✓	✓	✓	✓	✓	–	–	✓	–	✓	✓	✓	–	–	✓	–	–	✓	–	–
4 per 1000	✓	✓	–	✓	✓	✓	✓	✓	–	–	✓	✓	–	–	–	–	–	✓	✓	–	–	–	–
Cool Farm Tool (Cool Farm Alliance)	✓	–	–	✓	✓	–	✓	✓	✓	✓	–	–	–	–	–	–	–	–	✓	–	–	–	–
Delta Framework	✓	–	–	–	–	✓	✓	✓	–	✓	✓	–	–	–	✓	–	–	–	–	–	–	–	✓
Ecosystem Services Market Consortium	✓	–	–	–	–	✓	✓	✓	–	–	✓	–	–	–	–	–	–	✓	✓	–	–	–	–
Fieldprint Platform / Continuous Improvement Accelerator (Field to Market)	✓	–	–	✓	✓	–	–	✓	✓	–	–	–	–	–	–	–	–	✓	–	–	–	–	✓
Global Farm Metric (Sustainable Food Trust)	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	–	–	✓	✓	✓	–	✓	–	–	–	–	✓
MySoilCapital (Soil Capital)	✓	–	–	–	–	–	–	✓	–	–	–	–	–	–	–	–	✓	–	–	–	–	–	–
SMART-Farm Tool (Sustainable Food Systems/FiBL) (Tool: SAFA)	–	✓	✓	✓	✓	✓	✓	✓	✓	–	–	✓	✓	✓	–	✓	✓	–	–	–	–	–	–
EIT Food Regenerative Agriculture Revolution	✓	✓	✓	✓	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	✓	–	–	✓	–	–
Earthworm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	–	–	–	–	–	✓	–
FoodDrinkEurope	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	–	✓	–	–	–	✓	✓
Rabobank	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	✓	–	–	✓	–	✓	✓
The Sustainable Trade Initiative (IDH)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	–	✓	✓	✓	✓	✓	✓
International Trade Centre (ITC)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	–	–	✓	✓	–	✓	–
Regen10	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	–	✓	–	–	✓	✓	✓
ReNature	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	✓	–	–	✓	✓	✓	–
ReGrow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	✓	–	✓	–	✓	✓	–
South Pole	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	✓	–	–	–	✓	–	–
The Nature Conservancy	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	–	✓	✓	–	✓	–	✓
World Farmers Organisation	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	–	✓	✓	–	✓	–	–
World Wildlife Fund	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	–	✓	✓	–	–	✓	–
Worldbank	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	–	–	✓	✓	–	–	–
International Union for the Conservation of Nature (IUNC)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	–	–	✓	–	–	–	–
Consultative Group on International Agricultural Research (CGIAR)	–	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	–	✓	–	–	–	–	✓	✓	–	–	–	–
University of Leeds	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	–	–	–	–
Wageningen University and Research	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	✓	–	–	–	–
Cal State Chico	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	✓	–	–	–	–
Global Soil Laboratory Network (GLOSOLAN)	✓	✓	✓	–	–	–	✓	–	–	–	–	–	–	–	–	–	–	–	✓	–	–	–	–
Research Institute of Organic Agriculture (FiBL)	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	–	–	–	✓	✓	–	–	✓	–	–	–	–
Rodale Institute	✓	✓	✓	✓	✓	✓	✓	–	–	✓	✓	–	–	–	✓	✓	✓	✓	✓	–	–	–	–
Soil Foodweb Institute	✓	✓	✓	–	–	–	✓	–	–	–	✓	–	–	–	–	–	✓	–	✓	–	–	–	–
Soil Health Institute	✓	✓	✓	–	–	✓	✓	✓	–	–	✓	–	–	–	–	–	–	–	✓	–	✓	–	–

Annex 2

Table 7 Context Analysis scoring from 1 – 3.

Impact Area	Criteria	Question	Scoring Guidance
	Soil erosion	Is your supply shed at risk of losing topsoil through wind and water-borne erosion?	**1 = Low Erosion Risk.** Minimal soil erosion, with effective conservation practices in place. **2 = Moderate Erosion Risk.** Some signs of soil erosion from wind and/or water. **3 = High Erosion Risk.** Significant top soil erosion observed.
	Soil fertility	Is the loss of soil fertility a concern in your supply shed?	**1 = Low Fertility Risk.** Soil fertility is well-maintained with adequate organic matter, nutrients, and microbial activity. Productivity is not compromised. **2 = Moderate Fertility Risk.** Some decline in soil fertility is observed. Nutrient levels and therefore productivity may be suboptimal. **3 = High Fertility Risk.** Severe depletion of soil fertility, leading to a significant reduction in productivity.
	Soil salinity	Is there a concern about increased soil salinity in your supply shed (i.e., increased need for irrigation)?	**1 = Low Salinity Risk.** Soil salinity levels are within the optimal range for most crops. There is no significant impact on plant growth and productivity. **2 = Moderate Salinity Risk.** Some signs of soil salinity are observed, such as residual salt after irrigation or reduced crop growth. **3 = High Salinity Risk.** Severe soil salinity issues, posing a substantial threat to crop growth and yield. There has been an increased need to irrigation observed.
	Soil compaction	Has your supply shed experienced waterlogging during and after events of excessive rain?	**1 = Low Compaction.** Soil structure is well-maintained. Water and air infiltration are optimal, healthy root growth is observed. **2 = Moderate Compaction.** Some signs of soil compaction are present, potentially impacting root penetration and water movement. **3 = High Compaction.** Severe soil compaction issues, hindering root development and water movement.
	Air pollution	Does your supply shed engage in practices that may reduce residual organic matter?	**1 = Good Organic Matter Management.** Effective practices are in place to maintain and enhance organic matter content in the soil. Crop residues are returned to the soil. **2 = Moderate Organic Matter Management.** There may be instances of excessive residue removal of crop biomass or manure. **3 = Poor Organic Matter Management.** Management practices such as crop residue burning are common.
	Groundwater depletion	Has your supply shed groundwater depletion or are there receding groundwater tables in your region due to agriculture?	**1 = Low Groundwater Depletion Risk.** Groundwater levels are stable, and there is no significant risk of depletion. **2 = Moderate Groundwater Depletion Risk.** Some signs of declining groundwater levels are observed. **3 = High Groundwater Depletion Risk.** Significant risk of groundwater depletion, with noticeable declines in water levels.
	Surface water depletion	Has your supply shed experienced surface water bodies (rivers, lakes, streams) running low because of agricultural water use?	**1 = Low Surface Water Depletion Risk.** Surface water availability is sufficient for agricultural needs. Water sources are stable, and there is no significant risk of depletion. **2 = Moderate Surface Water Depletion Risk.** Some signs of decreasing surface water availability are observed, including seasonal fluctuations. There are potential risks of depletion. **3 = High Surface Water Depletion Risk.** Significant risk of surface water depletion, with noticeable declines in water availability.
	Crop and/or animal diversity loss	Does your supply shed focus on a limited number of types of crops and/or livestock species?	**1 = Low Diversity Loss Risk.** A diverse range of crops and livestock is cultivated, promoting resilience to pests, diseases, and environmental changes. **2 = Moderate Diversity Loss Risk.** Some reduction in crop diversity is observed. Livestock production system with less than 5 animal species raised reducing level of on-farm resilience. **3 = High Diversity Loss Risk.** Significant risk of crop diversity loss, with maximum 1-3 cultivated species and few varieties. Livestock production system with 1 animal variety raised reducing level of on-farm resilience.
	Land use change	Has your supply shed experienced a conversion from natural habitat into farmland and/or extensively used farmland (pastures, meadows) into intensive production?	**1 = Low Risk of Land Use Change.** Stable land use patterns with minimal conversion of natural habitats are observed. **2 = Moderate Risk of Land Use Change.** Some signs of land use change are observed, such as gradual expansion into new areas. **3 = High Risk of Land Use Change.** Severe risk of significant and rapid land use change, leading to the conversion of diverse ecosystems for agriculture.
	Pesticide leaching	Are you aware of pesticides leaching into soils, water bodies or ecosystems in your supply shed?	**1 = Low Pesticide Leaching Risk.** Pesticide application is carefully managed, and there is minimal risk of leaching into the environment. **2 = Moderate Pesticide Leaching Risk.** Some risk of pesticide leaching exists, requiring increased attention to application methods and timing. **3 = High Pesticide Leaching Risk.** Significant risk of pesticide leaching, posing a significant threat to groundwater and nearby ecosystems.
	Nutrient leaching	Are you aware of excess amounts of nutrients (e.g., nitrogen, phosphate) leaching into soils, water bodies or ecosystems in your supply shed?	**1 = Low Nutrient Leaching Risk.** Nutrient application is balanced, and runoff is well-controlled, preserving water quality. **2 = Moderate Nutrient Leaching Risk.** Some risk of nutrient leaching exists, indicating the need for improved nutrient management practices. **3 = High Nutrient Leaching Risk.** Severe risk of nutrient leaching, leading to amounts of nutrients leaching into water bodies and the environment and leading to ecosystem eutrophication.
	Non-renewable energy use	Are the supply shed farming operations predominantly reliant on non-renewable energy sources?	**1 = Renewable Energy Use.** Activities predominantly rely on renewable energy sources. **2 = Moderate Non-Renewable Energy Use.** Some agricultural activities (incl. processing facilities, machinery) rely on non-renewable energy sources is observed. **3 = High Non-Renewable Energy Use.** All agricultural activities (incl. processing facilities, machinery) are heavily dependent on non-renewable energy sources.

Annex 3

List of reference documents consulted for establishing connections between practices and outcomes. Documents are clustered against outcomes that are covered by them.

Reference Document	**Outcomes covered by Practices**									
	Maximise soil organic carbon	**Maximise soil cover**	**Optimise available water holding capacity**	**Optimise water use**	**Protect on-farm habitat/ ecosystems**	**Enhance crop and livestock diversity**	**Maximise fertilizer use efficiency**	**Maximise pesticide use efficiency**	**Minimise air pollution**	**Minimise greenhouse gas emissions**
(Nestlé Corporate Agriculture)	■	■	■	■		■	■	■		■
Ground Zero? Let's Get Real on Regeneration! (Giller K. E., 2023)	■	■	■	■	■		■	■		
McCain Regenerative Agriculture Framework (McCain, 2024)	■	■	■	■	■	■	■	■		
PepsiCo Positive Ag Supplier Playbook (PepsiCo, 2023)	■	■	■	■	■					■
Unilever Regenerative Agriculture Principles (Unilever, 2021)	■	■		■		■	■			
A Practical Guide to Climate-Smart Agriculture Technologies in Africa (Bell P, 2018)	■	■	■	■	■	■	■	■		■
Regenerative Agriculture: An Agronomic Perspective (Giller, Hijbeek, & Sumberg, 2021)	■	■	■		■	■		■		
Regenerative Agriculture: Identifying the impact; enabling the potential (Burgess PJ, 2019)	■	■				■	■	■		
Air quality impacts of crop residue burning in India and mitigation alternatives (Lan R, 2022)									■	
Regenerative Agriculture for Food and Climate (Lal, 2020)	■	■			■		■		■	
Agronomic Gain: Definition, Approach, and Application (Kazuki S, 2021)	■		■				■			

Annex 4

Case study – Field crops in New Zealand

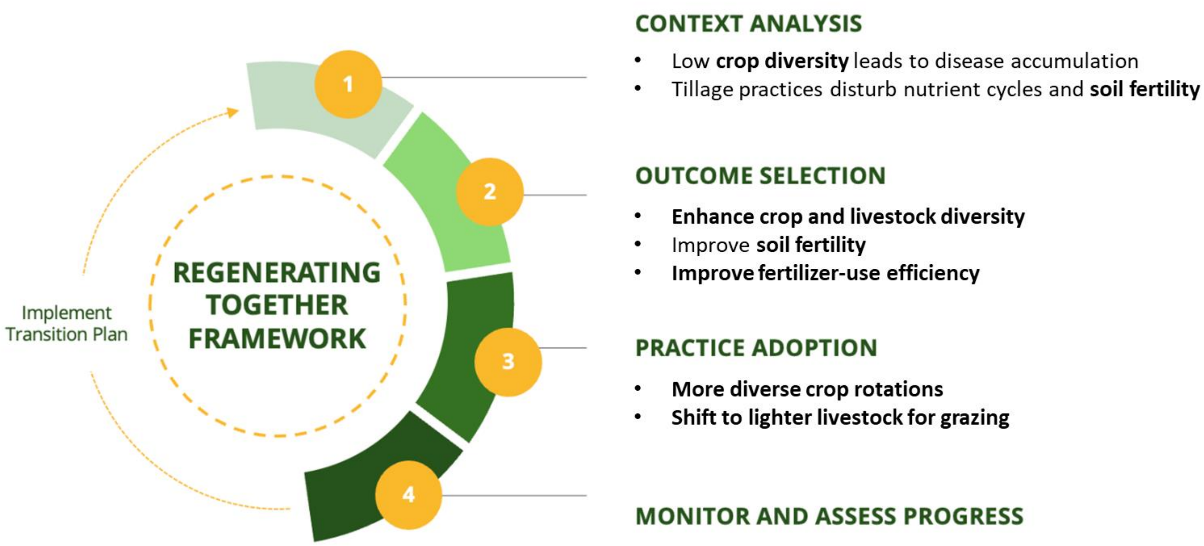

Figure 5: A case study of field crops in New Zealand using SAI Platform's Regenerating Together global framework for regenerative agriculture.

In 2012, a group of 17 arable farmers in the Mid and South Canterbury region of New Zealand noticed that their potato yields plateaued at around 55 tons/ha. This is notable despite increased investment in – and use of – fertilisers and crop protection inputs. This led the involved farmers to perform a **context analysis** of the production system and to identify the following criteria to be the main reasons for plateauing potato yields:

- **Crop Diversity:** A low diversity of cultivated crops shortens rotation cycles and leads to the accumulation of soil-borne diseases.
- **Soil Fertility:** Existing tillage and nutrient management practices may disturb soil integrity and soil nutrient cycles.

To address these factors and secure future yields, farmers decided to prioritise the following **outcomes** to monitor and report progress against and **practices** to implement:

- **Enhance crop diversity** to extend rotation cycles to a more diverse cropping system that reduces the share of depletive crops (such as potatoes, onions, and carrots) and reduces disease prevalence.
- **Increase livestock diversity** in mixed farms to reduce soil compaction caused by livestock stocking, and introduce lighter livestock, such as sheep.
- **Improve soil fertility and nitrogen-use efficiency** by adapting the timing of fertiliser applications and reducing soil disturbance.

As a result of the context-based selection and uptake of these practices, the following results have been obtained, both on **prioritised outcomes** and other environmental performance indicators.

- **Crop diversity** has increased to up to 14 crop species per rotation cycle.
- The rotation cycle for potato crops has been increased from 6 to 9 years, leading to reduced pressure of soil-borne disease.
- **Average potato yields** have increased by 25 % compared to averages from 2000-2012 (Figure 6). This notably without the application of additional amounts of fertilizers, leads to an increased **fertilizer use efficiency**.
- Modelled and measured average on-field **greenhouse gas emissions** have decreased by YY%.

Regenerative agriculture represents an approach to continuously improve the environmental performance of a farming system. This ambition is shared by the farmers represented in this case study, who have identified future focus areas to improve performance. These focus areas will include the improvement of pesticide use efficiency by introducing Integrated Pest Management (IPM) approaches to control Zebra Chip, a vector-based disease in potatoes; further extending the rotation diversity and enhancing on-farm biodiversity to increase pollinator presence and support IPM approaches through the presence of beneficial insects.

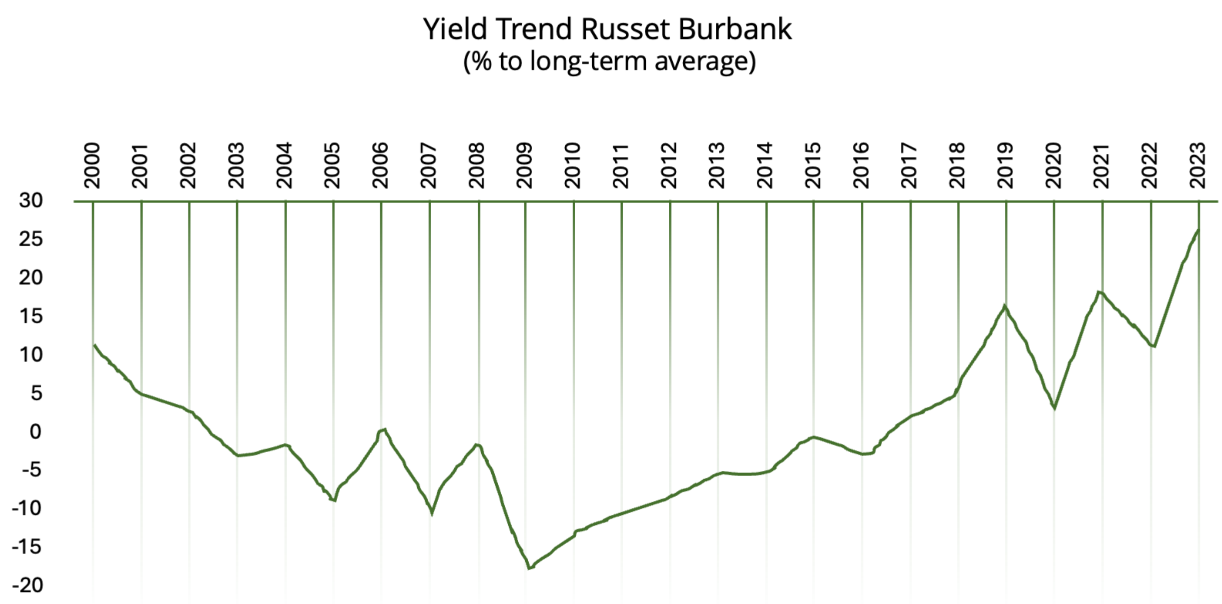

Figure 6: Yield Trend Russet Burbank (% to long-term average).