Regenerative agriculture in Brazil: challenges and opportunities

cebds

Cataloging Sheet

CONSULTANT: Gabriela Mota da Cruz

AUTHORS:

Carla Gheler Costa - CT Alimentos - CEBDS
Juliana Lopes - Diretora Natureza e Sociedade - CEBDS
Gabriela Mota da Cruz

TECHNICAL COORDINATION: Carla Gheler Costa - CEBDS

CONTENT REVIEW AND ADAPTATION:

Ana Carolina Carregaro - Nestlé
Alessandra Fajardo - Bayer
Carla Gheler Costa - CT Alimentos - CEBDS
Juliana Lopes - Diretora Natureza e Sociedade - CEBDS

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Prof. Dr. Carlos Eduardo Cerri - ESALQ/USP

Clecivaldo Ribeiro - Acting Director of the Secretariat of Innovation, Sustainable Development, Irrigation, and Cooperativism, Ministry of Agriculture, Livestock and Supply (MAPA)

Daniel Peter Beniamino - Director of the Department of Rural Environmental Management Policies - National Secretariat for Traditional Peoples and Rural Sustainable Development, Ministry of Environment and Climate Change (MMA)

Dr. Luciano Mattos - Advisor to the Secretary of Land Governance, Territorial Development, and Socioenvironmental - MDA

Dra. Ludmila Rattis - Researcher at the Amazon Environmental Research Institute (IPAM)

Dr. Moisés Savian - ecretary of Land Governance, Territorial Development, and Socioenvironmental of the Ministry of Agrarian Development and Family Agriculture (MDA)

Dr. Pedro Freitas - EMBRAPA Solos

Richard Smith - Executive Director of the PCI Institute

Victória Almeida - Ellen MacArthur Foundation

*Panel presentations.

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SOCIAL MEDIA ADDRESSES:

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linkedin.com/cebds

CEBDS ADDRESS:

WeWork - Avenida Almirante Barroso, 81 - 33º andar
Centro - Rio de Janeiro - RJ CEP: 20031-004
+55 21 2483-2250

CIVI-CO - R. Dr. Virgílio de Carvalho Pinto, 445 - 3º andar
Pinheiros - São Paulo - SP CEP: 05415-030

cebds@cebds.org

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About CEBDS

The Brazilian Business Council for Sustainable Development (CEBDS) is a non-profit civil association that promotes sustainable development through engagement with governments and civil society, as well as by disseminating the latest concepts and practices on the subject. Founded in 1997, it brings together about 100 of the largest business groups in the country, responsible for over 1 million direct jobs. CEBDS represents the World Business Council for Sustainable Development (WBCSD) network in Brazil, which includes nearly 60 national and regional councils in 36 countries and 22 industrial sectors, along with 200 business groups operating on all continents. For more information, visit: https://cebds.org/

Presentation letter

The ambition of the Brazilian business sector for 2050 is to establish sustainable, resilient, and regenerative food systems that provide access to healthy and safe food for all while respecting the planet's ecological limits.

On the path to 2050, the country aims to assume its leading role as one of the world's largest producers of sustainable food by enhancing productivity and the regenerative capacity of the food sector without expanding land use. This involves the adoption of low-carbon technology, innovation, and the utilization of biodiversity potential while preserving it.

Within this context, the focus of this study arises: regenerative agriculture by adopting both established and innovative techniques, and aiming concrete success stories by 2030, it comes to the conclusion that production and preservation can go hand in hand. The implementation of these initiatives yields benefits such as the conservation and restoration of food and agricultural systems; the enhancement of soil fertility; increased biodiversity; improvement of the rainfall cycle; resilience; and adaptation to climate change, as well as achieving zero or negative greenhouse gas emissions and combating food insecurity. In other words, it increases productivity, preserves the environment, and brings a better reputation to the sector.

In this study, CEBDS and its associated companies identified the challenges to a sustainable model of agricultural production growth, such as the lack of comprehensive and internationally accepted metrics and definitions. The work also highlights the opportunities available to the country if it can effectively leverage regenerative techniques in the field. This document elaborates on and delves deeper into the points identified throughout a year of research.

The survey was led by the CEBDS Agri-Food Systems Thematic Chamber, formed by 54 companies representing the entire sector chain, all the way from the field to consumption. Thus, this unprecedented study brings together contributions from the sector's leaders in the pursuit of sustainable business and solutions that are both applicable and scalable.

The Study "Regenerative agriculture in Brazil: Challenges and Opportunities" was developed by CEBDS, with consultancy from Gabriela Mota da Cruz and sponsorship from Bayer, Nestlé and Yara Fertilizer.

Enjoy your reading.

Introduction

This study is the result of three workshops conducted by the CEBDS Agri-Food Systems Thematic Chamber, with representatives from the public and private sector, academy, and civil society, to discuss and contextualize the challenges and opportunities for advancing regenerative agriculture in Brazil.

In the first workshop, concepts and definitions of regenerative agriculture from around the world were discussed, along with how they are being absorbed and applied in Brazil, leading to the formulation of a definition. The second event focused on the discussion of various metrics and criteria used to characterize production as regenerative, and how these are applied in Brazil. The third event aimed to identify challenges and opportunities for recognizing and promoting regenerative agriculture in Brazil, exploring how the Brazilian business sector can contribute to advancing this agenda and informing public policies on the subject.

Implementing regenerative agriculture in Brazil is seen as a crucial strategy for reducing greenhouse gas emissions, positioning the food sector as a significant player in addressing climate change. It also enhances resilience to these changes impacts on food production, thereby contributing to food security and the production of healthy and accessible food for all.

This study used a qualitative analysis methodology to develop the report, based on three pillars:

(I) DATA SURVEY - engaging associated companies, academia, the public sector, and civil society through workshops and qualitative analysis of the obtained data is part of the approach. This includes conducting surveys for descriptive statistics within the public domain of the sector.

(II) BIBLIOGRAPHIC RESEARCH - analysis of national and international scientific publications.

(III) CASE STUDY - analysis of experiences described in studies prepared by CEBDS and its associated companies.

This study provides an insight into the Brazilian reality regarding regenerative agriculture, considering the international literature debate and the position of companies affiliated to the Brazilian Business Council for Sustainable Development (CEBDS). It also presents regenerative agriculture projects from companies associated with CEBDS, demonstrating that the Brazilian business sector is already implementing this strategy and achieving significant results across various stages of the production chain – from the field to consumption.

The absence of a single and common definition in Brazil regarding regenerative agriculture may pose challenges to the implementation and recognition of these practices and their positive impacts on agroecosystems. The purpose of this study is to bring greater clarity to the nature of these practices and metrics, along with a suggested definition that can support more public policies aimed at promoting and implementing regenerative agriculture in Brazil, such as the RenovAgro Program (2023/2024 Safra Plan).

What is regenerative agriculture?

The debate on regenerative agriculture has been highlighted by international pressure to reduce GHG emissions from the agricultural sector. Brazil's role in global agricultural production and in the country's commitment to reducing GHG emissions, signed in the Paris agreement through the Nationally Determined Contribution (NDC) in 2015, has also reinforced the debate on regenerative agriculture. We would also like to highlight its developments, especially with the development of public policies aimed at promoting sustainable Brazilian agriculture, including the ABC Plan[1] (LIMA; HARFUCH; PALAURO, 2020), its replacement from 2022, the ABC+ Plan (MAPA, 2021) and RENOVAGRO from the 2023 Safra Plan (BNDES, 2023).

The expression regenerative agriculture was coined by Robert Rodale (1983a)**, who defined it as a production system that adopts agricultural principles in order to rehabilitate the entire ecosystem and improve natural resources, rather than depleting them. This definition is based on seven trends: (i) Pluralism** (increasing biodiversity of the planet's fauna and flora); **(ii) Protection (**increasing and improving vegetative soil cover, aiming to reduce erosion and enhancing soil's microbial population); **(iii) Purity (**non-use of agricultural pesticides); **(iv) Permanence** (promoting the development of perennial plants and strengthening their roots); **(v) Peace** (agricultural practices in harmony with the environment/nature); **(vi) Potential** (nutrient availability for plant development); **(vii) Progress** (promotion of soil quality, both in terms of structure and water access capacity) (RODALE, 1983a). Among these seven trends (7Ps), Rodale (1983a) also emphasizes that soil quality is the central point of this debate.

Despite the concept developed by Rodele (1983a) being an initial reference for the debate on regenerative agriculture, there are criticisms of this conceptualization, mainly regarding its relationship with Organic Agriculture and restrictions on the use of agricultural pesticides and biotechnology.

There is currently no precise definition of regenerative agriculture. Its concept is related to a production system that adopts sustainable and conservationist agricultural practices (mainly related to soil). Newton et al. (2020), in their analysis of 229 journal articles and 25 professional websites that discussed the meaning of the term "regenerative agriculture," found discrepancies among the concepts presented in different articles and sites. Therefore, one of the primary challenges for the dissemination of regenerative agriculture is the lack of a widely accepted definition.

The development of regenerative agriculture concept is based on two different perspectives: (i) processes (sustainable agricultural practices in terms of environmental and biodiversity aspects) and (ii) achieved results (such as emissions reduction, increased biodiversity, water preservation, etc.).

There are also definitions of regenerative agriculture linked to the expected outcomes of adopting certain agricultural practices. These results include: (i) reduction of greenhouse gas emissions; (ii) soil conservation and fertility; (iii) increase in biodiversity; (iv) improvement and maintenance of the hydrological cycle; (v) resilience and adaptation to climate change, among others.

Many regenerative agriculture definitions are based on sustainable agricultural practices. However, it is important to note that this definition should not be limited to the adoption of a specific practices set, excluding other sustainable agricultural practices that can be improved or even developed over time, and that can be incorporated into this production model. Some agricultural practices identified as belonging to regenerative agriculture include: (i) soil cover actions (such as no-till practices without soil disturbance); (ii) integrated systems (such as agroforestry integration systems, among others); (iii) soil quality improvement (increasing its potential for carbon sequestration, fertility, and biodiversity); (iv) implementation of native vegetation recovery and forest planting for greater climate

1 The Sectoral Plan for Mitigation and Adaptation to Climate Change for the Consolidation of a Low Carbon Economy in Agriculture (ABC Plan), launched by the federal government as a response to the climate agenda that Brazil took on at COP15 in Copenhagen in 2009, sets a target of implementing integrated production systems on four million hectares by 2020, with a mitigation potential of 18 to 22 million Mg CO2e.

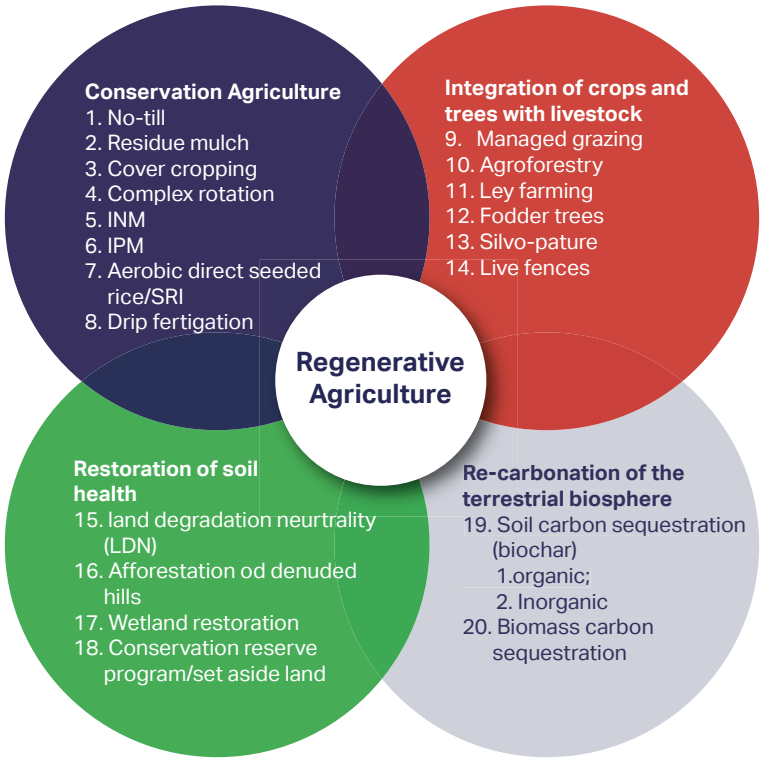
security in the region (studies indicate that "standing forest" and native vegetation play an important role in climate stability for agriculture); (v) rotation or successive cultivation of more than one crop in the same area; (vi) year-round cultivation/planting cover to prevent soil fallow during off-seasons, helping to prevent erosion; (vii) adoption of no-till practices (conservative cultivation or less field plowing); (viii) optimized and efficient use of agricultural pesticides and biotechnology with zero or negative environmental impact; (ix) promotion of animal welfare and fair labor practices for producers; (x) adoption of biodigesters to generate energy from bovine waste, among others (CEDBS, 2022; NEWTON et al., 2020) (Figure 1).

Thus, the Brazilian business sector suggests the adoption of a more comprehensive definition for regenerative production, considering the diversity of sustainable and conservationist agricultural practices that are also suitable for the Brazilian context. However, it is also important for this definition not only to consider environmental criteria but also to encompass the social, economic, and financial sustainability of these practices.

One of the main pillars of regenerative agriculture is soil conservation practices. According to Schreefel et al., (2020), a comprehensive approach to regenerative agriculture is based on soil conservation as the foundation for the regeneration of other ecosystem services. Regenerative agriculture practices are linked to sustainable soil use and conservation practices, characterized by encouraging the achievement of nutrient-rich soils with adequate water access (MOYER et al., 2020).

In this context, the No-Till System is a key component for effective soil conservation in Brazil. Therefore, its adoption is essential for strengthening the national regenerative agriculture production system. This system is an agricultural practice of soil, water and crop management, in which the crop is planted on the remains of previous crops - straw, with crop rotation, without soil movement (restricted to the sowing line) (Figure 2).

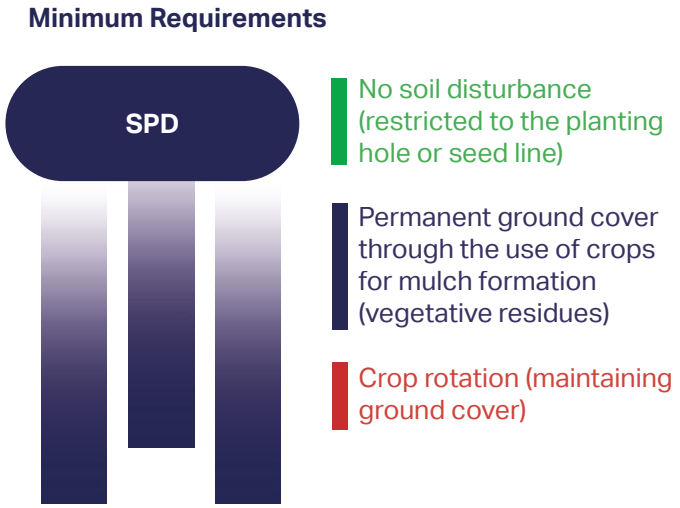
FIGURE 1 – PAGRICULTURAL PRACTICES FORESEEN IN REGENERATIVE AGRICULTURE



Source: Lal (2020).

INM = integrated nutriente managment, IPM – integrated pest management, SRI= system of rice intensification

FIGURE 2 – MINIMUM REQUIREMENTS FOR NO-TILL PLANTING SYSTEM



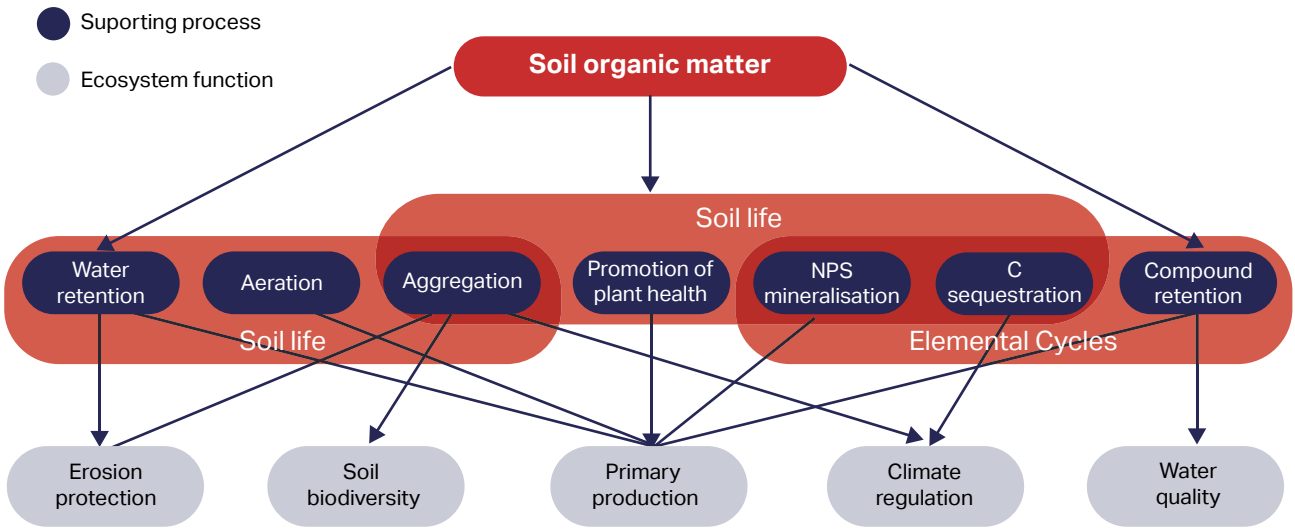
Source: CEBDS, 2023.

The capture of CO2 by plants is another crucial characteristic of regenerative agriculture, representing a significant source of carbon in Brazilian agriculture, helping to reduce GHG emissions. One square meter of soil stores about twice as much carbon as the atmosphere and three times as much carbon as the biosphere (CERRI, 2023 a).

The introduction of cover crops benefits carbon accumulation in the soil by: (i) Increasing the amount of biomass produced and added to the soil; (ii) Enhancing diversity and quality of biomass added to the soil; (iii) Boosting the soil's Nitrogen (N) content through biological nitrogen fixation (legumes), promoting greater plant growth and carbon stabilization efficiency in the soil; (iv) Enhancing stabilization and protection of Carbon (C) by increasing soil aggregation (Figure 3).

> Regenerative agriculture practices are linked to sustainable soil use and conservation practices, characterized by encouraging the achievement of nutrient-rich soils with adequate water access (MOYER et al., 2020)

FIGURE 3 – BENEFITS OF SOIL CARBON

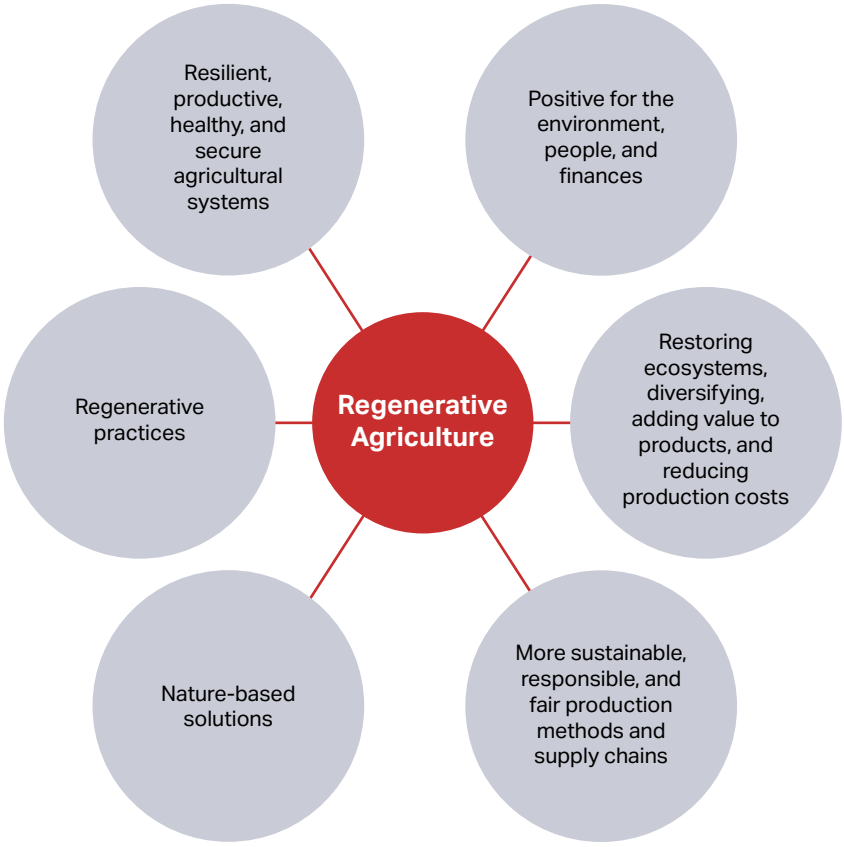


Source: Hoffland et al., (2020)

The existence of various definitions of regenerative agriculture can lead to uncertainty about which agricultural practices truly belong to this type of agriculture (processes) or what results we should expect from the adoption of this type of agriculture. These uncertainties can hinder the transition to regenerative agriculture by farmers and its promotion through policies, both public and private (NEWTON et al., 2020).

It is critical that the productive system model of regenerative agriculture considers its economic and financial viability so that the expansion of this production model is feasible and attractive to farmers. The Brazilian business sector believes that it is important to have mechanisms (both public and private) that encourage the adoption of agricultural practices promoting social well-being, the reduction of greenhouse gas emissions, biodiversity and soil conservation, efficient use of water and inputs. Such mechanisms should ensure that the adoption of these practices is also economically attractive for Brazilian farmers (Figure 4).

FIGURE 4 – REGENERATIVE AGRICULTURE



Source: CEDBS, 2023.

In general, the literature regards regenerative agriculture as a production strategy that adopts sustainable agricultural practices (from a socio-environmental and economic-financial perspective), resulting in a productive system with reduced or even positive socio-environmental impacts. It promotes the reduction of greenhouse gas emissions and the conservation of agroecosystems. Considering regenerative agriculture in the context of the Brazilian territory, it is expected to have the capacity to stimulate:

1. Conservation and rehabilitation of food and agricultural systems;
2. Recovery and maintenance of soil fertility;
3. Increase in biodiversity;
4. Improvement of the hydrological cycle;
5. Landscape management with the provision of environmental services;
6. Resilience and adaptation to climate change;
7. Null or negative Greenhouse Gas (GHG) emissions;
8. Assistance in combating food insecurity.

Regenerative agriculture presents both advantages and challenges. The advantages are largely associated with socio-environmental progress resulting from the adoption of more sustainable agricultural practices, as well as improvements in all soil health parameters. In general, these practices increase production potential without expanding the production area, meaning they enhance productivity and profitability without encroaching on native vegetation areas, contributing to a reduction in deforestation. On the other hand, challenges are associated with promoting the engagement of rural producers in adopting these practices, scalability, and the pursuit of robust results that substantiate the genuine positive socio-environmental and economic-financial impacts (Figure 5).

FIGURE 5 – ADVANTAGES AND DISADVANTAGES OF REGENERATIVE AGRICULTURE PRACTICES ADOPTION

Advantages		Disadvantages
• Healthy agricultural products; • Innovation and social development for vulnerable populations; • Restoration and preservation of agroecosystems; • Capacity for water resource preservation; • Efficient use of chemical inputs; • Potential for increased productivity and profitability without expanding the production area.	X	• Challenges in popularizing regenerative agriculture (connecting technologies to public participation and renewing financial mechanisms); • Scale of production;

Source: CEDBS, 2023.

Metrics for regenerative agriculture

The Brazilian business sector has recognized the urgency of developing metrics that analyze and effectively demonstrate whether the expected results in the regenerative agriculture production system have been achieved. The development of these metrics will make it possible for an agricultural producer to be "certified" (not necessarily by a certification company) in the future with a kind of "regenerative agricultural production seal," which could be public, for example. It is important to consider how and what to measure so that the results truly reflect the benefits of good regenerative practices. Figure 6 outlines the main expected outcomes on farms adopting the regenerative agriculture system.

INDICATORS OF SOIL QUALITY AND HEALTH

The analysis of soil quality and health plays a central role in the development of regenerative agriculture metrics. It is crucial to develop metrics capable of capturing levels of soil quality, health, water cycle, carbon capture, and biodiversity. This ensures that the results obtained align with the expected parameters for regenerative agriculture and genuinely contribute to soil regeneration.

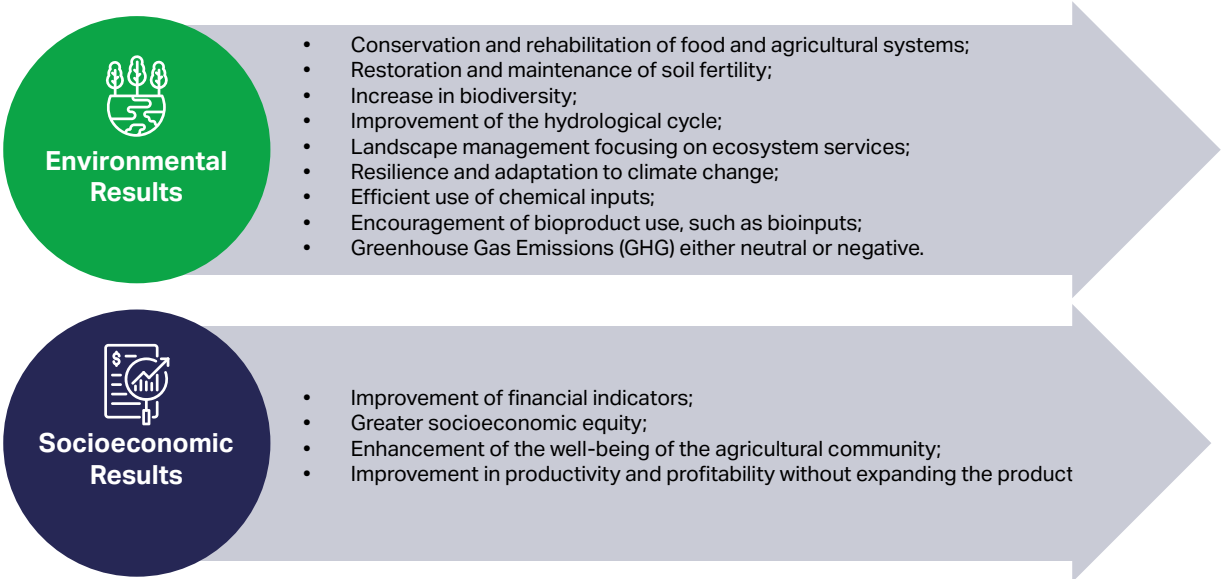
Analyzing the four main types of soil indicators: (i) Visual; (ii) Physical; (iii) Chemical; (iv) Biological.

Visual indicators have significant potential for use through satellite imagery, which can contribute to reducing the cost and scalability of regenerative agriculture assessment. Currently, with the development and advancement of Machine Learning and georeferencing technology, many image recognition software tools are progressing in the analysis of satellite-acquired images. These technological advances can be significant in promoting indicators capable of conducting robust soil analyses based on these images, eliminating the need for field research. In this context, the use of such technologies can contribute to making the assessment/recognition process of regenerative agriculture more cost-effective.

Physical, chemical, and biological soil indicators tend to have higher analysis/evaluation costs. Generally, these indicators require soil sample collection from the rural property and laboratory analyses, making the assessment process more challenging and costly for some producers.

Soil functions are closely related to soil quality/health indicators. Many of these indicators are developed considering soil functions that generate positive impacts on ecosystems. Figure 7 presents a visual scheme showing the relationship between some functions and important soil quality attributes. Three main types of soil indicators (chemical, physical, and biological) can be observed.

FIGURE 6 – EXPECTED RESULTS WITH REGENERATIVE AGRICULTURE IMPLEMENTATION.



Source: CEBDS, 2023.

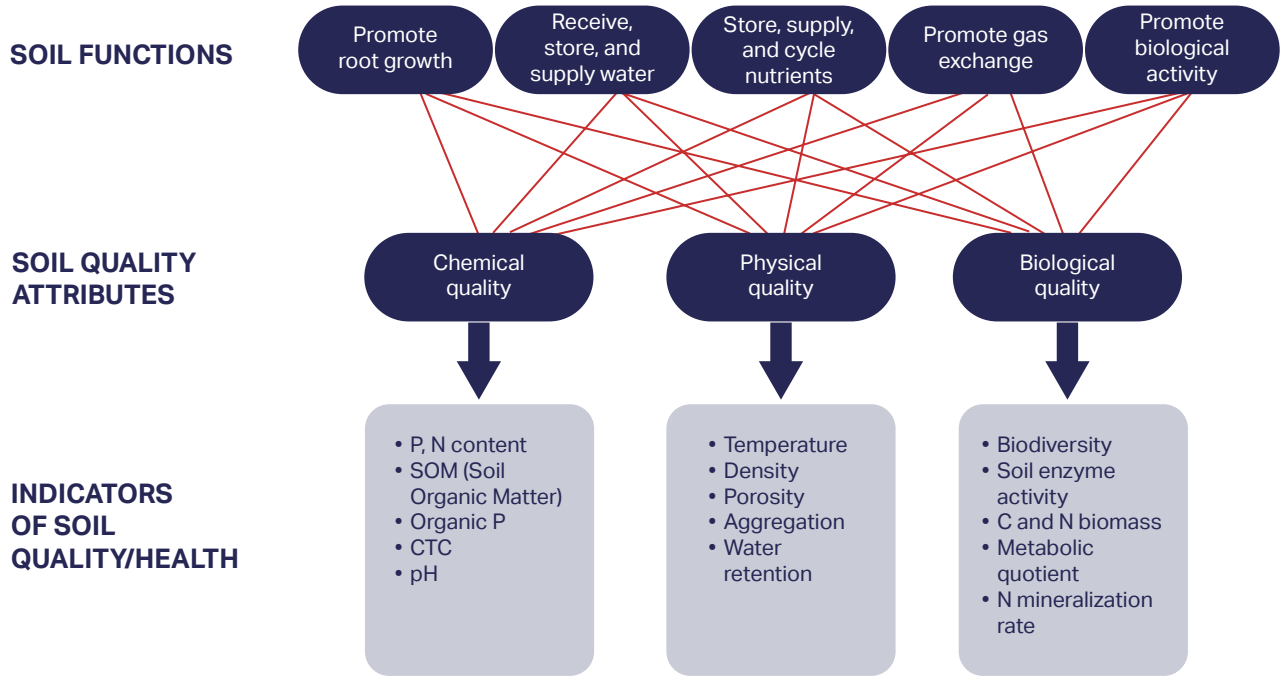
The great challenge in developing metrics to certify whether the soil on a rural property adopts a regenerative agriculture system is to reduce the list of indicators needed, making the analysis process cheaper and quicker.

Cerri and his collaborators mapped 38 of the most relevant soil quality indicators. The three main types of indicators for analyzing soil quality and health (chemical, physical and biological) were considered when selecting the indicators. These indicators are capable of analyzing different aspects of the soil, making it possible to certify that the rural property has soil that adopts agricultural practices that achieve the objectives and results envisaged in regenerative agriculture. Figure 8 shows these 38 indicators, 14 of which are chemical indicators, 14 physical indicators and 10 biological indicators.

Seven main indicators were selected through a process of analysis that provide information on the chemical, physical and biological aspects of the soil. Studies were carried out using a scoring system for the "efficiency" of each of the 38 indicators identified, and based on this, seven of the most relevant indicators were selected, adopting statistical methods to score the efficiency of this indicator in assessing soil quality (CERRI, 2023 b). Figure 9 shows the seven main indicators selected using this methodology.

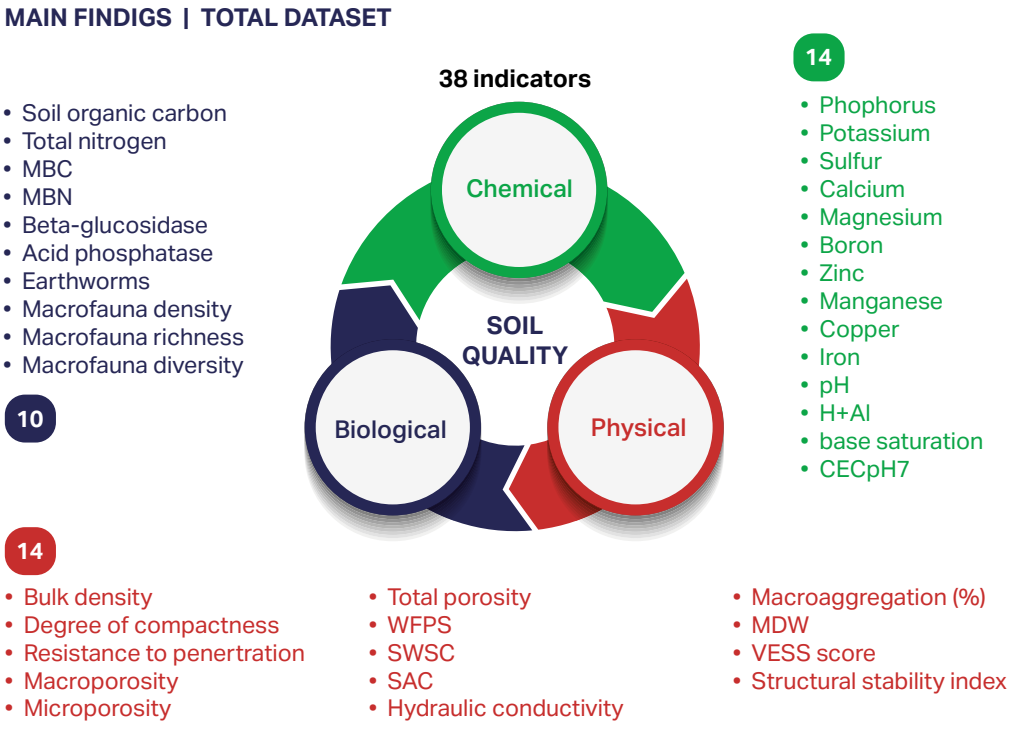
In another study also led by Professor Carlos Eduardo Cerri (ESALQ/USP), five better soil indicators were identified (Figure 10).

FIGURE 7 – IINDICATORS OF SOIL QUALITY/HEALTH



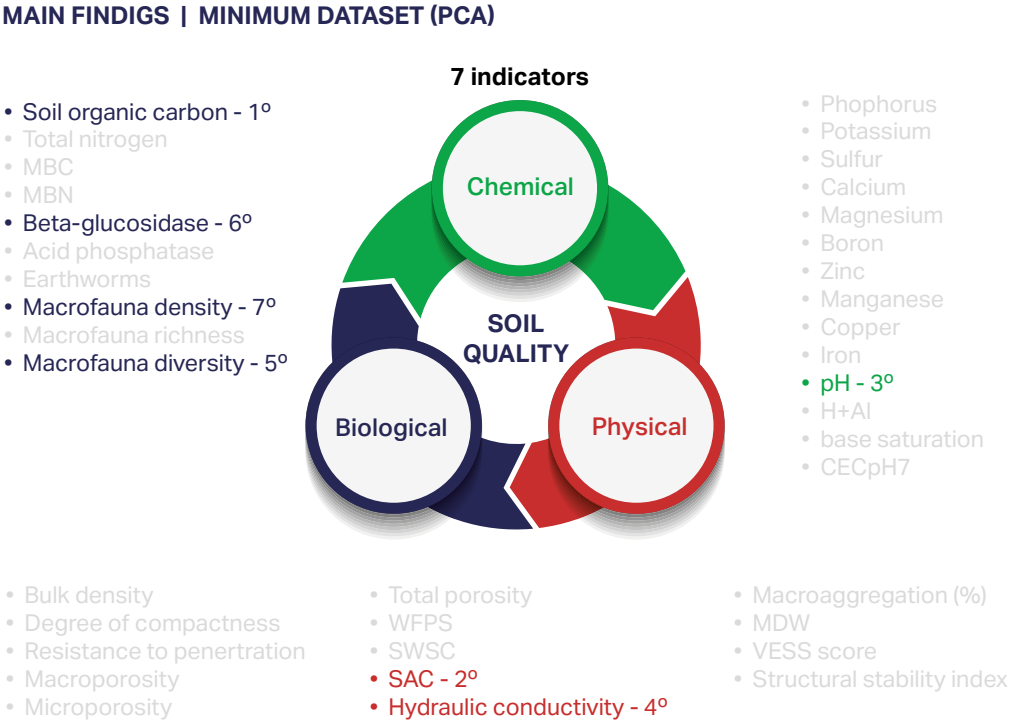
Source: Cerri (2023b).

FIGURE 8 – MAIN INDICATORS FOR ANALYZING SOIL QUALITY IN REGENERATIVE AGRICULTURAL PRACTICES



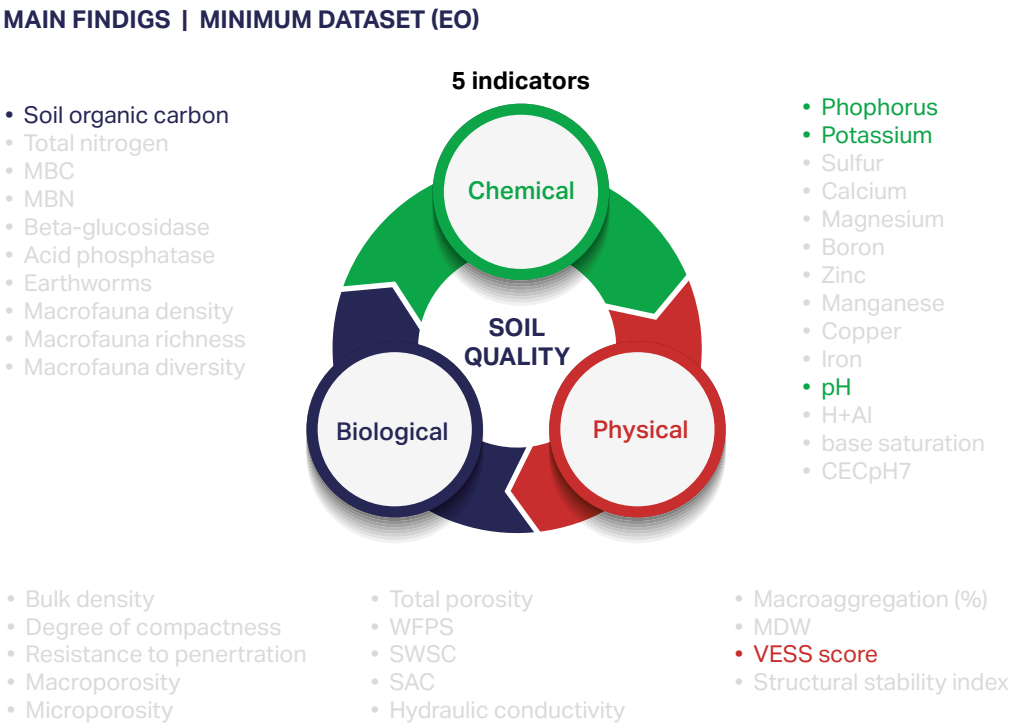
Source: Cerri (2023 b).

FIGURA 9 – SEVEN MAIN INDICATORS SELECTED AS MOST APPROPRIATE FOR ANALYZING SOIL QUALITY IN REGENERATIVE PRACTICES



Source: Cerri (2023 b).

FIGURA 10 – FIVE MAIN INDICATORS SELECTED AS MOST APPROPRIATE FOR ANALYZING SOIL QUALITY IN REGENERATIVE PRACTICES



Source: Cerri (2023 b).

GENERAL INDICATORS

Researchers Ludmila Rattis[2] and Andrea Garcia[3] are carrying out a research project that develops a proposal for metrics for regenerative agriculture. Considering the Theory of Change[4], four dimensions stand out for implementing regenerative agriculture: (i) carbon sequestration; (ii) soil

> The great challenge in developing metrics to certify whether the soil on a rural property adopts a regenerative agriculture system is to reduce the list of indicators needed, making the analysis process cheaper and quicker.

[2] Amazon Environmental Research Institute (IPAM)

[3] Université Catholique de Louvain

[4] A Theory of Change can be defined as "a planning model used by social entrepreneurs and organizations to describe the desired impact caused by an intervention or program in a specific community." In the case of the subject of study in this report, the impact of the adoption of regenerative agriculture on Brazilian rural properties is analyzed (PERES RODRIGUES et al., 2021).

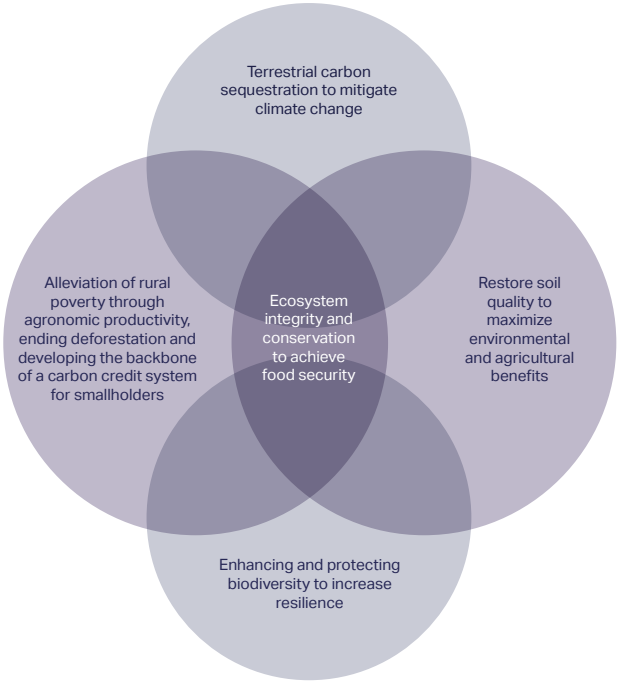
restoration; (iii) maximizing agricultural and environmental resources and (iv) biodiversity (Figure 11). These four dimensions aim to create an integrated ecosystem that also guarantees food security; it is therefore very important to consider these dimensions when formulating indicators to evaluate the results of implementing regenerative agriculture (RATTIS; GARCIA, 2023).

The indicators presented by the researchers mentioned above consider the following as the basis for their development: (i) Different types of agricultural crops[5]; (ii) Small and large agricultural producers; and (iii) Emphasis on indicators that use environmental/agricultural databases and remote sensing rather than field research (RATTIS; GARCIA, 2023).

Three basic axes were developed in which the implementation of regenerative agriculture is expected to promote positive ecosystem services for society: (i) Maintenance of Native Vegetation; (ii) Recovery of Degraded Areas; (iii) Enrichment in Productive Areas. Table 1 shows these basic axes, with their respective associated ecosystem services, considered for the development of these indicators (RATTIS; GARCIA, 2023).

[5] Including perennial crops, annual crops, pastures, etc.

FIGURE 11 – DIMENSIONS OF REGENERATIVE AGRICULTURE



Source: Adaptada de Lal (2007).

TABLE 1 – BASIC AXES OF ECOSYSTEM SERVICES ASSOCIATED WITH REGENERATIVE AGRICULTURE

Activity	Related Ecosystem Services
Maintenance of native vegetation	Maintaining carbon stocks
	Maintaining biodiversity
	Maintaining soil quality
	Maintaining water quality
	Maintaining pollination capacity
Recovering Degraded Areas	Climate regulation
	Carbon sequestration
	Increased biodiversity
	Recovery of soil quality
	Recovery of water quality
	Erosion control
	Restoring pollination capacity
Enrichment in Productive Areas	Climate regulation
	Incorporation of carbon into biomass
	Increased biodiversity
	Improved soil quality
	Biological control of pests and diseases
	Restoring pollination capacity
	Provision of food

Source: Rattis; Garcia (2023).

Remote sensing data is mostly used as indicators for assessing the impact of implementing regenerative agriculture on climate regulation (local and global). With its origins in remote sensing,

the data adopted for these indicators have proven to be suitable for analysis, also for small agricultural producers. Analyses of other technologies capable of contributing remote sensing data from small Brazilian farmers in different biomes are being developed, including the Cerrado, the Atlantic Forest and the Pampa (RATTIS; GARCIA, 2023). According to the researchers, the "Water Quality" indicators do not yet use remote sensing data, but partnerships are being established with institutions that monitor river basins to use this data in future models (RATTIS; GARCIA, 2023). With regard to soil quality indicators, the Standardized Precipitation Evapotranspiration Index (SPEI) is an indicator that deserves attention, as it uses remote sensing data, while most indicators of this kind require field research to assess soil quality (RATTIS; GARCIA, 2023). To assess biodiversity, the researchers adopted indicators related to the biodiversity support that the implementation of regenerative agriculture can generate (RATTIS; GARCIA, 2023) (Table 2).

Élt is important to bear in mind that these indicators are still under development and do not represent a consolidated standard of metrics for regenerative agriculture in Brazil. However, they contribute to enriching and promoting the debate on metrics for regenerative agriculture in Brazil and help guide public policymakers to remedy regulatory gaps and actually encourage and foster the implementation of sustainable and regenerative practices in all links of the food production chain – all the way from field to consumption.

TABLE 2 – SUGGESTED INDICATORS FOR REGENERATIVE AGRICULTURE

Indicators	Metrics
Local climate regulation	Earth surface temperature
	Moisture
Global climate regulation	Area occupied by native vegetation (percentage variation in coverage)
	Accumulated primary production (biomass variation)
Water quality regulation	Landscape management (number of animal access points to bodies of water)
	Portability (physiochemical and biological parameters)
Soil quality support	Temperature
	Humidity
	Soil organic material (MO percentage change)
Maintaining soil stability	Land erosion points (number, size and appearance)
	Exposed soil
	Sedimentation (soil loss model, e.g. RUSLE)
Water resources	Effort spent on water capture (water collection and distribution structures)
	Water yield
Food provision	Diversity of food items
	Primary production or vegetation vigor
	Productivity
Biological control of pests and diseases	Effort spent on pest control
Biodiversity support	Accumulated primary production
	Species richness
	Habitat Index
	Biodiversity Index
Pollinator support	Abundance of resources for pollinators

Source: Rattis; Garcia (2023).

Implementation of regenerative agriculture in Brazil

According to CEBDS associated companies, the promotion of regenerative agriculture in Brazil can be stimulated in various ways and can be driven by both the public and private sectors. There are several potential tools for encouraging regenerative agricultural production, including: (i) Research in agricultural practices (stimulating the development of technologies focused on low-carbon agriculture, increased agricultural productivity, biodiversity, etc.); (ii) Technical assistance (a communication tool with rural producers for training in more sustainable and productive agricultural technologies); (iii) Financial instruments (such as subsidized rural credit, price policies, etc.); (iv) Tax incentives (exemption or discount on taxes and fees); and (v) Command and Control Policies (forest code); (vi) Payment for Environmental Services, among others.

The Brazilian business sector has identified some bottlenecks in promoting the transition to regenerative agriculture in Brazil. In Brazil, small farmers still have difficulty accessing rural technical assistance, despite this being an essential factor for a transition to more sustainable agriculture in both environmental and socio-economic terms. Another important aspect of technical assistance is to help provide information about the benefits of adopting sustainable practices on rural properties and in the lives of farmers. The cultural aspects of farmers (especially livestock farmers) must be taken into account, as many rural producers have a conservative view of sustainable agricultural practices (from an environmental point of view), which results in a fearful view of the real cost-benefit of these practices. Another important point is the development of sustainable agricultural practices that are socio-economically viable, a basic aspect of the regenerative agricultural system.

Another bottleneck is related to the development of research into agricultural practices and the expansion of technical assistance plays a fundamental role in the transition to a regenerative agricultural production model. Encouraging these two actors should be encouraged by both public and private initiatives. However, it's not enough just to promote research; this technical knowledge needs to reach small farmers, and it's essential to encourage technical assistance, as mentioned above. The impact of technical assistance, both public and private, is felt mainly in the significant improvement in the productivity of rural producers and better efficiency in the use of resources and inputs per harvest. Studies indicate that technical assistance is more successful in training farmers when the impacts on productivity and efficient use of inputs are analyzed (OTÁVIO DE FREITAS et al., 2018; OTÁVIO DE FREITAS et al., 2021).

Over the years there have been important advances in rural financing for sustainable agricultural practices, the main examples being: (i) the Central Bank's sustainability program; (ii) credit lines for sustainable agriculture from the SAFRA Plan and other private banks; and (iii) the expansion of the Brazilian financial market in the development of green bonds. However, the lack of convergence in the definition of regenerative agriculture and what metrics and criteria should be used to recognize and identify such practices makes it difficult for rural producers to take out credit, and therefore hinders the expansion and implementation of regenerative practices. We should remember that rural credit policy has been the main public instrument for encouraging agriculture in Brazil for decades. Therefore, in the last decade, specific subsidized rural credit policies have been created for sustainable agricultural practices, both from an environmental and socio-economic point of view, with the ABC Plan and, currently, RENOVAGRO standing out in this regard.

Another way of encouraging regenerative agricultural practices is through tax breaks. However, they should be analyzed with caution due to the profound impacts they can have on public accounts. When analyzing the subsidies offered to the agricultural sector, there are no policies aimed at linking tax subsidies to compliance with the Forest Code, although this would be an important step forward in promoting regenerative agricultural practices.

The Forest Code (Law No. 12.651/2012) establishes environmental rules that must be adopted by all Brazilian rural properties. The Brazilian Forest Code provides for important command and control instruments such as the Rural Environmental Registry (CAR), but the country has faced challenges in implementing and validating the CAR. The implementation, validation and cross-checking of CAR data would already be of great value for better control of agricultural

production and for stimulating the transition to regenerative agricultural production.

Care should be taken with voluntary agreements and public policies that adopt a stance of excluding producers who do not automatically fit into the model of sustainable agricultural practices imposed. More inclusive actions, such as offering technical assistance and subsidized rural credit, are more effective than traditional command and control policies. The Brazilian business sector believes that the definition of a concept, metrics, and criteria for regenerative agriculture, to be adopted in Brazil, should be inclusive and should guide public policies so that the transition to sustainable and regenerative agriculture really advances in the country. In this way, Brazil can play a leading role in the transition and adoption of decarbonizing technologies for the agricultural sector.

Payment for Environmental Service (PES) is also a good incentive for the transition to regenerative agriculture and can be defined as an economic instrument that rewards and incentivizes those rural producers who provide environmental services (Law no. 14.119/2021). This additional revenue is an important incentive for more sustainable agricultural practices. In the last decade, PES has been gaining strength, highlighted by the Voluntary Carbon Market, CBIO (carbon credits linked to RenovaBio certification), among other regional policies that Brazil has been developing.

Given the real impacts of climate change on food production, the transition to sustainable and regenerative agriculture is urgent, and Brazil, as one of the world's largest food producers and exporters, needs to lead this journey, and the business sector is ready to collaborate in this transition.

> When considering these benefits, regenerative agriculture represents a relevant strategy for food production, integrating sustainable practices aimed not only at agricultural productivity, but also at ecosystem health and global resilience.

Recommendations

The transition from conventional to regenerative agriculture brings several benefits, not only for the environment, but also for human health and the economic resilience of the entire production chain, such as:

- Increases soil organic matter, promoting soil structure and fertility;
- Reduces soil erosion, improving water retention and preventing degradation;
- Encourages species diversity, including plants, animals, and microorganisms;
- Promotes more balanced and resilient ecosystems;
- Contributes to the capture of atmospheric carbon by the soil, helping to mitigate climate change;
- Reduces greenhouse gas emissions;
- Improves the soil's ability to retain water, reducing the need for irrigation;
- Mitigates the impact of floods and water scarcity;
- Contributes to the efficient use of inputs;
- Promotes agricultural systems that are more adaptable and resistant to extreme weather events;
- Provides more nutritious food products due to healthier soil and cultivation practices;
- Provides new local jobs and strengthens the economy.

When considering these benefits, regenerative agriculture represents a relevant strategy for food production, integrating sustainable practices aimed not only at agricultural productivity, but also at ecosystem health and global resilience.

During working meetings of the Food Systems Thematic Chamber, some gaps were identified for the advancement and implementation of regenerative agriculture in Brazil:

1. Lack of a concept and definition for regenerative agriculture in Brazil;
2. The absence of metrics and criteria to analyze and prove whether the expected results of a regenerative production system have been achieved. The development of these metrics will make it possible for an agricultural producer to be certified/recognized with a kind of "regenerative agricultural production seal", and thus add value to their product;
3. The absence of a regulatory framework for regenerative agriculture in Brazil.

These absences make it difficult to identify and recognize this practice, which in turn leads to difficulties in accessing incentives and credits (public and private) that are intended for rural producers who implement this type of agriculture (SAFRA plan, Reno-

vAgro, etc.), besides creating challenges for drawing up public policies that are geared towards this issue.

We therefore recommend to the Ministry of Agriculture, Livestock and Supply (MAPA) that a working group be set up, with the participation of public authorities, academia, the private sector, and civil society, to debate and remedy these identified gaps, so that Brazil can move forward and be a leader in the transition to sustainable and regenerative agriculture.

The Brazilian business sector can play a crucial role in advancing regenerative agriculture in Brazil through various actions and practices:

- Incorporate sustainable agricultural practices that promote soil health, biodiversity, and water conservation;
- Invest in agricultural techniques that reduce soil erosion and environmental degradation;
- Develop and implement innovative technologies that promote regenerative agriculture, such as low-impact cultivation systems and environmental monitoring;
- Collaborate with local farmers to encourage the transition to regenerative practices by providing technical support, training, and resources;
- Fund research aimed at improving regenerative agricultural practices, developing crop varieties that are more resistant and adapted to these methods;
- Invest in educational programs to raise awareness among farmers, suppliers and consumers about the benefits of regenerative agriculture;
- Establish tangible environmental goals and commitments, such as reducing the carbon footprint, sustainable water management and biodiversity protection;
- Promote sustainable supply chains, encouraging regenerative practices at all stages, from production to distribution.

By adopting these practices, companies can play a fundamental role in promoting regenerative agriculture, contributing to environmental sustainability, sustainable development of the Brazilian agricultural sector, and can also help shape public policies on the subject.

The following are regenerative agriculture projects by CEBDS associated companies. They demonstrate that the Brazilian business sector is already implementing this strategy and reaping important results at different links in the production chain – all the way from field to consumption.

Cases

Case Amaggi

Company Name	Amaggi
Project/Action Name	Amaggi Regenera
Type of Agriculture (sustainable or regenerative)	Regenerative
Case status (Conceptualization; Pilot; 1st year; 2nd year; over 3 years in existence)	Conceptualization

THE PROGRAM REPRESENTS AN INNOVATIVE APPROACH BY AMAGGI TO CONNECT AGRICULTURE WITH NATURE AND PROMOTE ENVIRONMENTAL REGENERATION.

COMPANY SUMMARY

With a sustainable operating model, AMAGGI is the largest Brazilian company in grains and fibers and operates in four business areas: Agro, Commodities, Logistics, and Energy. A leadership in the certified soybean market with the highest socio-environmental standards, the company was recognized for the second consecutive year as the first in the global Forest 500 ranking and with an A- leadership score in the CDP Forest.

PROJECT/ACTION OBJECTIVE

Amaggi Regenera is part of AMAGGI's climate commitment to achieve net zero emissions by the year of 2050. The main objectives of the program are: strengthening and regenerating soils in productive areas; protection of biodiversity and water resources; mitigation of climate impacts and economic resilience; and dissemination of regenerative practices to more producers.

INITIAL IDEAS

AMAGGI has been committed to transitioning to regenerative agriculture, understanding how this concept can be applied to large-scale commodity production. In partnership with Embrapa, IPAM, and ReNature, the company has structured all its years of learning and developed its program to scale and transparently communicate everything it has been doing.

CASE SUMMARY

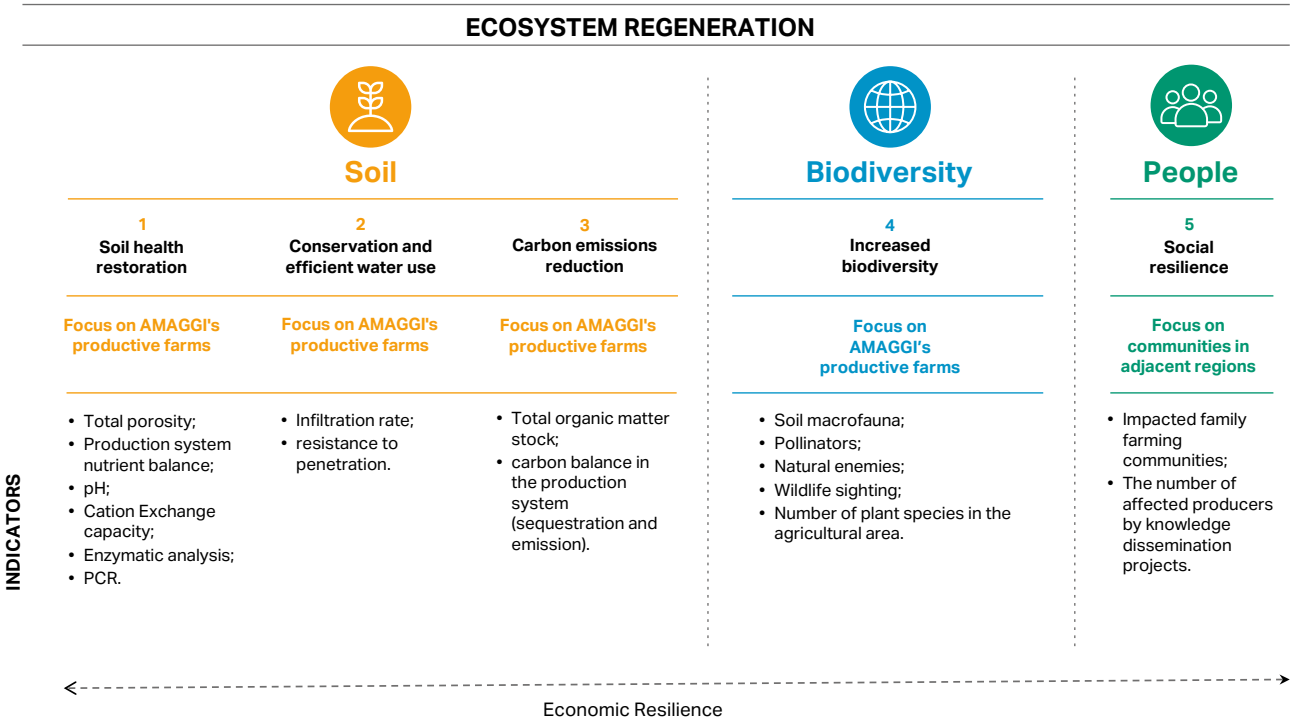
Amaggi Regenera is a connection of the highest technology in the field with nature, to ensure a low-carbon agricultural system that restores soil health and biodiversity while encouraging a whole generation of producers towards a new way of production. For the regenerative transition, the program will be based on 3 central pillars: Soil, Biodiversity, and People, with monitoring and transparency of best practices and achieved results.

DESCRIPTION

Based on research and strategic partnerships with organizations such as EMBRAPA, ReNature, and IPAM, the program represents an innovative approach by AMAGGI to connect agriculture with nature and promote environmental regeneration. Based on three pillars — Soil, Biodiversity, and People — it aims to enhance soil health through practices such as no-tillage, integrated systems, composting, and the use of cover crops. It also emphasizes biodiversity protection by incorporating biological disease control and the restoration of native vegetation areas. In addition, AMAGGI will empower producers and family farmers, influencing an entire generation towards regenerative agriculture. The actions are scaled to various regions, demonstrating the feasibility of regenerative agriculture on a large scale.

INDICATORS

To regenerate the ecosystem, there is monitoring of the program's 3 pillars:



PROJECT'S BENEFITS, RETURNS, LOSSES, AND RESULTS

Project benefits include restoring soil health, protecting biodiversity, reducing greenhouse gas emissions, and enhancing the resilience and sustainability of agricultural operations. In addition to progressing toward its SBTI climate goal, the company can also offer low-carbon commodities, responsibly and sustainably produced, aligned with its clients' ESG goals.

NEXT STEPS

The next steps involve implementing a company model farm with the expansion and deepening of practices and monitoring of results. This farm could serve as an inspiration for the company to scale the initiative to reach grain producers within its supply chain and family farming.

Learn more: www.amaggi.com.br/amaggi_regenera/

https://renature.pr.co/227303-amaggi-e-renature-firmam-parceria--para-acelerar-a- transicao-para-uma-agricultura-regenerativa-no--brasil

https://www.amaggi.com.br/amaggi-regenera-e-apresentado-no-better-cotton- conference-em-amsterdam/

https://www.reuters.com/sustainability/land-use-biodiversity/brazils-amaggi-push- regenerative-agriculture-large-scale-suppliers-2023-06-21/

https://www.youtube.com/watch?v=5e4xGf5af-o

Case Bayer

Company Name	Bayer
Project/Action Name	PROCarbono Project
Type of Agriculture (sustainable or regenerative)	Regenerative
Case status (Conceptualization; Pilot; 1st year; 2nd year; over 3 years in existence)	Over 3 years

THE INITIATIVE IS SUPPORTED BY FOUR BASIC PRINCIPLES: FARMER-CENTERED, SCIENCE-BASED, TRANSPARENT, AND COLLABORATIVE. IT AIMS TO ASSIST FARMERS IN IMPLEMENTING GOOD PRACTICES.

COMPANY SUMMARY

Bayer is a leading company in the agricultural industry and offers customized solutions for farmers to plant, cultivate and protect their crops using fewer natural resources while being more sustainable.

PROJECT/ACTION OBJECTIVE

At Bayer, we have made clear sustainability commitments to our shareholders, customers, and society, and we are fulfilling these commitments. One of them is to reduce Greenhouse Gas (GHG) emissions in agriculture by 30% by the year of 2030.

Bayer's ProCarbono initiative allies with farmers and scientific and technological partners to turn sustainability into a business by intensifying good practices that enhance carbon sequestration in the soil, increasing productivity. In this project, we aim to increase sustainability in the field and, in the future, enable a carbon market for agriculture in tropical countries. The project is closely connected to the soil health pillar within regenerative agriculture.

INITIAL IDEAS

The methodologies that exist today are not scalable or suitable for tropical soils, making it impossible to integrate Brazilian agriculture into a potential regulated carbon market in Brazil in the coming years. This difficulty provided Bayer with an opportunity to implement a

carbon project that seeks to increase sustainability in the field and implement regenerative agriculture practices in Brazil.

CASE SUMMARY

Launched in the 2020/2021 crop season, the initiative's pilot project involves 1,800 farmers in Brazil. The initiative is supported by four basic principles: farmer-centered, science-based, transparent, and collaborative. It aims to assist farmers in implementing Good Practices, bringing together various stakeholders to discuss the topic and support the implementation and scalability of the project.

- Key Instruments for Crop Protection: Seeds and Biotechnologies, Precision Planting, Seed Treatment Applications, Enhanced Formulations, Biologicals, Product Stewardship (such as protection strips, drift reduction), Active Ingredients with enhanced environmental profile, and Digital Agriculture.
- No-till farming, crop-livestock-forestry integration, cover crops, high-yielding seed varieties, precision agriculture or increased water efficiency are some of the ways to reduce greenhouse gas emissions. We are encouraging producers who use low-carbon practices to adopt climate-smart solutions in the medium and long term. Once the market is established and carbon credits are issued, they will constitute an additional source of revenue for producers.
- In the 2022/2023 crop season, we launched ProCarbono Commodities, which expands the scope of the work and bring a low-carbon and deforestation-free product.

DESCRIPTION

The Bayer Carbon Project has joined efforts with farmers in Brazil who meet certain requirements, such as social and environmental compliance and adoption of sustainable agricultural practices, so that they have a soil collection and analysis protocol with our science-based partner, Embrapa, and 14 other research institutions. The project was launched in 2020 with approximately 400 farmers. The partnership with producers will last for three years, with soil analysis, consultancy, and participant training and monitoring. The goal is to verify the accumulated carbon delta, promote an increase in crop profitability by 6% and an increase in productivity by 10%. Furthermore, it includes analyses to demonstrate that good agricultural practices contribute to more sustainable, regenerative, and productive agriculture.

In 2022, efforts were made made to operationalize the project, which already has more than 1,800 farmers located in 15 states. In addition to Embrapa, Bayer has technical partnerships such as Agrotools and Climate FieldView. The project also has partnerships with companies that benefit producers in how they produce, such as Itaú Bank for differentiated credit and Raix Sementes for cover crops.

PRO Carbono Commodities is a solution to address the challenges of the supply chain towards decarbonization, while also connecting and recognizing forest preservation. Through a tool co-developed with Embrapa and based on an internationally recognized methodology, Life Cycle Assessment (LCA), we can measure the carbon footprint of soy producers using specific crop data. All participating farmers and program areas underwent a strict analysis to ensure socio-environmental compliance, legal reserve presence, and areas free of deforestation in the last 10 years. Furthermore, all farmers have committed not to deforest the areas during the program.

The program was carried out in the 22/23 crop season, involving 10 producers in 5 municipalities (Sapezal, Campos de Julio, Campo Novo dos Parecis, Matupá and Alta Floresta), within the Cerrado and Amazon biomes. The project area is 159,000 hectares, of which 95,000 are protected forest and 64,000 having their soy footprint measured with primary data.

INDICATORS

1. SOIL: To contribute to fertile and healthy soils creation using techniques such as soil coverage, diversification, reduced compaction, and decreased chemical fertilizers.

Indicators:

1. Increase in organic matter in the soil from year 1 to year 3.
2. Increase in organic soil carbon from year 1 to year 3.
3. Implementation of conservation techniques such as no-till planting, crop rotation, and cover crops.

2. WATER: To increase soil water infiltration, water retention in plants, create a local microclimate, reduce irrigation usage, and manage clean water flow for rural safety.

Indicators:

Indicators for water are not completed as we are finalizing our global water commitment beforehand. However, we can mention the Climate FieldView platforms since the use of digital agriculture (4.0) tools such as Climate FieldView for precise application of fertilizers or agricultural inputs reduces water usage.

3. BIODIVERSITY: To increase biodiversity preservation within the system by using key species for pest and disease control and conserving forested areas.

Indicators:

1. Crop diversification promotes life proliferation in the soil.
2. The program only accepts projects with socio-environmental validation, favoring the conservation of forested areas and native forests.
3. Use of digital agriculture (4.0) tools such as Climate FieldView for precise application of fertilizers or agricultural inputs also reduces diesel usage.

4. CARBON: To increase the capacity for carbon sequestration and carbon stock in the soil.

Indicators:

Farmers are guided to adapt to conservation agricultural practices such as crop rotation and no-till planting. As previously mentioned, we will measure soil carbon and fertility levels over the three years of the program in the 1,800 farmers and assess the impact of adopting best practices on carbon accumulation in the soil.

5.SOCIOECONOMIC: To produce different types of foods that ensure food security for farmers' families, increase lifelong income, empower women in rural areas, and create favorable conditions to support future generations in staying in rural environment.

Indicators:

All project participants receive training, which enhances their knowledge of sustainable and regenerative agriculture. Through socio-environmental analyses, farmers also ensure that field workers comply with Brazilian legislation, creating favorable working conditions.

ProCarbono Commodities: The estimated average program carbon footprint is expected to reach 657 kg CO_2 eq/ton, with improvements resulting from the adoption of best practices (interventions) considering the scenario of the best-performing plots by municipality in the program.

PROJECT'S BENEFITS, RETURNS, LOSSES, AND RESULTS

The project retains 92% of farmers, and in addition to the ecosystem benefits, the Bayer Carbon initiative has shown that it can provide short-term benefits to rural producers. We estimate that, after a three-year period of adopting Bayer Carbon practices, producers will achieve an average gain of over 6% in profitability and over 10% in productivity.

Furthermore, we have brought in partners such as Banco Itaú, Mosaic, and Tokyo Marine, who have customized offerings for the 1,800 project farmers. These farmers have gained resilience through the project's implementation, making them less susceptible to climate change. Therefore, our partners can provide differentiated offers in insurance, loans, and/or products.

In the case of ProCarbono Commodities, in addition to quantifying emissions, the entire process was tracked through blockchain, and the volume of soy delivered is controlled by mass balance using the farmer's primary data. The average carbon footprint of the project was 862 kg/10 CO_2 eq/ton, 67% lower than the average carbon footprint of Brazilian soy according to international benchmarks.

"The project retains 92% of farmers, and in addition to the ecosystem benefits, the Bayer Carbon initiative has shown that it can provide short-term benefits to rural producers.

NEXT STEPS

Regarding ProCarbono Commodities, the objective in this second year of the project is to further reduce the carbon footprint and monitor zero deforestation. To achieve this, management plans focusing on interventions that could reduce the carbon footprint were structured and aligned with the client for implementation in the upcoming soybean crop season. The estimated average footprint of the program will reach 657 kg CO_2 eq/ton, with improvements arising from the adoption of best practices (interventions) considering the scenario of the best-performing plots per municipality in the program.

Both programs are already public, and the links are provided below:

https://procarbonoconecta.bayer.com/assets/pdf/pt-br/resultado-commodities.pdf https://www.youtube.com/watch?app=desktop&v=ri3RFS5JT0g&feature=youtu.be (vídeo)

Case Carrefour

Company Name	Grupo Carrefour Brasil
Project/Action Name	Products that protect biodiversity
Type of Agriculture (sustainable or regenerative)	Regenerative

ONE OF THE INITIATIVES IS TO PROMOTE SUSTAINABLE PRODUCTION OF NATIVE FOODS FROM BIOMES, WHICH VALUES BIODIVERSITY, BOOSTS THE MARKET EXPANSION FOR REGIONAL PRODUCTS, STIMULATES ECOSYSTEM CONSERVATION, AND SUSTAINABLE DEVELOPMENT FOR EXTRACTIVE COMMUNITIES.

COMPANY SUMMARY

Always committed with the United Nations' Sustainable Development Goals (SDGs) and through Act for Food, the company global movement that advocates leadership in the food transition, aiming to provide healthy, accessible, and responsibly produced food, Grupo Carrefour Brasil expands the offering of fresh products in its stores while respecting and valuing small producers, regional diversity, and local distribution.

The group maintains programs for sustainable food production and biodiversity preservation, seeking to develop actions that preserve Brazilian biomes, combat deforestation, and deliver high-quality and reliable products.

PROJECT/ACTION OBJECTIVE

The company works to promote regenerative businesses that can protect the ecosystems they are a part of, preserving biodiversity and generating social and economic opportunities for minoritized groups.

INITIAL IDEAS

As one of the key players in Brazil's food retail sector, Grupo Carrefour Brasil assumes responsibility to promote healthy and sustainable nutrition. The company believes that changes in the population's dietary patterns require major global food system companies to lead

the way by connecting producers and consumers on a daily basis in a sustainable and responsible manner—supporting ecological and regenerative cultivation while encouraging conscious consumption among its customers.

CASE SUMMARY

The group has been active in various biomes through regional projects and partnerships, focusing on environmental conservation linked to productive benefits. One of the initiatives is to promote sustainable production of native foods from biomes, which values biodiversity, boosts the market expansion for regional products, stimulates ecosystem conservation, and sustainable development for extractive communities.

DESCRIPTION

The company is investing in biome products that promote the best agricultural practices for food production, respecting factors such as seasonality. The cultivation of these products also aids in native vegetation restoration. In the network's shelves, items such as baru nuts, typical of the Cerrado region, and umbu fruit from the Caatinga, can already be found, sourced from traditional communities and local cooperatives.

INDICATORS

1.SOIL: To contribute to fertile and healthy soils creation, using techniques such as soil coverage, diversification, less compaction, and decreased chemical fertilizers.

Indicators:

- Number of pesticide residue analyses in F&V products.

2. WATER: To increase soil water infiltration, water retention in plants, create a local microclimate, reduce irrigation usage, and manage clean water flow for rural safety.

3. BIODIVERSITY: To increase biodiversity preservation within the system by using key species for pest and disease control and conserving forest areas.

Indicators:

- Hectares of managed and preserved native areas.

4. CARBON: To increase the capacity for carbon sequestration and carbon stock in the soil.

5. SOCIOECONOMIC: To produce different types of foods that ensure food security for farmers' families, increase lifelong income, empower women in rural areas, and create favorable conditions to support future generations in staying in rural environment.

Indicators:

- Percentage of Increase in Family Income
- Volume of business generated with the company

Other indicators:

- Number of local suppliers and small suppliers
- Value in merchandise sales with this approach

PROJECT'S BENEFITS, RETURNS, LOSSES, AND RESULTS

Both baru and umbu are typical of biomes threatened by the expansion of agricultural frontiers into native landscapes - Cerrado and Caatinga regions, respectively. Therefore, initiatives like these, based on sustainable extraction, not only enable the continued existence and strengthening of these rural families in a traditional way but also reconcile economic development with biodiversity conservation, the maintenance of water sources, and the preservation of local culture.

From a social perspective, the group's collaboration with small producers, local and regional producer cooperatives, and indigenous and quilombola communities results in increased professionalism among this group, commercial support, and an increased market presence. Through direct negotiations, without intermediaries, they can also achieve higher profits, increase their income, and improve their quality of life.

NEXT STEPS

The company aspires to be the retailer that prioritizes locality and currently offers around 9,000 regional items from 1,000 suppliers in its stores. The next steps include continuing the mapping of communities and products with sustainable attributes that contribute to environmental preservation and social inclusion.

Case Danone

Company Name and Focal Point	Danone Brasil
Project/Action Name	Projeto Flora
Type of Agriculture (sustainable or regenerative)	Regenerative
Case status (Conceptualization; Pilot; 1st year; 2nd year; over 3 years in existence)	Pilot

THE PROJECT WAS CREATED TO ADDRESS BEST PRACTICES IN REGENERATIVE AGRICULTURE FOR DAIRY PRODUCERS WHOSE PRODUCTION SYSTEM IS PASTURE-BASED.

COMPANY SUMMARY

Danone is a leading multinationalcompany in the food and beverage industry, with a focus on health-oriented and fast-growing categories: dairy products, plant-based products, water, and specialized nutrition. With its vision of 'One Planet. One Health', which recognizes the interconnection of people's health and the planet, Danone aims to inspire healthier and more sustainable eating and drinking practices. To accelerate this food revolution and create superior, sustainable and profitable value for all its stakeholders, Danone defined nine goals for 2030 and paved the way as the first publicly listed company on Euronext Paris to adopt the "Mission-Led Company" status. With the aim of bringing health through food to as many people as possible, and the corresponding social and environmental objectives established in its statutes, Danone is committed to operating efficiently, responsibly, and inclusively, in line with the United Nations Sustainable Development Goals (SDGs). In 2021, the subsidiary Danone Brasil became the first major food industry to obtain B Company certification in the country. With this certification in Brazil, the Danone Group, which has more than 100,000 employees and products sold in more than 120 markets, now derives half of its global revenue from B Corp-certified businesses. The aim is for all 130 subsidiaries to achieve B certification by 2030. Danone is part of leading sustainability indices, including those managed by Vigeo Eiris and Sustainalytics, as well as the Ethibel Sustainability Index, the MSCI ESG Indexes, FTSE4Good Index Series, Bloomberg Gender Equality Index and Access to Nutrition Index. In Brazil, the portfolio

includes successful brands such as Activia, Danoninho, Danone, Bonafont, Souvenaid, Milnutri, FortiFit and Nutridrink, among others.

Find out more at: https://corporate.danone.com.br/

PROJECT/ACTION OBJECTIVE

The project was created to address best practices in regenerative agriculture for dairy producers whose production system is pasture-based. The objectives of this project over time are as follows:

- Short-term: more efficient milk production by producers.
- Medium-term: producers using natural resources for efficient milk production without depleting them for future generations.
- Long-term: producers with an economically profitable model that sequesters carbon (net) from an environmental perspective.

INITIAL IDEAS

Producers with pasture-based production systems are the least economically efficient and emit the most CO^2 to produce 1 kg of milk.

CASE SUMMARY

The FLORA project adopts the principles of agroecology applied to conventional milk production through the technique of Rational Grazing Voisin (PRV) with Silvopastoralism. The project is designed for the following macro-deliverables:

- Lower production cost per kg of milk.
- Zero carbon emissions per kg of milk produced.
- Better management of farm zootechnical indicators

DESCRIPTION

The project is divided into stages:

1. Training for producers on regenerative agriculture techniques and how to manage the production system;
2. Customized planning of the production system for each producer (system layout, planning of financial and zootechnical indicators);
3. Project implementation;
4. Monitoring of indicators.

The main challenge is related to the proposal of the production model being pioneering in Brazil. Therefore, producers have difficulties in accepting new technology and implementing it. We are seeking to address this challenge by creating a robust short to medium-term farm planning in collaboration with the producer and by presenting real success stories.

Currently, the project has the partnership of companies such as MSD Animal Health, Fuzil Agricultural Equipment, AJAGRO Dairy Farming Consulting, Gensur, and Casa da Árvore Forest Nursery.

The project is currently focused on the South of Minas Gerais and is exclusively dedicated to Danone Brazil's dairy producers.

INDICATORS

1. SOIL: To contribute to fertile and healthy soils creation using techniques such as soil cover, diversification, less compaction, and reduction of chemical fertilizers.

Indicators:

Through the rotation of paddocks by the Voisin Rational Grazing method combined with the forestry component in the system, there is a significant trend of soil fertility increase. Therefore, we measure the following indicators:

- % Organic Matter in the soil each year
- Use of chemical fertilizers (ton/ha)

2. WATER: To increase soil water infiltration, water retention in plants, create a local microclimate, reduce irrigation usage, and manage clean water flow for rural safety.

Indicators:

The project is designed not to require irrigation in the pasture paddocks:

Water usage = 0

3. BIODIVERSITY: To increase biodiversity preservation within the system by using key species for pest and disease control and conserving forested areas.

Indicators:

Not quantitatively measured.

We will use 7 native tree species from the region in the production system. Considerable increases in local biodiversity are expected.

4. CARBON: To increase the capacity for carbon sequestration and carbon stock in the soil.

Indicators:

- % Organic Matter in the soil
- Kg CO2 / Kg of produced milk

5. SOCIOECONOMIC: To produce different types of foods that ensure food security for farmers' families, increase lifelong income, empower women in rural areas, and create favorable conditions to support future generations in staying in rural environment.

Indicators:

- Profit margin in the activity
- Production cost

Other indicators:

- Productivity (Liters of milk/hectare/year)
- % of dairy calf mortality (an indicator of animal welfare)
- Rates (%) of diseases in dairy cows

PROJECT'S BENEFITS, RETURNS, LOSSES AND RESULTS

As the project is in the pilot phase, the expected benefits from year 1 to year 5 include:

- Organic matter from 0.5% to 6%
- Kg CO2 emitted / kg of produced milk <= 0
- Increase in profit margin from 10% to 31%
- Reduction in production cost by 13%

NEXT STEPS

The next steps are as follows:

- Validate the pilot projects, mapping the key challenges and successes during this phase.
- Compare the "actual versus expected" outcomes.
- After confirming positively in these two stages, the ambition is to scale the project to all producers who express interest.

Public project information (narrative, data, etc.) can be found at the following link:

Sustainability Reports – Danone Brazil
https://corporate.danone.com.br/relatorio-de-sustentabilidade

Case Eneva

Company Name	ENEVA S.A.
Project/Action Name	Polo Agrícola Nova Demanda
Type of Agriculture (sustainable or regenerative)	Sustainable
Case status (Conceptualization; Pilot; 1st year; 2nd year; over 3 years in existence)	2nd year

THE NOVA DEMANDA AGRICULTURAL CENTER PROJECT WAS CREATED TO DEVELOP AGRICULTURAL POTENTIAL WHILE MINIMIZING THE ENVIRONMENTAL IMPACT OF AGRICULTURAL ACTIVITIES. THIS APPROACH ENSURES THE PRODUCTION OF HEALTHY FOOD AND THE MAINTENANCE OF SOIL HEALTH AND BIODIVERSITY.

COMPANY SUMMARY

Eneva is one of the largest integrated energy operators, engaged in the exploration and production of natural gas to providing energy solutions, with a focus on the Northern and Northeastern regions of Brazil. The Nova Demanda Agricultural Center Project is located in the influence area of the Parnaíba Complex asset in Santo Antônio dos Lopes, in the interior of Maranhão.

PROJECT/ACTION OBJECTIVE

The Project aims to promote agroecological family farming practices within local communities, encouraging soil conservation and increased food production, income generation, inclusion in public policies, and social development for families involved in the resettlement. The project represents the main opportunity to generate income for these populations, who were previously marginalized from the job market.

INITIAL IDEAS

The project started in 2020 after conducting an agricultural suitability assessment for the families included in the resettlement. Its primary challenge is to encourage sustainable agricultural practices by eliminating the use of herbicides and fire while improving soil

conservation techniques. This is expected to result in increased food production for subsistence and commercialization. Currently, the project is conducting its first agroforestry experiments, with the expectation of scaling it up.

CASE SUMMARY

The project provides technical training, supports the establishment and consolidation of a local producers' association, organizes municipal fairs for agroecological products, and encourages participation in public tenders. These efforts drive social development and increase family income.

DESCRIPTION

The project utilizes specialized technical consulting, collaborates with public authorities (municipalities, state environmental agencies, and universities), and offers guidance on agroecological and organic food production. It also implements agroforestry systems, providing new opportunities for 43 families. The region has a low Social Progress Index, with families experiencing economic vulnerability and a history of unsustainable practices, including high herbicide and fire usage for land clearing. In response to this scenario, the Nova Demanda Agricultural Center Project was created to develop agricultural potential while minimizing the environmental impact of agricultural activities. This approach ensures the production of healthy food and the maintenance of soil health and biodiversity.

INDICATORS

1. SOIL: To contribute to fertile and healthy soils creation, using techniques such as soil coverage, diversification, less compaction, and reduction of chemical fertilizers.

2. WATER: To increase soil water infiltration, water retention in plants, create a local microclimate, reduce irrigation usage, and manage clean water flow for rural safety.

3. BIODIVERSITY: To increase biodiversity preservation within the system by using key species for pest and disease control and the conservation of forested areas.

Indicators:

- Quarterly monitoring of the number of species (agricultural and forest) per hectare
- Quarterly monitoring of seedling production (agricultural and forest) in the community nursery
- Quarterly monitoring of the agricultural/agroforestry area of the project (hectares)

4. CARBON: To increase the capacity for carbon sequestration and carbon stock in the soil.

5. SOCIOECONOMIC: To produce different types of foods that ensure food security for farmers' families, increase lifelong income, empower women in rural areas, and create favorable conditions to support the permanence of future generations in those areas.

Indicators:

- Quarterly monitoring of the number of beneficiaries in the project
- Quarterly monitoring of sustainable agricultural production (in tons)
- Quarterly monitoring of income increase for project beneficiaries
- Monitoring of seedling sales

Other indicators:

- Quarterly monitoring of technical training hours (hours)

PROJECT'S BENEFITS, RETURNS, LOSSES AND RESULTS

> The project has created opportunities for the production, distribution, and marketing of 340 tons of agricultural products, involving 43 families who have benefited from a 15% increase in family income.

Significant progress has been achieved during the period to increase the beneficiaries' income sources and the distribution of local products. This includes the establishment of the Association of Rural Agroecological Producers Nova Demanda (APRAND), the regularization of the Family Farmer Registry (CAF), the establishment of the Community Agroforestry Nursery, and inclusion in public policies. These policies include the More Seeds Project, the Family Agriculture Purchasing Program (Procaf), the Food Acquisition Program (PAA), and the National School Feeding Program (PNAE). The project has created opportunities for the production, distribution, and marketing of 340 tons of agricultural products, involving 43 families who have benefited from a 15% increase in family income.

NEXT STEPS

There is an ambition to increase the number of affiliated families, expand the production and marketing capacity of beneficiary farmers, participate in more government programs, and contribute to the sustainable autonomy of the association and family members. Furthermore, there is a plan to expand agroforestry practices. Information about the project can be found in the company's Integrated Report (https://eneva.com.br/sustentabilidade/ri2022/).

Case Mosaic

Company name	Mosaic Fertilizantes
Project/Action Name	Gesso agrícola
Type of agriculture (sustainable or regenerative)	Sustainable
Case status (concept; pilot; 1st year; 2nd year; more than 3 years)	Consolidated (+5 years)

WE CURRENTLY HAVE GYPSUM GENERATION AT UBERABA AND CAJATI FACTORIES, FROM WHERE IT IS SHIPPED TO MORE THAN 7 BRAZILIAN STATES, WITH A SALES VOLUME OF 5 MILLION TONS, BENEFITING AROUND 5 MILLION HECTARES OF PRODUCTIVE AREAS.

COMPANY SUMMARY

Having as a mission to help the world producing the food it needs, Mosaic is one of the largest global producers of combined phosphates and potassium. In Brazil, the company operates in the mining, production, import, marketing and distribution of fertilizers for application in various agricultural crops, ingredients for animal nutrition and industrial products.

PROJECT/ACTION OBJECTIVE

Reuse of the production of phosphate fertilizers main co-product, as an input to improve the Brazilian soils characteristics, in which this substance acts by carrying calcium to soil subsurface layers, neutralizing aluminum which, toxic to most agricultural crops, in addition to being a source of calcium and sulfur for plants.

INITIAL IDEAS

For each ton of phosphoric acid, around 6 tons of gypsum are produced, which required stacking and storage space. The product development made it possible to reduce stacking areas and environmental risks of this storage. Thereby, around 5,500 tons stopped going to landfills and dams each year.

CASE SUMMARY

Besides serving producers in more than 7 Brazilian states, with sales of around 5 million gypsum tons annually, Mosaic Fertilizers has a gypsum donation program, serving farming families.

DESCRIPTION

Since 2018, Mosaic Fertilizantes has invested in a new products line development that, besides promoting a circular process of fertilizer manufacturing savings, with reuse of mining co-products, it also helps plants increase their climate resilience.

We currently have gypsum generation at Uberaba and Cajati factories, from where it is shipped to more than 7 Brazilian states, with a sales volume of 5 million tons, benefiting around 5 million hectares of productive areas.

In 2022, we have obtained the organic product certification, allowing the product's use by organic farmers.

INDICADORES

1. SOIL: To contribute to fertile and healthy soils creation, using techniques such as soil coverage, diversification, less compaction, and reduction of chemical fertilizers.

Indicators:

Brazilian soils, especially the Cerrado region, have high aluminum content due to their formation characteristics. Gypsum acts by carrying calcium to soil subsurface layers, neutralizing aluminum, which is toxic to most agricultural crops, in addition to being a source of calcium and sulfur for plants. It is estimated that we were able to impact around 5 million hectares per year with gypsum reuse.

2. WATER: To increase soil water infiltration, water retention in plants, create a local microclimate, reduce irrigation usage, and manage clean water flow for rural safety.

Indicators:

By improving soil subsurface condition, gypsum promotes the plant roots volume growth in depth, allowing greater absorption of water and nutrients for crop development, especially in the winter period, when there is severe water deficiency, improving adaptability of culture to climate change.

3. BIODIVERSITY: To increase biodiversity preservation within the system by utilizing key species for pest and disease control and conserving forested areas.

4. CARBON: To increase carbon sequestration capacity and stock in the soil.

Indicators:

By acting as a root growth promoter, gypsum improves the conditions for greater carbon sequestration to occur, given that 60-70% of soil carbon comes from roots.

5. SOCIOECONOMIC: To produce different types of foods that can guarantee food security for farmer families, increase lifetime income, empower women in the countryside and create favorable conditions to support the permanence of future generations in rural areas.

Indicators:

Mosaic Fertilizantes has a gypsum donation program, serving farming families, enabling them to boost their agricultural production. By certifying gypsum as an organic product, these farmers are able to access the organic food market, which offers better income and gives a bigger value for family farming and small farmers products.

Other indicators:

The use of phosphogypsum is directly related to inputs supply to increase the climate resilience of plants, thus promoting agriculture adaptation to climate change, increasing productivity and contributing to Sustainable Development Goal number 2 – Zero Hunger and Sustainable Agriculture – of the UN 2030 Agenda.

PROJECT'S BENEFITS, RETURNS, LOSSES AND RESULTS

Gypsum has become Mosaic Fertilizantes's second most sold product by volume, reducing environmental liabilities of this co-product disposal to landfills and/or dams. Therefore, it benefits agricultural soils to become more productive and adapted to climate challenges. A distribution chain was created for this supply, creating jobs, and generating income for several families.

NEXT STEPS

Agriculture gypsum: what is it and how to use it? > Nutrimosaic

mosaicco.com.br/ckfinder/userfiles/files/Catálogo Especialidades 122021.pdf

Mosaic Fertilizantes enters on the supplies market for organic production (mosaicco.com.br)

Case Nestlé

Company name	Nestlé Brasil
Project /Action name	Nature by Ninho
Type of agriculture (sustainable or regenerative)	Regenerative agriculture
Case status (concept; pilot; 1st year; 2nd year; more than 3 years)	In progress for more than 3 years

BALANCING PRODUCTION WITH NATURE HAS A MUCH BROADER IMPACT THAN JUST ON THE ENVIRONMENT. THE DEVELOPMENT OF REGENERATIVE AGRICULTURE AND LOW-CARBON DAIRY PRODUCTION HAS NOT ONLY DISTINGUISHED THE RAW MATERIALS OFFERED BY PRODUCERS BUT HAS ALSO BOLSTERED BUSINESS RESILIENCE, OPTIMIZED RESOURCE UTILIZATION, AND EVEN LOWERED PRODUCTION EXPENSES.

COMPANY SUMMARY

Nestlé has been operating in Brazil for over 100 years and continues to renew its commitment to society, as a mobilizing force that contributes to bringing nutrition and well-being to millions of people, creating an environment of inclusion and opportunity for thousands of Brazilians, being the most sustainable food producer in the country. The company employs more than 30 thousand people in Brazil and has 20 industrial units, in addition to nine distribution centers and more than 50 brokers.

PROJECT/ACTION OBJECTIVE

For more than 15 years, Nestlé has invested in good practice programs concerning the milk chain, and today there is the Nature by Ninho program, which encourages and remunerates more than 1,200 partner producers according to the implementation of regenerative practices. Goals: To reduce CO_2 emissions by 20% by 2025 and have 30% of fresh milk volume coming from farms that implement regenerative agriculture practices by 2025.

INITIAL IDEAS

More than 70% of our greenhouse gas emissions come from agriculture, and milk represents the main source of emissions.

CASE SUMMARY

The Nature by Ninho Program encourages and remunerates producers according to the implementation of regenerative agriculture practices on dairy farms. The program prioritizes animal welfare, water saving and soil care aiming the decrease of greenhouse gas emissions.

DESCRIPTION

In 2021, Nestlé began a project in partnership with EMBRAPA to develop the low-carbon milk production protocol, working with 8 demonstration farms that will be NETZERO (zero net emissions) and that represent different biomes and production systems. The partnership led to the creation of the Manual for Nestlé's Nature by Ninho program, promoting and financially rewarding producers who adopt best practices related to rational use of water, correct disposal of property waste, monitoring animal health indicators, and implementation of regenerative agriculture. This program, coupled with specialized technical support provided by Nestlé, enables partner producers to actively implement and advance regenerative agricultural practices.

INDICATORS

1. SOIL: To contribute to fertile and healthy soils creation, using techniques such as soil coverage, diversification, less compaction, and reduction of chemical fertilizers.

Indicators:

In terms of soil care, the implementation of Nature by Ninho program already contributes to reduce the impact on farms in an area equivalent to 7 thousand soccer fields.

2. WATER: To increase soil water infiltration, water retention in plants, create a local microclimate, reduce irrigation usage, and manage clean water flow for rural safety.

Indicators:

By optimizing water consumption and reducing use per liter of milk produced — since 2020, the savings are equivalent to 75 million liters of milk.

3. BIODIVERSITY: To increase biodiversity preservation within the system by utilizing key species for pest and disease control and conserving forested areas.

Indicators:

Implementação de práticas como: Rotação de culturas e diversidade de plantas, uso de fertilizantes orgânicos, Culturas de cobertura, Consorciação de culturas, Armazenamento e processamento de dejetos dos animais.

4. CARBON: To increase the capacity for carbon sequestration and carbon stock in the soil.

Indicators:

Implementation of practices that preserve CO_2 in the soil, such as minimal soil disturbance, soil cover, and crop diversification.

In animal care — over 30,000 cows living in climate-controlled environments that provide more comfort, health, and a reduction in greenhouse gas emissions.

In partnership with Embrapa, the development of the first national protocol for low-carbon dairy farming in the country, as well as the first carbon footprint calculator adapted to the various biomes and production systems in Brazil, which will be ready in 2023.

5. SOCIOECONOMIC: To produce different types of foods that ensure food security for farmers' families, increase lifetime income, empower women in rural areas, and create favorable conditions to support the permanence of future generations in those areas.

Indicators:

A pioneering study that measured the carbon footprint and profitability of 150 dairy farms during the 2022/2023 season found that farms that adopted regenerative agriculture practices had an 8% lower production cost compared to conventional properties that did not adopt regenerative practices. The result was a 4% higher profitability in dairy farming.

Other indicators:

A total of 48% of the land on properties that had previously engaged in conventional farming made the transition to no-tillage or minimum-tillage practices (regenerative agriculture), leading to a decrease in diesel oil consumption per hectare.

Incorporating bovine waste as a natural fertilizer into the farms' fertilization plan further played a role in reducing the usage of chemical fertilizers by 13%.

The cows receive a balanced diet and ample access to quality water in an environment that promotes comfort and well-being.

PROJECT'S BENEFITS, RETURNS, LOSSES AND RESULTS

Balancing production with nature has a much broader impact than just on the environment. The development of regenerative agriculture and low-carbon dairy production has not only distinguished the raw materials offered by producers but has also bolstered business resilience, optimized resource utilization, and even lowered production expenses. Furthermore, this journey has positively influenced family succession, with the newer generation of producers actively participating and developing a strong affinity for continuing the regenerative efforts initiated by their predecessors.

NEXT STEPS

Nestlé is committed to sourcing 50% of its key raw materials from regenerative agriculture farms by 2030. In the current volume of milk purchased by Nestlé in Brazil, this represents approximately 500 million liters per year. We not only have the interest but also the commitment to continue developing the dairy supply chain sustainably in the coming years. That's why we've formed partnerships with EMBRAPA to create a low-carbon dairy farming protocol in Brazil, as well as a carbon calculator. This is another step towards achieving our goal of becoming a net-zero greenhouse gas emissions company by 2050.

https://www.plurale.com.br/site/noticias-detalhes.php?cod=20844&codSecao=20

https://exame.com/esg/nestle-intensifica-descarbonizacao-da-producao-de-leite/

https://www.nestle.com.br/media/pressreleases/allpressreleases/nestle-reune-mais-de-200-pessoas-entre-produtores-tecnicos-da-embrapa

Case Syngenta

Nome da empresa	Syngenta Proteção de Cultivos LTDA
Nome do projeto/ação	Programa Reverte
Tipo de agricultura (sustentável ou regenerativa)	Regenerative agriculture
Status do case (conceituação; piloto; 1° ano; 2° ano; mais de 3 anos de existência)	More than 2 years in progress

REVERTE WAS INITIATED IN 2019 WITH THE AMBITIOUS OBJECTIVE OF RESTORING ONE MILLION HECTARES BY 2030. IN ADDITION TO IMPROVING SOIL HEALTH, THE PRIMARY BENEFIT OF REVERTE IS TO INCREASE THE AREA AVAILABLE FOR AGRICULTURAL CULTIVATION AND ENHANCE FOOD SECURITY WITHOUT ANY ADDITIONAL DEFORESTATION.

COMPANY SUMMARY

Syngenta Crop Protection is one of the leading agricultural companies in the world. Our ambition is to safely feed the world while caring for the planet. Our goal is to enhance the sustainability, quality, and safety of agriculture through world-class science and innovative agricultural solutions. Our technologies enable millions of farmers worldwide to make more efficient use of limited agricultural resources.

PROJECT/ACTION OBJECTIVE

Reverte, an initiative launched by Syngenta, is dedicated to the restoration of degraded soils in Brazil. It is a program that assists in expanding available agricultural lands without resorting to deforestation. Reverte's primary emphasis is on the Cerrado biome, a vast subtropical region covering an area equivalent to the combined size of France, Germany, Spain, Italy, and Norway. The initiative brings together key stakeholders from the public and private sectors, along with civil society, to carry out this project aimed at fostering greater sustainability in agriculture.

The concept was jointly developed by Syngenta and The Nature Conservancy (TNC) in 2019. In 2020, Itaú BBA, a major Latin American bank, joined as the program's financial partner, and Embrapa, the official agricultural research organization of Brazil, became an advisor.

INITIAL IDEAS

In Brazil, there are approximately 160 million hectares of pastures, and estimates indicate that at least 50% of them, which amounts to around 85 million hectares, are experiencing various forms of degradation Within the Cerrado region alone, there are 32 million hectares of degraded pastures. Reverte was initiated in 2019 with the ambitious objective of restoring one million hectares by 2030. In addition to improving soil health, the primary benefit of Reverte is to increase the area available for agricultural cultivation and enhance food security without any additional deforestation. The use of regenerative agricultural practices, such as crop rotation, cropping cover, and no-till farming, helps capture carbon in the soil, reducing agriculture's impact on climate change.

CASE SUMMARY

Located in the heart of Brazil, the Cerrado region is a vital water source and encompasses a diverse ecosystem spanning more than 2 million square kilometers. Reverte aims to demonstrate the economic feasibility of rehabilitating existing agricultural lands instead of opening up new areas for cultivation. The program focuses on the rehabilitation of degraded pastures, which are agricultural areas currently producing below their potential.

DESCRIPTION

The concept was jointly conceived by Syngenta and The Nature Conservancy (TNC) in 2019. In 2020, Itaú BBA, a major Latin American bank, joined as the financial partner of the program, and Embrapa, the official agricultural research organization of Brazil, came on board as an advisor.

Itaú BBA offers program farmers a 10-year loan with a three-year grace period. During this period, farmers are not required to make any principal repayments, which means they only need to cover the interest on the loan for the first three years.

TNC worked to develop the entry and eligibility criteria for the Reverte program, including ensuring that farmers comply with all legislative requirements, including a commitment to abstain from any involvement in illegal deforestation.

EMBRAPA supported the program by providing a guide for the recovery of degraded areas. Using this guide, an independent agronomic consultant works alongside each Reverte farmer, helping them tailor Embrapa's guidelines based on local conditions.

Syngenta actively promotes the program among farmers, approves agronomic consultants chosen by the farmers, ensures compliance with Embrapa's guidelines, and equips producers with cutting-edge technologies.

Once the application for participation is received, Syngenta assesses whether the producer meets the eligibility criteria established by TNC. The farmer then applies for their loan from Itaú BBA, which completes the credit evaluation. After the farmer receives approval from Itaú BBA, they engage an agronomic consultant approved by Syngenta, who develops a customized protocol for each individual farmer.

INDICATORS

1. SOIL: To contribute to fertile and healthy soils creation, using techniques such as soil coverage, diversification, less compaction, and reduction of chemical fertilizers.

Indicators:

Percentage of utilization in areas with cropping cover, crop rotation, crop-livestock integration, no-tillage, and biological soil analyses (BioAs-Embrapa).

2. WATER: ATo increase soil water infiltration, water retention in plants, create a local microclimate, reduce irrigation usage, and manage clean water flow for rural safety.

Indicators:

Maintenance and preservation of Permanent Preservation Areas (APP) and Legal Reserves (RL) in the program's benefited areas, ensuring no soil leaching, erosion control, use of contour lines, among others.

3. BIODIVERSITY: To increase biodiversity preservation within the system by utilizing key species for pest and disease control and conserving forested areas.

Indicators:

By preserving the surplus of Legal Reserves (RL) in the benefited areas, even though it is the landowner's right, they cannot deforest this area. This practice creates vital ecological corridors for wildlife, safeguarding the preservation of both fauna and flora. Furthermore, it fosters the restoration of enzymatic soil activity through reduction processes, augmenting the population of soil microorganisms and thereby enhancing soil recovery.

4. CARBON: to increase carbon sequestration capacity in the soil and reduce greenhouse gas emissions (GHG).

Indicators:

Degraded pastures lead to a reduction in soil carbon stocks. The objective of Reverte is to restore degraded pastures in productive areas using regenerative agricultural techniques. Moreover, the adoption of improved agricultural practices and technologies can result in greenhouse gas emissions reduction (e.g., optimized fertilizer application). Based on a review of scientific literature and a feasibility study conducted in partnership with an American startup using the DNDC method, we estimate that the carbon sequestration potential of the Reverte Program ranges from approximately 0.5 to 4.0 tons

of CO_2 per hectare per year, depending on the cultivation system, soil type, and time of practice adoption. We will also estimate GHG emissions using the Cool Farm Tool (CFT). Soil sampling in some areas is conducted to monitor indicator progress.

5. SOCIOECONOMIC: To produce different types of foods that ensure food security for farmers' families, increase lifetime income, empower women in rural areas, and create favorable conditions to support the permanence of future generations in those areas.

Indicators:

The program has a framework that evaluates and monitors various socio-environmental indicators. Health, environment, and safety conditions of employees, absence of slave-like labor, and hygiene and cleanliness conditions on the properties.

PROJECT'S BENEFITS, RETURNS, LOSSES AND RESULTS

So far, Reverte has 39 customers and 206 farms with a signed commitment to the program, totaling 140,000 hectares of degraded soils in the process of soil recovery.

NEXT STEPS

The program's expectation is to restore 1 million hectares of degraded soils to cultivable and productive areas throughout Brazil by 2030. Currently, the program primarily covers lands in the regions of Mato Grosso, Mato Grosso do Sul, and Goiás.

Case WestRock

Company Name	WestRock
Project/Action Name	Regenerative agriculture: The sustainable management of planted forests by WestRock
Type of Agriculture (sustainable or regenerative)	Regenerative
Case status (Conceptualization; Pilot; 1st year; 2nd year; over 3 years in existence)	More than 60 years in existence

WESTROCK SUSTAINABLE FOREST MANAGEMENT IS CARRIED OUT THROUGH FORESTS PLANTED IN A MOSAIC WITH NATIVE FORESTS, PRESERVING MORE THAN 600 SPECIES OF BIODIVERSITY AND WATER RESOURCES FOUND IN THE ATLANTIC FOREST BIOME – WHETHER THROUGH THE AVAILABILITY OF WATER TO ECOSYSTEMS OR THROUGH THE 2,700 SPRINGS PRESERVED IN OUR FOREST AREAS.

COMPANY SUMMARY

WestRock is a global company providing unique and sustainable paper and corrugated packaging solutions. In Brazil, our business includes 54 thousand hectares of forests, a HyPerform® paper mill and four corrugated cardboard packaging manufacturing units.

PROJECT/ACTION OBJECTIVE

Since the company began its forestry activities in Brazil, more than 60 years ago, we have invested in the principles of regenerative agriculture to achieve sustainable management of planted forests. Our goal is to combine the supply of renewable raw materials for packaging, fulfilling the needs of society while maintaining a delicate balance with the surrounding ecosystems, preserving water resources, mitigating the impacts of climate change, enriching soil with organic matter, and safeguarding habitats to conserve biodiversity.

INITIAL IDEAS

With the bold aim of innovating and embracing sustainable packaging, we are unwavering in our commitment to implement responsible practices across the three pillars of sustainability: environmental, social, and economic. This dedication extends throughout the entire lifecycle, from seed to packaging, as we endeavor to cultivate a sustainable partnership with our customers. One of our core

commitments involves contributing to the betterment of our planet through cultivated forests, a renewable source of raw materials for our paper and corrugated cardboard packaging. These forests serve as carbon sinks, effectively capturing and storing CO_2 from the atmosphere, which aids in the rejuvenation of our Earth and the protection of our shared environment. Motivated by this commitment, we adopt environmental monitoring and international certification standards for the management of our forests (FSC® and PEFC). Through our forestry endeavors, we strive to achieve net positive impacts on both the environment and society.

CASE SUMMARY

WestRock sustainable forest management is carried out through forests planted in a mosaic with native forests, preserving more than 600 species of biodiversity and water resources found in the Atlantic forest biome – whether through the availability of water to ecosystems or through the 2,700 springs preserved in our forest areas. In addition to conservation, our planted forests regenerate the planet by removing and storing thousands of tons of carbon from the atmosphere every year – in 2020 alone, our forests removed and stored 556 thousand tons of CO_2 from the atmosphere. And the benefits don't stop there: planted forests provide protection and organic matter to the soil; help regulate the climate; and, through our development program, they help generate income for rural producers, with socioeconomic benefits for the region.

DESCRIPTION

Forests are the cradle of biodiversity and water resources, offering shelter and protection for species' reproduction and providing essential environmental services. It is within this framework of knowledge and reverence allocated to this wealth that WestRock incorporates regenerative agriculture into its business strategy.

Given the challenges presented by the United Nations Sustainable Development Goals 13 and 15, which call for urgent action against climate change and its impacts, as well as the sustainable management of forests, we at WestRock undertake the responsible management of our planted forests. This commitment is underscored by our internationally recognized certifications from PEFC and FSC®, which demonstrate that our management of planted forests is environmentally responsible, socially beneficial, and economically viable.

As a raw material sourced from renewable origins within our portfolio of 100% biodegradable and recyclable products, our planted forests, in conjunction with preserved native forests, encompass an area of 54 thousand hectares located in the northern region of Santa Catarina and the southern region of Paraná. As a company with an integrated supply chain from seed to packaging, the sustainable management of planted forests with a focus on regeneration is one of our foremost priorities. Regeneration, in fact, is one of our 5Rs®

of WestRock Sustainability (alongside Rethink, Reduce, Reuse, and Recycle) – a guiding principle that propels us towards continuous improvement in sustainability.

Our Forest Management system is grounded in silviculture and the cultivation of genetically enhanced Pinus and Eucalyptus species, products of over 60 years of investment in research and development. All this research effort has contributed to the creation of tree families with enhanced adaptability to climate and soil conditions, increased resistance to diseases and pests, and the production of trees with a higher fiber concentration per hectare. As a result, these trees exhibit heightened efficiency in utilizing natural resources, including water and soil, while capturing an impressive 40% more CO_2 compared to other planted forests in Brazil (Ibá, 2018). This is crucial for enhancing forest resilience and combating the impacts of climate change.

The entire strategy for producing the primary raw material for WestRock products – virgin fiber sourced from planted forests – is aligned with the standards of two international sustainable management certifications, FSC® and PEFC. By integrating planted forests with native forests in a mosaic pattern and monitoring their attributes, we can harvest more than just raw material for our products. We can establish a relationship with the environment that generates benefits among the various beings and resources that share the same habitat.

Driven by a commitment to continuous improvement in sustainability, our forest management processes are consistently enhanced, taking into consideration new technologies, innovations, and internal procedures. Among the challenges of managing planted forests is the aim to increase productivity within their areas, extracting more fiber per hectare, optimizing the use of natural resources, and reducing the consumption of agricultural chemicals and operational activities within the forests. In addition to the well-established environmental monitoring and social development processes, our team consistently seeks to expand the advantages of regenerative silvicultural practices through ongoing exploration and innovation.

INDICATORS

1. SOIL: To contribute to fertile and healthy soils creation, using techniques such as soil coverage, diversification, less compaction, and reduction of chemical fertilizers.

Indicators:

The growth and operational cycle of planted forest management allows for branches, leaves, bark, and tree stumps – all nutrient-rich materials – to be incorporated into the soil as organic matter. The decomposition process of wood and litter, as per a study by Embrapa Soils (1999), is one of the "main mechanisms responsible for transferring nutrients accumulated in phytomass to the soil." It is important to emphasize that the entire process of planted forest

management (planting and harvesting) does not involve deforestation of native forests.

Despite the ecosystem regulation services provided by cultivated planted forests, in forest management, we continually seek technologies to reduce the impacts of activities on the soil. An example of this is recent technologies adopted in the soil preparation process, including the use of onboard computers and automatic pilots during spacing and fertilization stages. Both adopted technologies ensure more suitable conditions for tree growth, reduce input waste (while also providing the necessary fertilization to the soil at the plot level for increased planting productivity), decrease the risk of erosion, and eliminate operational safety hazards.

A second initiative, currently in its testing phase, involves the use of drones for the application of agricultural pesticides, with the aim of standardizing product use and reducing water consumption associated with the process. Initial studies indicate an 85% reduction when compared to the mechanized system.

2. WATER: To increase soil water infiltration, water retention in plants, create a local microclimate, reduce irrigation usage, and manage clean water flow for rural safety.

Indicators:

According to the Brazilian Tree Industry (2018), both planted and native forests function as mechanisms that contribute to absorbing a portion of rainfall and its subsequent distribution to the soil and groundwater, resulting in reduced impact. This helps in regulating the flow of water and preventing erosion caused by the absence of vegetation cover. These are some of the ecosystem services offered by forests, which play a crucial role in regulating ecosystem processes. These are essential for human well-being and, consequently, for economic activities.

In WestRock's more than 54,000 hectares of forests, over 2,700 springs are preserved. Furthermore, for over a decade, we have been conducting monitoring in collaboration with the Institute of Forestry Research and Studies (IPEF) in both native and planted forests to compare the behavior of water resources in these areas. The well-established results of these studies confirm that WestRock's Pinus planted forests are responsible for providing water to the soil, rivers, and streams in the surrounding areas in quantities equivalent to native forests. This minimizes soil degradation and desertification, while also dispelling misconceptions regarding the impact of planted forests.

Moreover, forests play a critical role in rainwater filtration, reducing the accumulation of sediments in rivers. They also act serve as a protective barrier, thwarting soil erosion from the surrounding areas into rivers, which would otherwise lead to siltation. This effect reduces water volume, increases water turbidity, and hinders light penetration, thereby posing challenges to photosynthesis and the survival of algae and fish. In areas lacking forest cover, rainwater runoff carries

with it many sediments into the river (leaching), which depletes soil fertility and raises riverbeds, making them more prone to flooding" (Ibá, 2018).

Studies confirm that the rivers adjacent to WestRock's planted forests sustain comparable levels of suspended solids as those in native forests. This indicates that, even during operations, planted forests also contribute to preventing river siltation, thus leading to the enhancement of water quality for the ecosystems in their vicinity.

3. BIODIVERSITY: To increase biodiversity preservation within the system by utilizing key species for pest and disease control and conserving forested areas.

Indicators:

The preservation of over 23,000 hectares of native forests, among the forested areas, stands as one of the company's initial and primary actions for biodiversity conservation. In total, WestRock maintains 54,000 hectares of forests in a mosaic pattern, comprising both planted and native forests, a highly significant factor in the creation of ecological corridors that facilitate refuge, movement, feeding, and reproduction for hundreds of animal species. Biodiversity conservation contributes to the preservation of various ecosystem services: "Regarding flora, among the environmental services provided by biodiversity conservation, the reservation of timber and non-timber products stands out. In the fauna, we find natural enemies of pests, efficient seed dispersers and pollinators, and an extraordinary genetic bank with solutions for global challenges related to the responsible use of natural resources" (Ibá, 2022).

For 28 years, WestRock has been investing in ongoing biodiversity monitoring in its native forests located in the Atlantic Forest biome in the northern region of Santa Catarina and southern Paraná. The monitoring is conducted with the aim of continuously assessing the relationship between the management of planted forests and the species that inhabit and reproduce in the preserved forests – which constitute 47% of the company's forested areas. These monitoring efforts are of paramount importance in gathering increasingly detailed information about the presence of flora and fauna species in the forests, thus identifying strengths and opportunities for improvement in forest management. From the inception of our monitoring efforts up to 2021, we have identified a total of 607 species of flora and fauna within our company's areas, with 41 of them classified as endangered.

Through critical analysis of historical data, the company has been highlighting the quality and benefits of planted forest management for biodiversity conservation, even identifying top-level predators in its areas, such as the puma, which demonstrates the overall balance of the ecosystem in the study region.

4. CARBON: To increase the capacity for carbon sequestration and carbon stock in the soil.

Indicators:

Forests play a vital role as climate regulators by removing and storing carbon from the atmosphere during the photosynthesis process, which is essential for plants to generate energy for their growth. In this process, trees absorb carbon dioxide molecules and water, and with the aid of light, convert them into glucose and water, simultaneously releasing oxygen into the atmosphere. The glucose then undergoes a series of internal chemical reactions, ultimately leading to the production of biomass.

Approximately 47% of a tree's biomass consists of carbon. WestRock's planted forests sequester thousands of tons of CO_2 from the atmosphere each year, contributing to climate change mitigation. In 2020 alone, WestRock's planted forests removed 556,000 tons of carbon (Source: GHG Protocol 2020 Inventory - https://rpe-gvces.s3.amazonaws.com/tmp/cache/pdf/193e85cf/westrock.pdf).

Planted forests exhibit faster growth rates, resulting in increased carbon absorption, even more so than native forests. Over more than 60 years of genetic improvement research, these planted forests have become 40% more productive, consequently removing carbon from the atmosphere at a rate 40% higher than the average of other planted forests in Brazil (Ibá, 2018).

Forest management allows for the simultaneous harvesting of certain areas while other forested areas are replanted or continue to grow, thereby maintaining a carbon balance or even achieving a positive balance. In the case of WestRock's planted forests, over 6.5 million tons of carbon are stored in our areas.

In addition to carbon storage in trees, the forests also contribute to carbon fixation in the soil through the action of fungi and bacteria and help regulate rainfall patterns through transpiration (Ibá, 2021).

5. SOCIOECONOMIC: To produce different types of foods that ensure food security for farmers' families, increase lifetime income, empower women in rural areas, and create favorable conditions to support the permanence of future generations in those areas.

Indicators:

Through our Forestry Promotion Program, we encourage sustainable forest planting by producers who own rural properties near our areas. The program provides partners with an alternative source of income through the management of high-performance forests, focusing on quality, profitability, and sustainability. Producers receive specialized technical assistance, a guarantee of wood sales, and a minimum price guarantee for the cultivation and management of forests. In this program, more than 10,000 hectares of planted forests are managed by local producers in the North of Santa Catarina and the South of Paraná.

Another initiative that promotes regenerative socioeconomic development for small rural producer families is the Forest Honey Program. We allocate areas of our native forests for sustainable apiculture, a predominantly family-based activity that generates income for producers in the regions of Três Barras (SC), Mafra (SC), Bela Vista do Toldo (SC), and Major Vieira (SC). This initiative encompasses all three pillars of sustainability (social, environmental, and economic) as it contributes to income generation for local beekeeping families, maintains pollination services provided by bees, helping balance regional ecosystems, and donates a portion of organic honey production to social entities. In 2022 alone, 6.5 tons of honey were produced, with 657 kg donated to social organizations. Our goal in the coming years is to recruit more beekeepers for the program in other municipalities, thereby extending the reach of the organizations benefiting from donations.

Additionally, we undertake other social projects aimed at the communities living in the vicinity of our forestry operations. These include the "Together for Education" Program, a project spanning over 27 years that trains public school teachers in environmental education content, impacting approximately 20,000 students annually. Another initiative is the "Bugio Trail," situated in a WestRock preservation area, which promotes learning through environmental interaction for visiting groups, fostering an understanding of the fauna and flora of the Mixed Ombrophilous Forest biome, also known as the Araucaria Forest.

> The well-established results of these studies confirm that WestRock's Pinus planted forests are responsible for providing water to the soil, rivers, and streams in the surrounding areas in quantities equivalent to native forests. This minimizes soil degradation and desertification, while also dispelling misconceptions regarding the impact of planted forests.

PROJECT'S BENEFITS, RETURNS, LOSSES AND RESULTS

By adopting regenerative agriculture as the production model for our primary raw material, we positively impact the environment through the benefits of cultivated planted forests. Our business maintains 100% traceability of raw materials, ensuring responsible and sustainable production that begins in our forests.

We uphold a business model with a positive carbon balance – removing 431,000 more tons of CO_2 than the total emissions from our operations in Brazil in 2021. Through Life Cycle Analysis of WestRock corrugated cardboard packaging, we have also determined that for every ton of cardboard produced, our forests remove 600 kg more CO_2 than all emissions associated with its production, contributing to mitigating the impacts of climate change.

Given the national and international efforts to achieve greenhouse gas reduction targets and regulate the carbon market, our business demonstrates promising performance in generating carbon credits, with potential financial returns in this area in the future.

Moreover, from a commercial standpoint, our business model, based on products derived from raw materials obtained through regenerative agriculture, gains traction as more companies incorporate the elimination of fossil-derived substrates, such as plastic, into their sustainability goals and commitments. The advantages of this model contribute to the large-scale production of renewable, biodegradable, and recyclable packaging, thereby aiding our customers, including consumer goods companies, in building more sustainable supply chains.

Clearly, guided by our commitment to a positive impact across the three pillars of sustainability, we have set goals for 2030, including the maintenance of forest management certifications, directing us toward the continuous control and improvement of our operations.

NEXT STEPS

Our next steps are focused on continuously expanding the use of products derived from planted forests as alternatives to non-renewable substrates, providing more sustainable solutions for our customers and their consumers, thus fostering a chain of benefits from these activities. We continue to invest in innovation and technology to explore new processes and solutions that bring continuous improvement to silviculture activities, resulting in net impacts across the supply chain and helping our customers achieve their sustainability goals.

Globally, we have also received approval from the Science Based Targets initiative (SBTi) for our greenhouse gas (GHG) emissions reduction goal of 27.5% by 2030, which aligns with the Paris Agreement and contributes to climate change mitigation, according to the SBTi tool. At national level, we are committed to environmental,

social, and business-related goals, including maintaining sustainable forest management and expanding certified third-party areas.

We are also working to ensure that more of our 1,600+ customers in Brazil and their consumers become aware of the benefits of corrugated cardboard packaging. We aim to encourage the adoption of more sustainable packaging solutions when both packaging and purchasing products.

Since 2021, we have launched a communication channel aimed at reaching the end consumers of our customers by applying a QR code to corrugated cardboard packaging. This QR code leads users to a comprehensive website that unveils the sustainability story behind the packaging. It offers insights into our forest management and its regenerative aspects. You can explore the website at this link.: https://dws-cdn.westrock.com/nossopapelnomundo/index.html.

Case Yara

Company name	Yara Brasil Fertilizantes
Project/Action Name	Regenerative agriculture Offering
Type of Agriculture	Regenerative
Case status	4 Pilots in coffee crop - 1st year

SUSTAINABILITY IS INTEGRATED INTO OUR BUSINESS STRATEGY, AND FOR MANY YEARS NOW YARA HAS BEEN PROMOTING SUSTAINABLE AGRICULTURE, CREATING NUTRITIONAL AND DIGITAL SOLUTIONS THAT OPTIMIZE THE USE OF MINERAL FERTILIZERS, DEVELOPING CLEANER TECHNOLOGIES FOR FERTILIZER PRODUCTION.

COMPANY SUMMARY

Yara Fertilizers is a century-old multinational, with origins in Norway, emerged from the innovation of transforming atmospheric nitrogen into fertilizer, helping to eradicate the hunger spreading across Europe.

Our mission is to feed the world and protect the planet responsibly. Our ambition is to cultivate a nature-positive food future, and one of the pillars of this ambition is Regenerative agriculture.

Although there is still no official definition for Regenerative agriculture, there is a growing consensus that it is a form of agriculture that seeks positive outcomes for nature and mitigates climate impacts, while ensuring the prosperity of producers and food security. For Yara, Regenerative agriculture is related to soil health, carbon sequestration in the soil, mitigation of greenhouse gas emissions, promoting biodiversity, increased nutrient use efficiency, rational use of natural resources, and the prosperity of those involved in agriculture.

PROJECT/ACTION OBJECTIVE

A huge amount of teamwork was undertaken to identify sustainable practices combined with our plant nutrition solutions to build customized value propositions for farmers, bringing the sought benefits in Regenerative agriculture.

In Brazil, we have started pilot projects in coffee farming to validate the benefits of Yara's offering for Regenerative agriculture (RA) in the field, meeting the global demand from the food production chain and aligning with our company's mission and ambition.

Short-term goals:

1. Measure the impact of Yara's nutritional solutions through 20 indicators previously defined, within five main recurring themes in RA: Climate, Soil Health, Resource Use, Biodiversity and Prosperity.

Medium to long-term objectives:

2. Demonstrate efficient use of resources through methodologies such as MRV and Nitrogen Use Efficiency.
3. P roof of benefits for the climate and soil health, measuring carbon sequestration and the carbon footprint of the food.

INITIAL IDEAS

Sustainability is integrated into our Business Strategy, and for many years now Yara has been promoting sustainable agriculture, creating nutritional and digital solutions that optimize the use of mineral fertilizers, developing cleaner technologies for fertilizer production, and sharing knowledge in the field to make agricultural areas more productive and profitable.

With the popularization and growing global demand for regenerative agriculture, we faced the challenge of defining our global positioning. However, it was not necessary to develop new products and tools, but rather to connect what we already have with RA practices, showing how Yara's solutions contribute to improving soil health, mitigating climate impact, optimizing the use of natural resources, and promoting biodiversity.

CASE SUMMARY

Regenerative agriculture Offering Yara – RAO presents our value proposition for Regenerative agriculture. Globally, we are working with pilot projects tailored to each region's strategic crops.

In Brazil, the project is in the pilot phase for coffee cultivation in key producing regions such as Cerrado Mineiro and Southern Minas.

DESCRIPTION

This is a global project, led by a team of Yara experts, with local implementation and adaptation. Local teams are responsible for

implementation and conducting pilots with farmers. In these pilots, Yara is responsible for all technical support and analysis costs, with third-party assistance for data collection and processing to ensure data reliability.

In Brazil, the local team visited and benchmarked producers who already adopt RA practices to understand their practices, needs, and challenges. The intention is to tailor this new approach to field visits, providing knowledge and support to farmers actively contributing to the transition process.

INDICATORS

1. SOIL: Contribute to the development of fertile and healthy soil, using techniques such as soil cover, diversification, reduced compaction and efficient use of chemical fertilizers.

Indicators:

- Chemical composition of the soil: pH, mineral nutrients in line with crop demand, soil organic matter;
- Physical structure of the soil: compaction, water infiltration rate, stability of soil aggregates;
- Soil health indicator (BioAS Embrapa);
- Duration of bare soil without cover crops (days per year);
- Percentage of area under no-till cultivation (% of cultivated area).

2. WATER: Increase water infiltration in the soil, water retention in plants, create a local microclimate, reduce irrigation usage, and drain clean water for rural safety.

Indicators:

- Physical structure of the soil: water permeability;
- Water Use Efficiency (WUE) for irrigated areas (m3 water / t crop).
- Effect of fertigation on increasing productivity and reducing the carbon footprint.

3. BIODIVERSITY: Enhance biodiversity preservation in the system by using key species for pest and disease control and conserving forested areas.

Indicators:

- Number of crops planted in the production system (n°/ha).

4. CARBON: Increase the capacity for carbon sequestration and storage in the soil.

Indicators:

- Carbon footprint of the product "within the farm" (t CO2 eq / t crop);
- Absolute Greenhouse Gas (GHG) emissions on the farm (t CO2 eq / ha);
- Monitoring the increase of carbon in the soil (t MOS / ha).

5. SOCIOECONOMIC: Produce intercropped foods to ensure food security for farmer's families, increase lifetime income, empower women in the countryside, and create favorable conditions for the next generations to remain in rural areas.

Indicators:

- Productivity and profitability of producers per ha or per crop (ROI).

Other indicators:

- Productivity (t crop / ha);
- Nutrient Use Efficiency – NUE (%N absorbed / total N applied);
- Land Use Efficiency (t crop / ha; extra t crop / ha compared to baseline);
- Nutrient cycling – combined use of mineral N with organic fertilizers (use of farm waste) and organominerals.

BENEFITS, RETURNS, LOSSES, AND PROJECT RESULTS

As the regenerative agriculture Pilot in coffee farming is in its early stages, potential financial returns have not yet been mapped. These will be evaluated after harvesting and measuring productivity and beverage quality, as well as the commercialization of this coffee.

We believe the main benefits lie in leveraging our ambition to cultivate a nature-positive food future. The primary lever for generating value for Yara and farmers is to increase the long-term productivity and profitability of crops while simultaneously regenerating production systems and ensuring food security for the population.

NEXT STEPS

- Validate the results obtained in the next year with the pilots.
- Expand Yara's offer to other crops in Regenerative agriculture systems.
- Establish partnerships with Food Companies and other stakeholders.

Official Yara International Website on Regenerative agriculture:

https://www.yara.com/sustainability/transforming-food-system/regenerative-agriculture/

Yara Brasil Official Website –Yara Nutri Blog:

https://www.yarabrasil.com.br/conteudo-agronomico/blog/agricultura-regenerativa-praticas-e-beneficios/

Annexes

For more information about the articles used in this study, please contact carla.gheler@cebds.org.

And for more information about soil carbon in food systems we suggest:

- https://www.esalq.usp.br/banco-de-noticias/centro-de-estudos-de-carbono-em-agricultura-tropical-ter%C3%A1-apoio-financeiro-da
- https://www.embrapa.br/solos.

Low-carbon and regenerative technologies should be encouraged throughout the production chain, as they favor the development of strategies for environmental and socio-economic gains. Brazil, with the help of the business sector, can play a leading role in the technological market for low-carbon agricultural production, and regenerative agriculture is the way to adopt such practices and decarbonize the sector.

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