Great Giant Foods

Regenerative Agriculture

" Rehabilitating The Earth "

2024

Farming is not just about growing crops, it's about cultivating a sustainable future for our country


Great Giant Foods
Rehabilitating
The Earth

Content

Regenerative Agriculture

Concept & Importance

> To forget how to dig the earth and tend the soil is to forget ourselves.
>
> **Mahatma Gandhi**

Throughout human history, we have depended on the land, and we owe it a lot. It supports us, provides a foundation for our lives across generations, nurtures the growth of our food, and will eventually be our final resting place.

Land is integral to the human life cycle, passed down from one generation to the next. Despite enduring centuries of exploitation, the land has continued to provide for us. However, traditional farming methods have now reached their limits. The threat of climate change is becoming increasingly tangible. Water quality is deteriorating, droughts are widespread, crops are becoming harder to grow, and farmers are finding it increasingly difficult to thrive.

If we persist with exploitative agricultural practices, the day may come when the land can no longer sustain us. The Food and Agriculture Organization (FAO) has emphasized the importance of regenerative agriculture in tackling the environmental and social challenges that threaten today's food systems.

In its report, "The State of Food and Agriculture 2023," the FAO introduces the concept of "true cost accounting" (TCA) to uncover the hidden costs of current food and agricultural systems, which include environmental, health, and social impacts, amounting to at least USD 10 trillion. The report also highlights that low-income countries bear the heaviest burden of these hidden costs relative to their national income. Although these estimates are preliminary, the analysis underscores the urgent need for rapid agricultural transformation, with regenerative farming practices as a crucial step forward.

Agricultural Transformation :

From Degenerative to Regenerative

Degenerative agricultural practices of the past have been responsible for the degradation of 70%-80% of global farmland. In response to this, the FAO introduced the concept of sustainable agriculture in 2014, which later evolved into regenerative agriculture by 2022.

Sustainable Agriculture

An agricultural system that manages and conserves natural resources while utilizing technology to meet the needs of both present and future generations.

Regenerative Agriculture

A holistic cultural approach based on system that improves water and air quality, fosters biodiversity, produces nutrient-rich food, and sequesters carbon to help mitigate the effects of climate change.

Regenerative agriculture is not merely a technique or method; it is a philosophy grounded in restoring and honoring the land according to principles of balance and harmony with nature. Embracing this approach requires a significant shift in mindset.

Through regenerative agriculture, humanity makes a humble effort to repay the land's past generosity, ensuring a better future for generations to come.

Regenerative Agriculture Journey at GGF

Since its inception, Great Giant Foods (GGF) has been dedicated to providing the global community with high-quality, nutritious products through responsible practices. We believe a healthy ecosystem positively impacts the economy, environment, and society. To this end, GGF is committed to regenerative agriculture, focusing on four key pillars: soil, water, climate and biodiversity.

03 Climate

Strengthening Climate Resilience

To store more carbon and reduce emissions through the use of eco-friendly agricultural inputs, renewable energy, increased organic matter (such as compost and liquid organic biofertilizer), crop rotation, diversification, and minimal tillage.

04 Biodiversity

Nurturing Ecosystems

To diversify crops based on ecosystem principles, create and preserve conservation areas, utilize biocontrol methods, minimize chemical use, and implement targeted plant protection strategies.








By implementing these practices, GGF not only engages in field activities but also measures the effectiveness of its regenerative agriculture efforts.
Success is evaluated through two dimensions: organizational health and environmental health.

Organizational Health Assessment

Regenerative agricultural practices engage all employees at GGF, reflecting our commitment to these practices. It is essential to measure the effectiveness of this engagement. We assess the condition and performance of employees in implementing regenerative agriculture through pre-defined methods and parameters, with evaluations conducted annually.

Environmental Health Assessment

The environment is central to regenerative agricultural practices. Therefore, assessing environmental health is critical to determine if our practices align with regenerative agriculture principles that enhance environmental conditions. This assessment provides an overview of current performance and identifies areas for improvement. Environmental health is evaluated using various parameters, such as soil quality and biodiversity, with annual assessments (Short Term Monitoring) and every five years with additional parameters (Long Term Monitoring).

At GGF, we recognize that implementing regenerative agriculture is a significant responsibility to ensure the Earth's capacity for future generations. As the old adage goes, **" We do not inherit the Earth from our ancestors; we borrow it from our children."**

GGF Regenerative Agriculture

Principles & Implementation

Guidelines

01.

Soil

For over 30 years, Great Giant Foods has harnessed the land to cultivate a variety of commodities. How can we enhance the fertility of soil that has been utilized through regenerative agricultural practices?

Principle

Restore and enhance soil quality, improving its structure, fertility, and biodiversity

Regenerative Assessment

- Soil organic carbon and organic matter
- Soil biodiversity and its activity
- Soil erosion rates
- Plant/root performance

Soil is home to microorganisms and plant roots, forming a vibrant ecosystem.

However, once this habitat is damaged, the restoration process takes time. Over time, essential nutrients in the soil—vital for plant and microorganism life become depleted as they are absorbed by plants, consumed by microorganisms for metabolism, washed away by water runoff, or evaporate into the atmosphere. During the rainy season, nutrient leaching from the topsoil is particularly severe because the soil struggles to absorb water efficiently, leading to heavy surface runoff.

While it takes decades for soil to form through the weathering of mineral rocks or sediments, soil degradation can happen rapidly due to poor land management practices. These include excessive fertilizer use, inappropriate heavy machinery, lack of organic matter, and inadequate drainage.

6 Indicators of Healthy Soil

Land Cover 01.

Healthy soil is marked by abundant vegetation, such as grass, shrubs, or bushes, growing on its surface. Lush vegetation indicates the soil is rich in nutrients, supporting robust plant growth.

Soil Color 02.

Dark soil, particularly in the top layer, indicates a high organic matter content. This dark hue comes from the decomposition of plant biomass and organisms, which is essential for sustaining microbial activity in the soil.

Soil Erosion 03.

Low levels of erosion are a key indicator of soil health. Erosion can be caused by water or wind, and healthy soil should have the resilience to withstand both.

Soil Structure 04.

A well-structured soil results from physical and biological processes that create pores and cavities. The balance of clay, silt, and sand influences soil structure, with clay-rich soils typically containing more organic matter.

Active Biological Activity 05.

The presence of earthworms is a positive sign of biological activity. Earthworms play a crucial role in decomposition, creating channels that improve water and air retention, and producing vermicompost, which enhances nutrient cycling.

Soil Aroma 06.

Geosmin is a compound produced by microorganisms in healthy soil, giving it a distinctive earthy aroma. This scent is a sign of active biological processes at work within the soil.

How Are
Soil Management Practices
Implemented at GGF?

01. Understanding Soil Contours and Water Flow in Agricultural Areas

We employ Digital Surface Model (DSM) technology to analyze land contours and water flow patterns. This method effectively reduces soil erosion and minimizes fertilizer leaching during the ridging process and manual application of basal fertilizers.

02. Using organic mulch

To combat soil erosion, we apply mulch as ground cover. This technique decreases the direct impact of rainwater on the soil, enhances water infiltration, and prevents surface soil movement. We specifically use non-productive pineapple plants for this purpose, and a chopper is crucial in ensuring the mulch is of the right quality and size.

03. Using Compost

Compost is vital in improving soil structure, reducing nutrient leaching, promoting root growth, and ensuring proper air and water distribution within the soil. We extensively use compost in our pineapple plantations. Given the rapid degradation of compost in tropical climates, we produce a premium mix by combining bulk compost, biochar, and vermicompost to ensure long-term soil benefits.

04. Reducing the Use of Heavy Machinery for Land Preparation

Frequent use of heavy machinery can cause soil compaction, so we aim to reduce machinery use without compromising soil quality. For instance, we use a rotary ripping implement that combines the functions of a subsoiler and a finishing rotary to streamline the process.

Soil Management Initiatives

Based on Principles

Principles	Objectives	Initiatives	
		Description	Parameters
Restore soil quality by improving its structure, fertility, and biodiversity	To keep the roots healthy during the crop cycle	• Adding soil amendments to the soil for optimal root growth	• pH level complies with the crop growth requirement • Soil compaction below the critical value • C-organic • Mineral content
	To minimize soil disturbance	• Reducing land tillage activities that have potency of decreasing soil properties	• Fulfilled land requirement criteria with reduced tillage activities
	To protect soil from high erosion with natural mulch or land design	• Designing land layout based on water direction and waterlogging map • Mulching bare soil with organic matter derived from plant debris	• Erosion rate • Fallow period characterization
	To establish better soil structure	• Reducing land tillage activities that have potency of decreasing soil properties	• Fulfilled land requirement criteria with reduced tillage activities
	To feed the soil with organic material (essentially plant debris)	• Adding compost, green mulch, and plant debris under the canopy areas	• C-organic, mineral content, and living organism in the soil

02.

Climate

Climate helps determine the types of plants and animals that can live in a region, and it influences human activities such as agriculture, construction, and energy use.

Principles

- Promote carbon sequestration
- Reduction of Greenhouse Gas Emissions
- Enhance ecosystem resilience

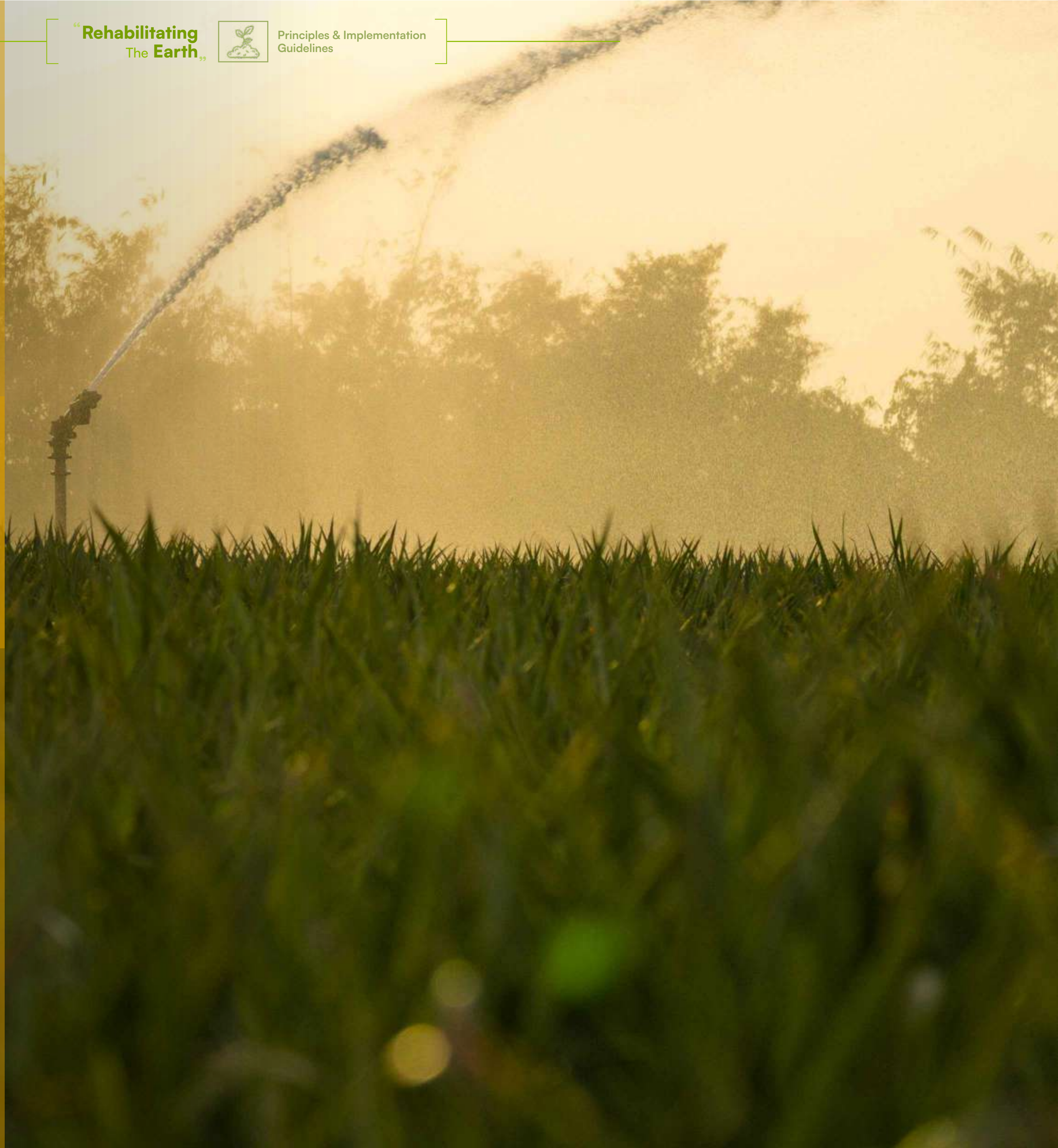
Regenerative Assessment

- Carbon emission index
- Nitrogen use efficiency
- Tree diversity
- Natural habitat
- Tractor fuel use in the plantation

If we imagine the climate as a symphony, it resembles a weather orchestra that unfolds over decades in a given region, typically spanning more than 30 years.

This symphony includes the notes of temperature, precipitation, humidity, and wind,which play in a consistent rhythm.

However, over time, these notes begin to change, creating a different melody. Global temperatures rise, precipitation patterns shift, and extreme weather events become more frequent. The once harmonious weather symphony becomes discordant. This shift is driven by increased concentrations of greenhouse gases in the atmosphere, altering the natural composition of our climate symphony.



GGF's Contributions to
Climate Change Mitigation Through Regenerative Agriculture?

01.
Reducing Atmospheric CO_2 Concentrations

Regenerative practices enhance soil's ability to capture and store more atmospheric carbon through plants and microorganisms, thereby reducing CO_2 concentrations contributing to global warming. In GGF, compost, which is a organic fertilizer with abundant of C-Content, are applied in the plantation. Moreover, minimizing excessive soil tillage helps keep carbon sequestered in the soil.

02.
Supporting Climate-Responsive Farming Systems with Sensor and IoT Technology

Technology can optimize farming systems by detecting potential waterlogging, reducing erosion risks, and preventing nutrient leaching during the rainy season. During dry periods, sensors, such as soil moisture sensors, provide real-time monitoring of soil water levels.

03.
Mitigating N2O Emissions

Nitrogen fertilizers can emit greenhouse gases like nitrous oxide (N_2O). Regenerative agriculture helps reduce the use of such fertilizers. One practical practice is using the Normalized Difference Vegetation Index (NDVI) for satellite or unmanned aerial monitoring. NDVI identifies areas needing attention, guiding precise nutrient application and reducing N_2O emissions. Additionally, a fertilizer with slow-release capabilities is used to minimize the need for chemical fertilizers.

04.
Enhancing Plant Resilience Against Extreme Weather with S14 Fertilizer

S14 fertilizer promotes strong root development, improves nutrient and water absorption, and enhances resistance to extreme weather conditions, thus reducing agricultural carbon footprint.

05.
Minimizing Emissions from Heavy Machinery

The Rotary Ripping method exemplifies regenerative agriculture by integrating various tools to reduce reliance on large machinery and excessive soil tillage. This approach streamlines soil preparation and reduces emissions from heavy equipment use.

Facts

Agriculture accounts for

20% of global greenhouse gas (GHG) emissions

(U.S. Environmental Protection Agency)

primarily through

(N_2O) nitrous oxide	**(CH_4)** methane

produced by nitrogen fertilizers

N_2O has a global warming potential 265 times greater than CO_2

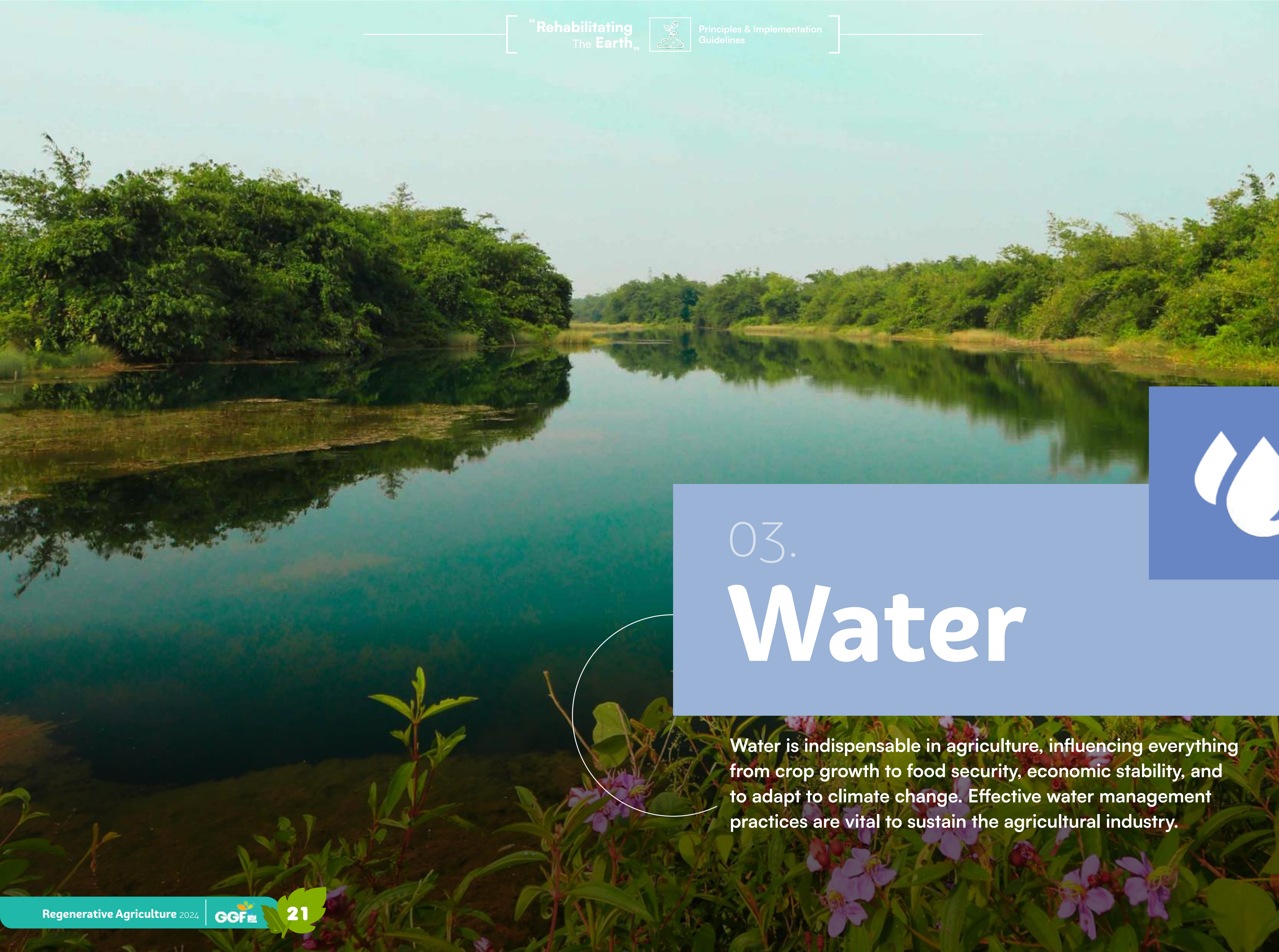
Degraded soil loses its capacity to sequester carbon, and excessive soil disturbance can release the carbon stored within it.

Moreover, the use of heavy machinery for land preparation adds to emissions from fossil fuels.

Soil Management Initiatives on Climate Factors
Based on Principles

Principles	Objectives	Initiatives	
		Description	Parameters
Promote carbon sequestration	To preserve carbon storage in the soil	Employing minimum soil disturbance that potentially exposed stable carbon to the air	• Reduce soil tillage activities • Total carbon content in the soil • Life cycle assessment
		Utilizing cover crops and increase the soil organic matters	• C-organic content
Reduction of greenhouse gas emissions	To reduce the use of chemical fertilizers, focus on those that emit nitrogen (N_2O) and methane (CH_4) gasses	Optimizing fertilization program using organic and green fertilizers with the help of new technologies	• NO_2 and CH_4 emissions in the field • Life cycle assessment
	To utilize fuel emissions that can emits carbon dioxide (CO_2) gas efficiently	Optimizing the employment of machinery especially during the land preparation and plant care	• Life cycle assessment
Enhance ecosystem resilience	To establish suitable environment for organisms above and below the ground	Applying organic fertilizers or amendments that support soil microorganisms' growth	• C-organic and living organism in the soil

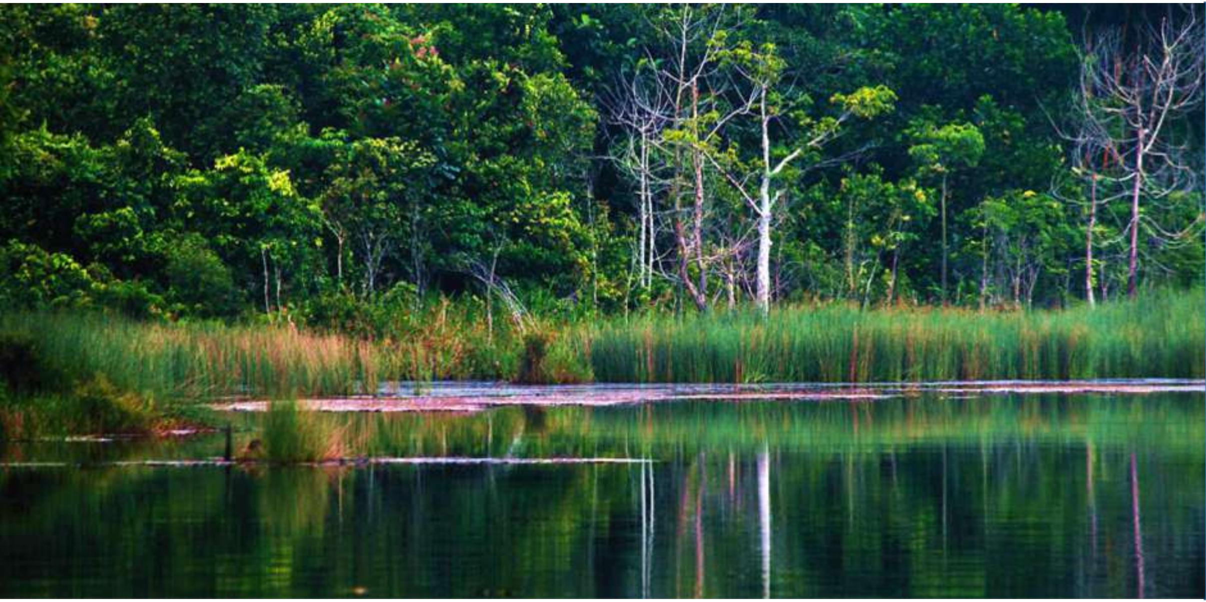
Principles	Objectives	Initiatives: Description	Initiatives: Parameters
Enhance ecosystem resilience	To establish suitable environment for organisms above and below the ground	Maintaining plant diversity through crop rotation and cover crops	• Nutrient cycle of carbon and nitrogen • C-organic and mineral content in the soil
		Rehabilitation of marginal land and maintaining the viability of current forest area	• Forest area surrounding the plantation



03.

Water

Water is indispensable in agriculture, influencing everything from crop growth to food security, economic stability, and to adapt to climate change. Effective water management practices are vital to sustain the agricultural industry.



Principles

Improve water retention

Efficient use of water and maintaining its quality

Preventing run-off

Regenerative Assessment

Erosion rate

Water quality in reservoirs

Monitoring of available water reserves

Water infiltration in soil

Water is a critical element in agriculture, playing a central role in sustaining food production. Water is not just a constant companion to plants--integral to every growth stage, from photosynthesis to nutrient transport—but also acts as a cooling agent in the fields, helping to maintain ideal temperatures for plant development. Water is vital for agriculture's long-term sustainability and ensuring that we have sufficient food on our tables.

Facts

Without efforts to improve water productivity or significant shifts in current agricultural practices,

water consumption through agricultural evapotranspiration

is projected to **increase by**

70% to 90%

by 2050

(International Water Management Institute)

Keynote

Regenerative agriculture views water as a central element that not only supports plant growth but also maintains ecosystem balance. By adopting a holistic approach that thoughtfully integrates technology with conservation practices, regenerative agriculture strives to establish a more sustainable and ecologically sound farming system.

How Are Water Management Practices Implemented at GGF?

01. Water Conservation and Protection

In regenerative agriculture, water is vital not only for its availability but also for the preservation and protection of existing water ecosystems. To achieve this, we focus on maintaining year-round root growth, reducing erosion, and conserving natural wetlands. These efforts help preserve water quality, prevent pollution, and ensure the long-term sustainability of our water resources.

02. Digital Surface Model (DSM) Technology

At Great Giant Pineapple, we utilize DSM technology to design land more effectively. This technology helps optimize the layout and shape of the land so that rainwater flow can be more efficient and erosion can be minimized. With this design, we are able to keep the soil stable and prevent the loss of essential nutrients for plants.

03. Natural Reservoir Conservation

Our reservoir conservation efforts include planting conservation vegetation around reservoir and regularly monitoring sedimentation. These practices help preserve reservoir as natural water absorption areas and essential water reserves during the dry season. Natural reservoir play a crucial role in water storage within the regenerative agriculture system.

04. Water Stock Monitoring with Water-Level Sensors

We use water-level sensor technology to accurately measure and manage water availability in wetlands. These sensors ensure the wise and sustainable use of water, supporting agricultural operations with a consistent and controlled water supply.

05. Irrigation Optimization with Sensors and IoT

We employ advanced sensors to determine optimal watering schedules and the precise water needs of our crops. This technology-driven approach enhances irrigation efficiency and ensures that soil moisture levels remain ideal for plant health.

Water Management Initiatives
Based on Principles

Principles	Objectives	Initiatives	
		Description	Parameters
Improve water retention	To maintain the vegetation life on going in the field	• Reducing the bare soil timeline and keeping the land covered by crops	• Evapotranspiration (ETo/ETc) and the soil moisture content
Promoting efficient use of water and its quality	To conserve the water using reservoirs for irrigation	• Measuring the water level in the reservoir by the employment of technologies	• Water level of reservoir and evaporation
			• Sedimentation monitoring using drone boat
	To reduce the use of chemical fertilizer that pollute water quality	• Managing chemical fertilizers usage with the help of Normalized Different Vegetation Index (NDVI) analysis	• Nitrate levels and living organism in the reservoir and sources regularly
	To carry out efficient irrigation	• Employing efficient irrigation to prevent water wastage	• Water reservoir level, soil moisture content, evapo-transpiration (ETo and ETc)
Preventing fertilizer run-off	To protect soil from erosion with natural mulching and land design	• Designing land layout based on water direction & water logging map • Mulching bare soil with organic matter derived from plant debris	• Soil moisture content and evaporation • Preserved chemical nutrient in the soil • New layout for land design

04.

Biodiversity

GGF is commited to continously preserving biodiversity around our operational area as a part of our responsibility to mitigate potential impacts of our operations.

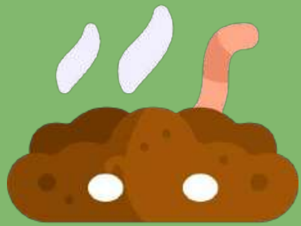
Principles

Fostering a diverse range of plant, animal, and microbial life in agricultural systems

Regenerative Assessment

Number of earthworms

Percentage of cover crops

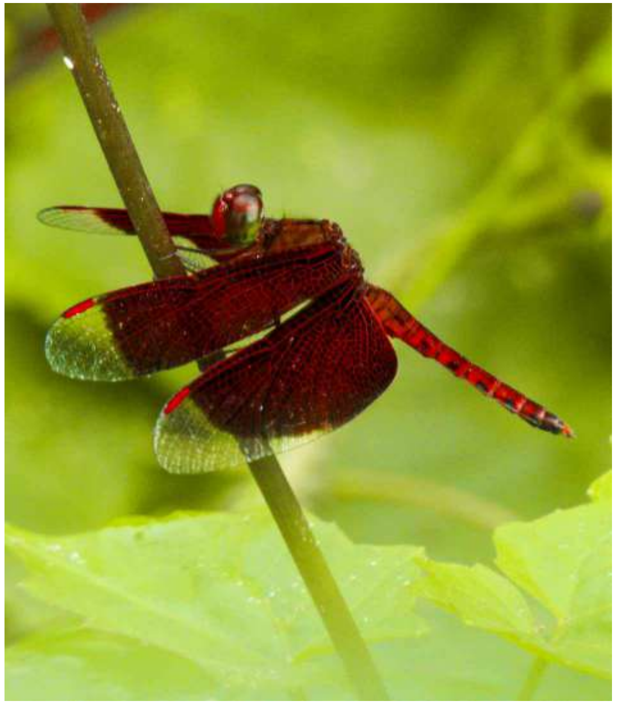


Soil biomass and microbial diversity

Number and abundance of desired rare species

Imagine an ecosystem as a natural orchestra that sustains the stability of the climate, water supply, soil fertility, and other essential components of nature. Within this orchestra, biodiversity serves as its beating heart, comprising millions of plants, animals, and microorganisms that coexist in harmony.

However, this orchestra now faces a significant threat: severe degradation. Ensuring that this orchestra continues to play harmoniously involves preserving and enriching biodiversity.



According to the World Wildlife Fund (1989),

Biodiversity encompasses not only the variety of plants, but also the habitats where these species thrive.

As a critical foundation for a healthy and sustainable agricultural ecosystem, biodiversity in regenerative agriculture is deeply interconnected with the overall vitality of the system.

How Does Regenerative Agriculture Contribute to Biodiversity?

01. Creating a system in harmony with natural ecology

In regenerative agriculture, biodiversity extends beyond the crops being cultivated. It encompasses the microorganisms in the soil, insects, and other organisms that inhabit and influence the environment. This approach aims to create systems that are in harmony with natural ecological principles, taking into account the natural conditions while integrating both biotic and abiotic factors.

02. Maintaining soil health and enhancing biodiversity

Regenerative agriculture employs crop rotation over time in a given area of land. This practice helps prevent soil degradation, as different crops draw different nutrients from the soil, maintaining its structure and nutrient balance. Moreover, crop rotation reduces the risk of pests and diseases that can accumulate when a single crop is grown repeatedly.

At GGF, we have implemented crop rotation by planting cassava, and bananas, enhancing our productivity and enriching our biodiversity.

03. Minimizing adverse impacts with Integrated Pest Management (IPM)

Regenerative agriculture typically uses Integrated Pest Management (IPM) to control pests and diseases, prioritizing non-chemical, biological, and physical methods from seed selection to plant care. Through IPM, the environment remains more balanced and sustainable, as pest populations are naturally regulated by other organisms. GGF has integrated various control methods, such as using natural predators, managing pest habitats, and selectively applying pesticides, to maintain the balance of the agricultural ecosystem and protect biodiversity.

Biodiversity Management
Based on Principles

Principles	Objectives	Initiatives: Description	Initiatives: Parameters
Fostering a diverse range of plant, animal, and microbial life in agricultural systems	To preserve and enrich the soil fauna	Reducing chemical fertilizer usage in plantation	Soil macro and mesofauna amount
		Combining biological pest control methods with monitoring and appropriate control measures	Soil macro and mesofauna amount
		Planting various cover crops after harvest	Cover crop planting area
		Promoting the diversity of forest near to the plantation area	Diversity of the species in forest area
		Practicing minimum tillage by combining several soil preparation steps	Microorganism diversity abundance
		Encouraging the use of organic amendments in plantations	Microorganism diversity abundance

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