# Regenerative Agriculture

## IDH Approach

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idh
transforming markets

# IDH definition of Regenerative Agriculture

One sentence definition

***Regenerative Agriculture is a system of farming principles and practices that increase biodiversity, enrich soils, restore watersheds, and enhance ecosystem services*** *(FAO)*

Common principles (as selected by IDH*)

- Actively regenerate farm and environment[1,3,4,5,6,8]
- Core focus on soil health, but also considering water, biodiversity etc.[1,3,4,5,6,8]
- Let nature perform farm processes as much as possible, rather than using external inputs[4,5,7]
- Maintain healthy, nutritious, high-yielding crops[3,5]
- Define precise combination of practices based on local context[3,4,8]
- Combine with social activities[1,3]

One paragraph definition proposed by IDH

*Regenerative Agriculture aims to **actively improve a farm's natural conditions** while maintaining **high-yielding** crops. A **healthy soil** is used as foundation but other outcomes such as biodiversity, carbon sequestration and resilience are also prominent features. Farm processes are solved by **nature as much as possible, rather than using external inputs**. Ideally, Regenerative Agriculture is combined with practices that aim to achieve positive impact on local communities. A precise combination of practices and outcomes is determined pragmatically **dependent on local circumstances, knowledge and priorities**.*

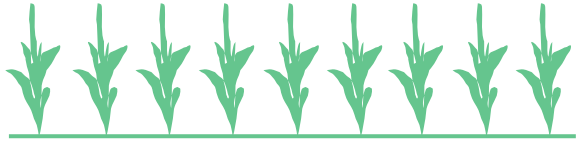
# Principles, practices, mechanisms & outcomes

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Principles** | Improve soil health | Nurture natural processes | Minimize external inputs | Maintain high yields | | | |
| **Practices** | **Soil coverage** | **Low soil disturbance** | **Farm diversity** | **Fertilization** | **Crop protection** | **Water management** | |
| **Mechanisms** | Soil less disturbed by elements | Weed suppression | Increasing soil carbon | More abundant soil life, improving biological nutrient cycling | Improved resilience (climate, pests, diseases) | Improved water infiltration and retention | |
| **Primary outcomes** | Reduced erosion | Less labour requirements | Carbon sequestration | Reduced reliance on external inputs | Healthier and more resilient crops | More diverse crops | Greater water buffering |
| **Ultimate outcomes: improved resources** | Soil | Water | Biodiversity | Livelihoods | Crop | Energy | |

# Regen Ag aims to revert the damaging trends from industrial intensification

## Industrial intensification

High input, high output



- High costs of production
- High dependency on external inputs
- Soil degradation
- Vulnerable to climate events

## Regenerative Agriculture

Low input, high output

- Cost of production minimized
- Many inputs outsourced to natural processes
- Improve soil health
- Resilient to climate shocks

# How is this different from other sustainable trends?

## Sustainable Intensification

- Focus on high yields but limit environmental harm
- Gray area, what is “limited harm”

## Climate-Smart Agriculture

- Any practice that improves climate resilience or relates to carbon
- Widely used terminology, even if one mediocre practice is applied

## Organic

- No application of chemical inputs
- Slightly lower yields, often still industrial monoculture

## Agroforestry

- Combining crops under a tree canopy, usually no-till
- Only suitable for some crops

# Regen Ag requires implementation of practices across 6 categories

| |  Soil cover |  Soil disturbance |  Diversity |  Fertilization |  Crop protection |  Water management |
|---|---|---|---|---|---|---|
| **GAP**  | - | Regular tilling, ripping, compaction etc. | - | Apply 4R principles[1] | 4R principles[1], less toxic inputs | - |
| **Basic Regen Ag**  | Mulching , limited cover cropping | Less (deep or frequent) tillage than conventional, reduced compaction | 2-3 crops polyculture or rotation<br>Small natural strips or buffers on farm | 4R principles[1] & less chemical fertilizers & some organic fertilizers | First rely on IPM[2] & natural buffers, if insufficient apply chemicals with 4R[1] | Water use does not over-extract available resources; additional practices in place to reduce external water use |
| **Advanced Regen Ag**  | Continuous cover – in between crop rows and in between seasons, living cover crops where possible | No till | 3+ crop polyculture or rotation<br>Extensive natural strips and buffers on farm<br>Integrated livestock | (Nearly) circular nutrient management (e.g. mulches & green manure & crop synergies) | Fully rely on IPM[2] & natural buffers, no external inputs applied | Targeted capture and distribution of water; no or sporadic irrigation from off-farm sources |

1: The 4R Principles of Nutrient Management: Right source, Right rate, Right time, Right place; 2: Integrated Pest Management

# Types of regenerative systems

Regenerative agriculture can exist in many different forms, as long as the principles and practices are applied. The most suitable approach depends on local conditions and preferences. A few main types are described below.
Due to the high level of variability in Regenerative systems, some flexibility is required in assessing (scoring) how advanced the system is. Implications of cropping archetypes on the scoring ladder are also given below.

| Types of regenerative systems | Agroforestry | Integration with livestock | Polyculture | Rotational annual crops |
|---|---|---|---|---|
| |  |  |  |  |
| **Description** | • Farms combining trees with annual or perennial crops below canopy | • Combining specific crops with livestock or aquaculture, either directly between the crops or fenced off but with an active role (e.g. converting crop stubble to manure) | • Simultaneous combination of multiple crops (annual and/or perennial) | • Monoculture or simple polyculture of annual crops, with changing setup each year (to prevent soil depletion and recurrent pests/diseases) |
| **Examples** | • Rubber, oilpalm, coconut with food crops under canopy<br>• Shade-tolerating plant such as coffee, cocoa under shade trees | • Silvopasture (trees + livestock)<br>• Leafy crops with aquaculture ponds<br>• Rice-fish or rice-duck systems | • Legume + cereal mixes (e.g. maize, beans & squash)<br>• Banana, papaya & sweet potato | • Rice-wheat rotation<br>• Wheat-fallow-alfalfa-potato<br>• Wheat-maize-beans |
| **Implications for scoring sheet*** | • Active mulching is less important in these systems because soils are already relatively protected by tree cover and falling leaves<br>• Agroforestry systems are often by default fully rain fed | • Livestock may take up an important part in fertilization and crop protection. However, too much/constant livestock can have a negative impact on soil structure | *No particular implications* | • Annual crops are often very reliant on tilling. While annual crops can still work well in no-till setups, compromises can exist in reduced frequency or depth of tillage. |

**See section Qualitative Assessment*

# Carbon

| | How Regen Ag influences carbon | Co-benefits of carbon | Quantitative inclusion | Specific calculations |
|---|---|---|---|---|
| | | | | Disclaimer: suggestive information only. For more exhaustive and detailed recommendations a topical expert should be involved. |
| **Reduced carbon emission** | • Mostly by reduced fossil-based fertilizers | Benefits for companies:<br>• Reaching carbon targets: Insetting. Elaborate guide on how to approach this as a company: Insetting 101<br>• Or, generating an additional income stream: Offsetting. This requires a large scale and third party verification | Total carbon reductions or sequestration can be roughly estimated. Look for reliable reports that mention emission reduction or sequestration potential in similar cases.<br><br>*E.g.: "Regenerative Agriculture cotton emits X% less carbon", or "Reduced tillage in wheat increases soil carbon by 0.X% per year"* | Emissions from fertilizers can be calculated if the amount and type of fertilizer reduction is known, using e.g. this calculator |
| **Biomass carbon sequestration (trees)** | • Carbon is be stored in biomass by growing trees (or other woody plants) | • Benefits to farmers are only indirect: e.g. trees for shade, wind breaks, diversified income | | The amount of carbon stored in wood can be estimated by inserting the amount of trees planted in e.g. this calculator (approximate only; precise amounts depend on tree type and climate) |
| **Soil carbon sequestration** | • Carbon amount in soils is increased by:<br>  • Less tillage<br>  • Organic inputs & mulches<br>  • Biochar<br>  • More living roots | • Benefits to farmers are only indirect: soil carbon is a general proxy for soil health<br>• Benefits for companies are limited. There is still unclarity about how much carbon is really being sequestered long term in soils. No verification method yet exists for carbon credits on this. | | • Soil carbon is measured via Soil Organic Carbon/Matter (SOC/SOM). This needs expensive lab tests which are impractical at scale. Cheaper equipment that can measure SOC in the field is being developed but not commercially available yet |

# Climate resilience

| | How Regen Ag influences resilience | Co-benefits of resilience | Measurement & calculations |
|---|---|---|---|
| **Crop diversity** | • Increased crop diversity can reduce the impact of a particular climate event on a farmer's income, because if one crop is damaged, the other may not be | *See Climate Resilience Module* | *See Climate Resilience Module* |
| **Biodiversity** | • More abundant biodiversity on a farm can reduce the impact of pest and disease outbreaks, which are expected to increase under climate change | | |
| **Soil buffering capacity** | • A healthy soil can absorb excess water and reduce erosion in case of heavy rainfall, while maintaining water better during heat and drought | | |
| **Shade** | • Trees can provide shade to other crops, making them more heat and drought tolerant | | |

# Ecosystems

| | How Regen Ag influences ecosystems | Ecosystem benefits<br>Also known as Ecosystem Services | Measurement & calculations |
|---|---|---|---|
| **Biodiversity** | • All Regen Ag practices are designed to improve biodiversity | • More abundant biodiversity on a farm can reduce the impact of pest outbreaks<br>• Increased biodiversity can increase the amount of pollinated flowers and subsequent fruit development | *Estimating and calculating the impact of Regen Ag on ecosystem services is difficult even for experts. Co-benefits should only be described in a qualitative manner.* |
| **Soil health** | • All Regen Ag practices are designed to improve soil health | • As for climate resilience, a healthy soil can absorb excess water and reduce erosion in case of heavy rainfall, while maintaining water better during heat and drought | |
| **Water quality** | • Reduced chemical runoff from farms and increased filtration in natural buffers leads to higher quality water sources in the surroundings | • Improved water quality improves drinking water and freshwater fish availability | |

# Social standards

| | How Regen Ag influences social standards | Social benefits | Measurement & calculations |
|---|---|---|---|
| | | | Disclaimer: suggestive information only. For more exhaustive and detailed recommendations a topical expert should be involved. |
| **Food security** | • Diversification can lead to a larger variety of crops for local consumption | • Diverse cropping systems likely improve nutritional variety of locally available crops, such as increased protein availability from typically intercropped legumes | • The nutritional value of additional crops can be looked up and coupled to information on local diets and nutritional deficits. For example, this report shows a vast overconsumption of tubers and insufficient consumption of nuts and legumes in Sub-Sahara Africa.<br>• Nutritional information in the web is often of low quality; info should only come from highly trusted sources and be verified in the local context. |
| **Gender equality** | • There is a broad call to implement Regen Ag together with programs that aim to increase gender equality; e.g. by providing training for women on managing additional crops | • Improved social equality, besides its moral implications, can increase adoption of coupled Regen Ag services and improve their long-term application | • Measurement of social improvements is likely to be output-based only (e.g. # women included in trainings) |
| **Indigenous people** | • There is a broad call to include indigenous people in Regen Ag programs. They are likely to have extensive knowledge on cropping systems and plant species that suit the local environment. Compensation for sharing such knowledge should be provided | | |

# Glossary

| Term | Description |
|---|---|
| 4R principles | 4R principles of nutrient management are designed to optimize input use for plant health and low environmental damage. The are: Right source, Right rate, Right time, Right place of application. |
| Green manure | Green manure is a name given to cover crops that provide fertilizing services to the soil; most notably nitrogen fixation. Leguminous plants are the most common example of this, but many other plants also lead to nitrogen fixation (including some vines and trees) |
| Integrated Pest Management (IPM) | Integrated Pest Management here means that in first instance, pests are diminished by preventative measures, such as crop rotations, diversification and stimulating biodiversity for natural predators. If pests do occur at a damaging level, clear plans are in place to mitigate them in the least damaging way |
| Mulching | Mulching is the covering of soil with some material to reduce exposure to the elements or evaporation from the soil. Mulching is effective with many types of organic materials, including crop residues, leaves, compost, and wood chips. Consequences such as fire hazards and increase in fungi must be considered. In some cropping systems, plastic sheets are used as mulches, but this is not recommended in regenerative setups. |
| Natural buffers | Natural buffers are areas on or surrounding a farm that provide a natural resource or service. It could be e.g. strips of native plants for pollinators and natural pest predators, or reeds that filter and absorb excess nutrient and chemical run-off |
| No till | No till refers to farming without seasonal tillage or ploughing, which breaks natural soil structure and exposes soil to increased erosion. It is aimed to enhance soil health. No till requires additional farming practices to deal with consequences such as weed growth. All crops can and have been grown in no till setups, and literature often exists on results and best practices. |
| Permaculture | Permaculture is the growing of multiple plants and crops in a way that mimics a stable ecosystem and needs little to no maintenance once mature. It often includes a large amount of perennial plants, but can also include annuals that self-seed in subsequent years. |

| Term | Description |
|---|---|
| Agroecology | |
| CSA | Climate Smart Agriculture has been defined as “agricultural practices that sustainably increase productivity and system resilience while reducing greenhouse gas emissions”. Under this broad umbrella fall things such as soil and water management that can overlap with GAP and Regenerative Agriculture. The main difference with Regenerative Agriculture is that CSA can include single-practice interventions that impact only one or a few components on the farm. These often interfere as little as possible with conventional (industrial) agriculture. For example, adding irrigation to a monocropped, intensive farm could be considered a CSA intervention. |
| GAP | Good Agricultural Practices are guidance and practices that aim to reach high yielding and quality crops. Common elements are nutrient management (e.g. through the 4R principles), crop protection, irrigation, land preparation, harvest etc. Its main differences with Regenerative Agriculture are that it is typically based on chemical inputs and continuous intensive human management (e.g. ploughing, irrigation), rather than nature-based inputs and services |
| NBS | |
| Nature positive | |

# Further reading

## Introduction to Regen Ag

- NRDC Guide to Regenerative Agriculture

## Practical guidance

- Regenerative Agriculture 101
- Agrovista Practical guide
- Farming for a Better Climate (scroll down for various useful factsheets & practical guides)

## Company frameworks

- Unilever guide to Regen Ag
- Nestlé's RA Framework and guide

## Definitions

- Schreefel et al, compiling definition from 28 articles
- Giller et al, looking at common principles and practices
- Newton et al, reviewing definitions from 229 articles
- Review paper, building on all the before

## Thought-provoking articles

- The Counter: Regen Ag needs a reckoning
- Offshoot: Can we talk about Regen Ag?
- Growing Africa: Why the buzz on Regen Ag?