



# Six Simple Steps to Regenerative Agriculture





**This booklet has been developed by LEAF in close association with AgriCaptureCO2, with particular thanks to:**

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This booklet has been designed based on the principles of **Integrated Farm Management (IFM)** and highlights six simple steps to support you in implementing regenerative agricultural practices on farm.

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# Introduction

## What is regenerative agriculture?

Regenerative agriculture describes holistic farming systems that, among other benefits, improve soil, water and air quality, enhance ecosystem biodiversity, produce nutrient-dense food, and store carbon to help mitigate the effects of climate change. These farm systems are designed to work in harmony with nature, while also maintaining and improving economic viability (FAO, 2022).

Regenerative agriculture is not a new concept, the fundamental principles that underpin this concept have been practiced for hundreds of years yet it is only in the last fifty or so that the approach has gained popularity.

Regenerative agriculture is receiving increasing attention from producers, retailers, and consumers, as well as mainstream media. However, there still exists a certain degree of misunderstanding about what it actually means in practice. Regenerative farming encompasses techniques that promote sustainable and efficient use of natural resources, with a focus on building soil health, increasing biodiversity, and reducing carbon emissions. This is achieved by combining pre-industrial agricultural practices, innovation, and science to benefit the soil, environment, local and global communities.



LEAF has been developing and promoting more sustainable farming for over thirty years through its network of leading demonstration farms and world-renowned innovation centres, as well as its management tools, and through its environmental assurance scheme, LEAF Marque. Recently, it has been involved in a number of EU funded projects, like [AgriCaptureCO2](#), specifically focused on identifying the mechanisms and support needed by farmers to transition from conventional practices towards more sustainable, regenerative farming methods. Subsequently, this will help provide environmental, economic, and social positive outcomes - beneficial to the farmer, consumer and the climate.

A prominent element of regenerative agriculture is around the mindset of farmers implementing more regenerative approaches; these involve 'generation' as well as 'regeneration'. It is not solely based on the practices and tools used but also the outcomes of the approach, and consequently sits well with LEAF's Integrated Farm Management (IFM) framework.

“We are literally standing on the largest and most potent carbon capture storage of the planet. If we want not only to preserve biodiversity, expand food production and at the same time fight climate change, there is no alternative to regenerative agriculture ”

Orsolya Valkó, Institute of Ecology and Botany



## Why regenerative agriculture?

Whilst being responsible for around a [third of global carbon emissions](#) and contributing to [17% of global greenhouse gas \(GHG\) emissions](#), agriculture is also extremely vulnerable to the effects of climate change. Farmers and smallholders are increasingly struggling with harvest and livestock losses whilst trying to adapt to the increasingly irregular weather conditions caused by the changing climate. All stakeholders involved in regenerative agriculture have the [potential to benefit](#). Farmers can save money and increase profitability with drought resistance crops and reduced reliance on synthetic fertilisers. The environment benefits from improved soil health, conservation of water, increased biodiversity, and carbon sequestration as well as greenhouse gas (GHG) emission reductions.

To mitigate climate change, the [IPCC](#) emphasise the importance of [removing carbon dioxide from the atmosphere](#). Alongside mechanical solutions, like carbon capture and storage, sequestering carbon in soil can help remove carbon dioxide already in the atmosphere in a relatively natural way. A recent study estimated land currently under cultivation has the capacity to store an extra [1.85 gigatons of carbon](#) each year if it is managed in a more regenerative way. If applied appropriately at scale over the next 25 years, regenerative agricultural practices could draw down around [10% of all anthropogenic carbon emissions](#) into the soil, improving soil health and more broadly helping combat climate change.





## Concerns with conventional agricultural systems



**400** insects have become resistant to pesticides

*(Environmental Issues (Our Future World) Textbook, 1999)*



**30%** of the world's population were food insecure in 2020/1

*(World Bank, 2021)*



Farming uses **70%** of the world's fresh water

*(World Bank Blogs, 2017)*



**8%** total global carbon soil stocks are lost as a result of agricultural land use, equivalent of 133 Petagrams of carbon from the top 2 metres of the soil

*(IPCC, 2020)*



**13-22%** anthropogenic greenhouse gases come from agriculture, forestry, and other land uses

*(IPCC, 2020)*

# The principles of regenerative agriculture

Whilst there is no universally agreed definition for “regenerative agriculture”, there are 5 core principles:

1. Limit soil disturbance
2. Keep the soil surface covered
3. Increase the diversity of plants
4. Keep living roots in the soil
5. Integrate livestock into the system

By implementing these principles, the aim is to:

- Regenerate the health of soils
- Regenerate the land and ecosystems
- Generate knowledge, collaboration and relationships
- Generate healthy and resilient food and farming solutions
- Generate value
- Generate climate change solutions

A sixth principle - ‘context’ is increasingly being included and indeed, the ‘site specific’ nature of farming underpins [LEAF’s IFM approach](#). Context recognises that each farm is unique and must be managed according to specific conditions, needs and goals. This principle is [critical for ensuring the success](#) and sustainability of farm management practices, as it emphasises the importance of considering the unique conditions of each farm and tailoring management practices accordingly. IFM integrates a site-specific context to sustainable farm management: using a comprehensive approach that considers the interrelations that impact farm health, recognising that different components of the whole farm system, such as soil, water, air, and biodiversity are all connected and must be managed in an integrated and holistic manner. For example, farmers may need to use different types of cover crops, composting methods, or tillage practices depending on the specific needs of their land and soils.



“Regenerative agriculture implies more than just sustaining something but rather an active rebuilding or regeneration of existing systems towards full health”

Charles Massey, Call of the Reed Warbler

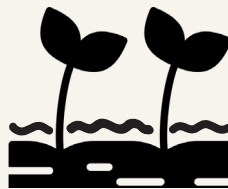
## The 6 principles of regenerative agriculture

1



**LIMIT SOIL  
DISTURBANCE**

2



**KEEP THE SOIL  
SURFACE COVERED**

3



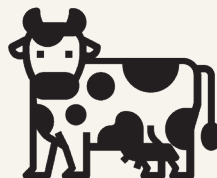
**INCREASE PLANT  
DIVERSITY**

4



**KEEP LIVING ROOTS  
IN THE SOIL**

5



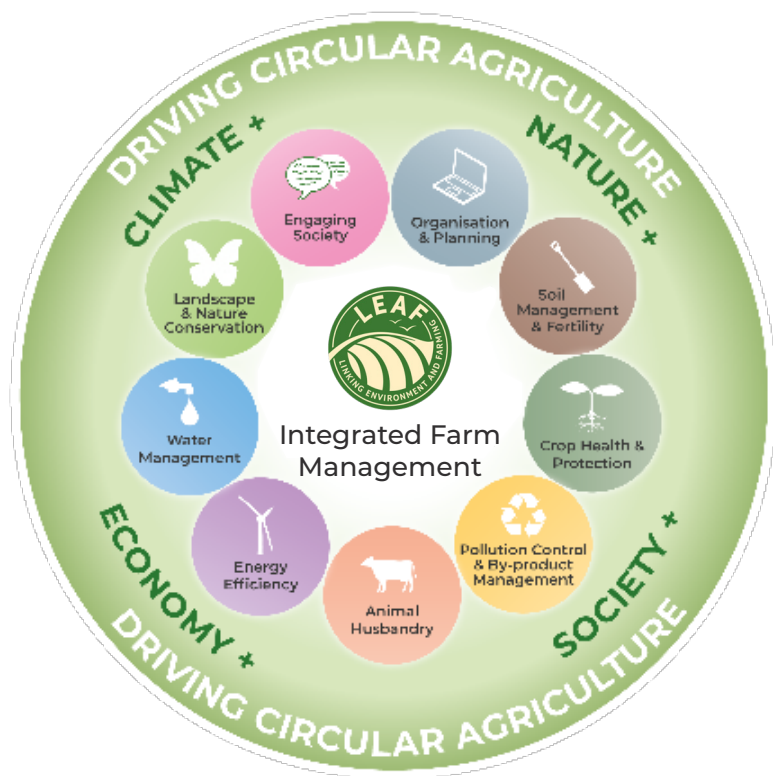
**INTEGRATE  
LIVESTOCK**

6



**CONTEXT**

## How does Integrated Farm Management and regenerative agriculture overlap?



The principles that underpin regenerative agriculture align closely with the integrated approach to farming through LEAF's [Integrated Farm Management \(IFM\)](#) and as supporting practices and outcomes within the LEAF Sustainable Farming Review.

IFM is a whole farm business approach that delivers more sustainable farming. Decision making on farm is not based on single issues and IFM supports farmers in identifying the most appropriate decisions in an integrated manner.

IFM is geared towards sustaining and optimising the use of all resources on farm, including soil, water, air, staff, machinery, capital, Integrated Pest Management (IPM), wildlife habitats, and landscape features. It aims to address regulation and embrace innovation, with its successful uptake requiring a detailed understanding of the business and a challenging and forward-thinking approach.

The implementation of IFM is built around smart management that embraces the best of modern technology and traditional methods. A risk management approach is also developed to anticipate, assess, manage, and develop contingency plans for any unplanned events.

At the core of IFM is the concept of continuous improvement; the implementation of regenerative farming needs to be continuously reviewed in order to improve productivity, environmental health, and economic viability.

Regenerative agriculture is not solely based on the outcomes, nor the practices and tools used, it is a mindset that takes you on a journey, which sits well with IFM and our work at LEAF:

- Regenerating the health of our soils
- Generating knowledge, collaboration, and relationships
- Generating site-specific management plans
- Generating healthy and resilient food and farming solutions
- Regenerating land and ecosystems
- Generating value
- Generating carbon and wider climate change solutions

## AgriCaptureCO2 Project

[AgriCaptureCO2](#), a [European Horizon2020](#) project, is a collaborative endeavour, uniting farmers, researchers, and farming organisations, with the aim to champion regenerative agriculture as a solution to mitigate climate change, whilst providing agronomic and economic solutions for farmers. Via the adoption of regenerative farming practices, this project aims to address future solutions to the climate crisis, whilst improving farmer resilience and boosting profit margins.

The two key aims of the AgriCaptureCO2 project are:

1. To develop an innovative, robust, and scalable solution to measure carbon capture in soil.
2. To actively engage with farmers and stakeholders through the European Regenerative Agriculture Community (ERAC), which serves as a platform for facilitating knowledge exchange around regenerative practices and technologies.

# Step 1 - Limit soil disturbance

## Minimise soil disturbance and encourage soil health improvements

The first step in your more regenerative agriculture journey is to review soil disturbance levels. Improving and restoring soils is at the heart of regenerative agriculture, as well as IFM.

Soil is a mixture of organic matter, minerals, and gases, that together support a complex web of plants and organisms, from bacteria and fungi, to worms, insects, and protozoa. Physical soil disturbance is harmful to the biological integrity of the soil ecosystem; it can damage organisms, like worms, resulting in the biological simplification of soil.

Minimising soil disturbance through the implementation of regenerative practices can help improve and restore the damage done through traditional practices such as ploughing. Reducing physical disturbance by eliminating or minimising tillage, reducing machinery compaction, and minimising overgrazing enhances soil aggregation, restores soil structure, and improves soil carbon sequestration. Similarly, reducing chemical and biological disturbance, by reducing synthetic applications and maintaining living roots, can help maintain soil and biological integrity, as well as improve soil fertility and the management of pests through an [Integrated Pest Management \(IPM\) approach](#).



## Practices that can help you minimise soil disturbance:

- Implementing an IFM approach can reduce the need for cultivation and therefore improve soil health and structure
- Reduce or eliminate tillage practices
- Reduce cultivations
- Reduce compaction from machinery
- Minimise overgrazing, and control grazing using rotational strategies, such as MOB grazing
- Introduce disc drilling where possible
- Reduce or eliminate chemical fertiliser and pesticide applications to minimise chemical and biological soil disturbance
- Maintain living roots (see step 3)



Types of physical cultivations that cause differing levels of soil disturbance:

**PLOUGH  
OR POWER  
HARROW:**



**TINE DRILL  
OR STRIP /  
MINIMUM TILL:**



**DISC DRILL  
OR DIRECT /  
ZERO TILL:**





Whilst using the plough / power harrow is reliable and sometimes necessary, it causes a high level of soil disturbance. When soil is ploughed or heavily cultivated, its structure is damaged, meaning it is vulnerable to erosion as well as soil microbial destruction.



Using minimum till as a cultivation method is effective if you are working towards implementing no till, as it minimises soil compaction, with medium levels of soil disturbance.



Where site-suitable, farmers implementing regenerative agriculture should try to practice no-till. This improves soil organic matter and reduces the soil's risk of erosion and weathering. Whilst this cultivation method relies on well-structured seed beds and skilled seed placement, it causes very low, or no soil disturbance.

# Step 2 - Keep the soil surface covered

The second step is to review how much of the year you keep the ground covered.

Maintaining ground cover offers numerous benefits that positively impact soil health and the ecosystem. By keeping the soil covered, you can protect it from erosion caused by heavy rain and wind and prevent soil drying out during droughts whilst maintaining living roots beneficial to soil microbes (step 3). Ground cover can be achieved through various methods, such as using crop residues like straw or planting cover crops to shield and sustain the soil. Cover crops play a crucial role in enhancing soil biology by promoting a diverse ecosystem of beneficial microorganisms, leading to improved soil health, carbon sequestration and nutrient cycling. They can help anchor the soil, reduce erosion risks, and break up compacted areas, enhancing soil structure. Cover crops can also support natural weed control and create a beneficial habitat for wildlife during winter. Farmers aim to select the most appropriate cover crop or mix that aligns with their farming system, soil type, available equipment and overall business objectives.

## Types of cover crops:

### **SHORT TERM MIXES:**

Faster growing species such as radish, mustard, phacelia, buckwheat and linseed

### **OVER-WINTER MIXES:**

Winter rye, spring oats, winter vetch, linseed, buckwheat, or stubble turnips



## Cover crop benefits:

- Stabilise and reduce soil erosion
- Remove compaction and improve soil structure
- Increase soil biology
- Used as extra livestock feed
- Reduce overall cultivation costs through increased soil biological activity
- Help to control weeds
- Create habitats for wild birds, small mammals, and insects during the winter

## Below are some practices that can help you keep your ground covered:

- Implementing an IFM approach can help you select the correct cover crop for your farm
- Introduce cover crops and catch crops into your farm rotation plan
- Leave crop residue on your soil whenever possible
- Introduce perennial planting where suitable

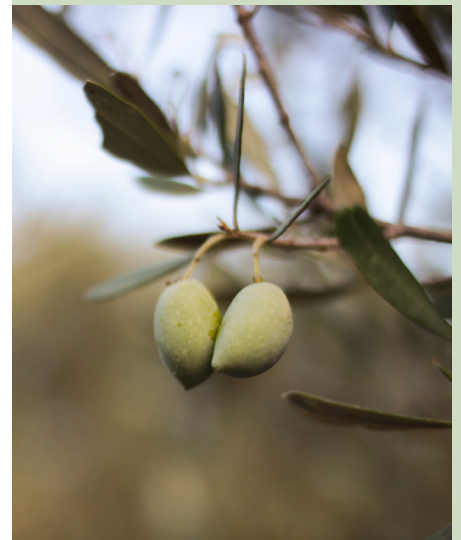


# Case Study: Praktikou & Peramera Farms, Crete, Greece





Prakitkou and Peramera Olive Farms, in Crete, cover 0.65 hectares and have been taking measures to keep their ground covered, whilst minimising soil disturbance for over 25 years. Prakitkou Farm Owner, Ioannis Evaggelinakis has farmed the land for 23 years after taking over from his parents, growing olive trees in soil that has never been ploughed nor had chemical inputs. Similarly, Peramera Farm Owner, Ourania Tzortzi does not plough in order to keep the ground covered and protected all-year-round, using cover cropping and leftover crop materials. The following case study looks at the different practices and approaches they are using to increase crop diversification and as a result improve above-ground and below-ground diversity.





Ioannis' olive farm has award winning oil and high olive fruit counts despite the increasingly extreme weather events and Ioannis puts this down to his good soil conditions.

Practices that have improved the soil include:

- Farming organically using compost, manure, and mulch to enrich the soil as opposed to applying chemical inputs that disrupt the soil health and structure
- Running a no plough/no till system
- Adding seaweed to the soil which improves soil structure and water infiltration
- Using cover crops, such as legumes to fix nitrogen, and weed cover around each olive tree to keep the soil protected
- All leftover crop materials remain on the soil surface to decompose which as a result increases the SOM content and improves soil structure
- Ioannis directly irrigates olive tree roots when they need water, which has reduced water demand/consumption and kept his plants healthy and soil stable

Alongside these practices, a student from Athens University suggested he add mycorrhiza to the base of each olive tree, which has been shown to improve tree and root health. Whilst Ioannis only applied the mycorrhiza once, this application alongside other regenerative practices have resulted in an overall improvement in tree health and a significant increase in yields.

Ourania particularly focusses on keeping the ground covered by:

- Planting legumes every year amongst the trees with the primary purpose of increasing the soil nitrogen content and improving soil health
- Pruning the olive trees regularly and leaving the waste material on the soil surface to decompose
- Spreading wood chippings as mulch to keep the ground covered and protected

Since implementing these regenerative practices, alongside minimising soil disturbance through a no plough system, Ourania has seen an increase in soil health and crop yield.

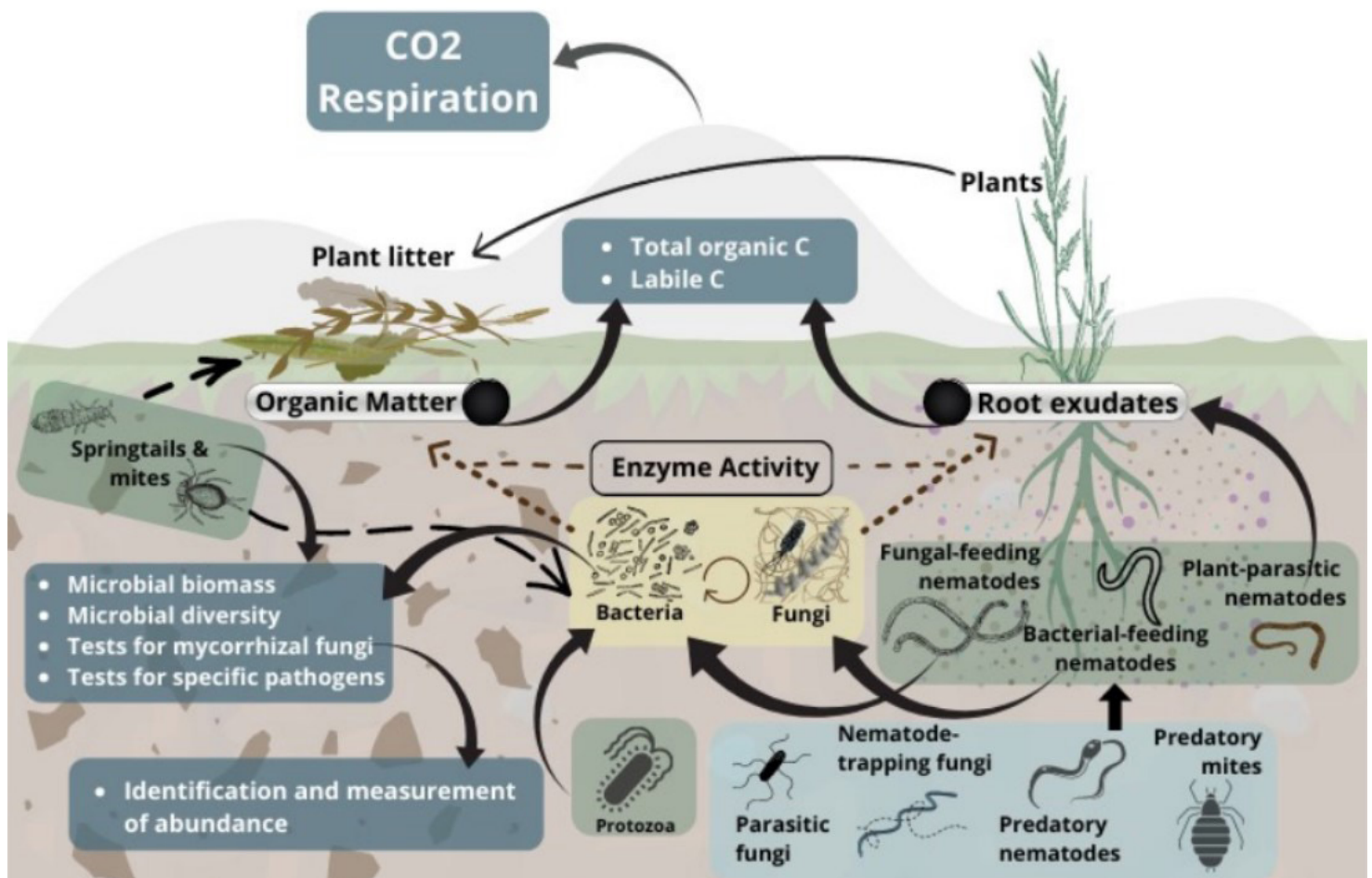


# Step 3 - Keep living roots in the soil

Maintaining living roots in the soil provides year-round benefits that are vital for soil health. Planting cover crops in between cash crops can be a simple way of maintaining living roots in your soil. These roots help with soil infiltration, reducing runoff and supporting soil structure, all of which positively impact the soil. Having living plants above ground also protects the soil from erosion and provides grazing and weed control for the next crop. Most of the time there are unused nutrients found in soils, which are often subject to leaching in the winter. One crucial advantage of living roots is their ability to collect leftover nutrients, like nitrogen, and make them available to the next crop as the previous crop decomposes. Additionally, soil conditions in the winter are normally wetter. Cover crops grown during this time can help prevent soil compaction and improve soil infiltration because roots find wet soils much easier to penetrate. This leaves channels for cash crop roots to follow during dry months. Finally, living roots in the soil increase water entering and being retained in the soil, therefore decreasing the risk of soil drought when you plant your cash crop.



Root exudates, which are offshoots of roots and act as messengers between soil microbes and plant roots, are also essential for soil health. They facilitate efficient nutrient transfer and protect plants from potential harm by acting as a communication signalling messenger. If the soil doesn't have a living root over winter, these root exudates disappear. The next summer when cash crops are planted, root exudates must reform and redevelop, which can slow down the transfer of necessary nutrients leading to plant nutrient deficiencies. Root exudates can also add carbon to the soil, promoting organic matter buildup. This creates a healthy soil ecosystem, contributing to organic matter decomposition, nutrient cycling, retention, bioturbation, disease suppression, and toxin breakdown.



Below are some practices that can help you maintain living roots in your soil all year round:

- Implementing a site-specific IFM approach can help you recognise your capacity for year-round cropping and the incorporation of annual cover crops if appropriate
- Introduce cover cropping to your rotation to maintain root exudates: you can plant this as soon as you have harvested the cash crop
- Implementing a more diverse crop rotation can benefit your soils, because different species have roots of varying lengths. This means the roots can work together and scavenge the maximum amount of nutrients from the soil



## Step 4 - Increase the diversity of plants

After considering how to maintain living roots in your soil, you can now look at reviewing the diversity of the plants you are currently using within your farming system.

Promoting above-ground plant diversity is vital for cultivating resilient crops, supporting pollinators and wildlife. Above-ground diversity can also lead to below ground diversity, as different species support different soil organisms, providing well balanced nutrition for the soil food web. Achieving this goal involves employing various practices to enhance crop diversity, including incorporating multiple species of cover crops, cultivating diverse forage in pastures, and preserving permanent vegetation in specific areas. You can boost crop diversity by varying cash crops in rotations, adopting companion cropping or intercropping within arable crops. Using diverse green cover crops between cash crops will also achieve soil coverage and the maintenance of living roots in the soil. The careful selection of crop species is crucial to their success, as some crops may outcompete others for vital resources like light, water, and nutrients.



Below are some practices that can help you increase the diversity of your crops:

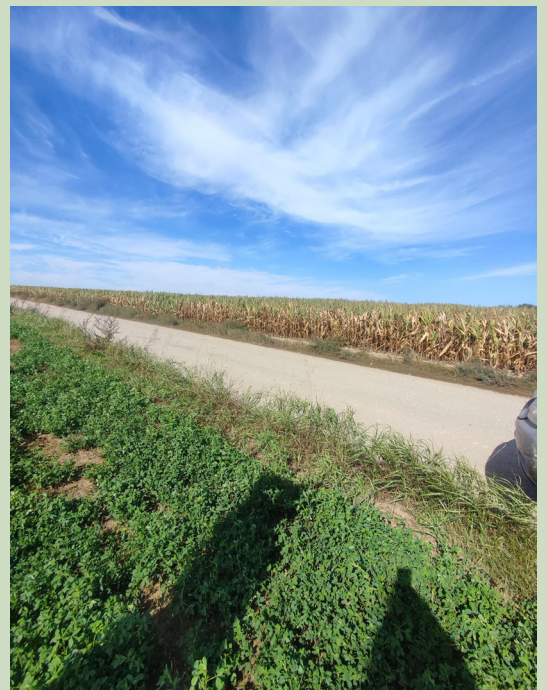
- Following an IFM approach can help you establish which crop species are most resilient to pests, diseases and weed competition so that you can choose the correct crop species when diversifying
- Plant cover crops, companion crops and introduce intercropping
- Consider your species selection to choose crops most suited to your business goals: certain crops are better than others at promoting soil biodiversity, nitrogen uptake, and weed and pest suppression
- Monitor and manage the invasive species within your crop and choose diverse crop species that can help minimise their impacts



# Case Study: Radzicz Ranch, Poland



Radzicz Ranch in Poland covers 500 hectares and Farm Owner, Lukasz Karmowski is making a significant effort to cultivate a variety of crops on his mixed farm, particularly within his arable enterprise. He has been trialling equipment and technology developed through the AgriCaptureCO2 project as part of his regenerative approach to increase crop diversification, and as a result, improve above-ground and below-ground diversity.



Lukasz used to suffer financial losses and significant soil health deterioration on the arable enterprise. However, since working on the AgriCaptureCO2 project and implementing a regenerative approach, he has made significant, positive changes to his practices:

- The farm plants crop varieties that improve soil quality such as sunflowers and various grasses. This commitment to enhancing soil health has effectively prevented financial losses and increased overall farm longevity and sustainability. Lukasz now focusses on maintaining soil organic matter by planting a diverse range of crops that are beneficial to his soil type
- The farm plant crop varieties that are drought resistant such as alfalfa and rye. Both crops grow well under drought conditions which are increasingly common with worsening climate change and dry periods. The crop diversification has enabled Lukasz to grow crops in fields under very dry conditions
- Lukasz employs precision agriculture techniques including soil mapping and variable fertiliser application rates, leading to resource efficiency and minimal environmental impact

These innovative solutions to rapidly changing conditions in a bid to improve soil health and the wider environment have been implemented for a year now and are already yielding positive results. Notably, the cash crops, including rye and triticale, have thrived since soil health has improved, reversing the financial losses Lukasz had experienced in the past.



# Step 5 - Integrate livestock into the system

Integrating livestock into a farming operation is vital to support a more regenerative approach as they can help spread organic matter and increase nutrient cycling and plant growth. Practices such as managed intensive rotational grazing and mob grazing allow areas to recover whilst others are grazed. Controlled grazing prevents overgrazing and soil degradation whilst stimulating diverse plant growth, enhancing pasture performance and overall ecosystem health. Promoting uniform manure distribution, naturally fertilising the soil, and reducing reliance on synthetic fertilisers and minimising environmental impact.

Essential nutrients are replenished by returning manures to the soil through regenerative grazing, enriching soil fertility and promoting organic matter decomposition. This improves soil health, increases microbial activity, and enhances water retention capacity. Livestock can also be introduced through grazing of cover crops, temporary grass leys, or cash crops. This provides additional advantages like increased organic manure, species diversity, weed control, continuous soil cover, and risk diversification.

Integrating livestock into an arable farm is beneficial as it can increase soil diversity and resilience, however it may be difficult to do so due to lack of fencing, water troughs, animal husbandry knowledge and capital investment. Where possible regeneratively integrating livestock should be implemented, however if this is not possible an increasing number of farmers are collaborating with neighbouring livestock farmers on third party arrangements.



## Below are some practices that can help you integrate livestock into your farming operations:

- Implementing IFM can help you consider not only animal welfare, grassland, forage, and crop management, but also the attention to detail demanded to ensure sound husbandry techniques, environmental responsibility and an economically viable farming business. This input could be especially helpful if you are currently an arable farmer looking to integrate livestock into your farming business
- Integrate livestock into the farming system, where appropriate
- If you do not have livestock on your farm, record justification and considerations as to why not. Consider possible collaborative arrangements with other livestock businesses





## Step 6 - Generate relationships

Building strong connections between farmers, local communities, and wider societies facilitates the exchange of knowledge and best practices. These relationships mean you can share insights and learnt lessons with others, helping to accelerate the adoption of regenerative farming methods. Connecting with local communities can also provide valuable feedback and perspectives, leading to continuous improvement. Challenges, such as soil degradation, water scarcity, and climate change are often addressed more effectively through collaborative efforts because you can collectively develop and implement innovative solutions to shared problems by coming together as a community. This problem-solving approach leads to more resilient farming systems that are better equipped to face environment, agronomic and economic uncertainties.

Below are some ideas to help you generate relationships to support more regenerative approaches:

- Interact with community pages, farming groups and wider knowledge exchange networks like the European Regenerative Agriculture Community (ERAC).
- Host knowledge exchange events: invite local farmers for farm visits, and openly talk about your regenerative journey.
- Engage in collective action (landscape-level community work, collaborate and resource share)
- Attend our various events throughout the year and across the LEAF Network. You could even consider becoming a LEAF Demonstration Farm.
- Take part in our annual *Open Farm Sunday* event, farming's annual open day! Open your gates to the public and showcase regenerative farming.
- Link up with local schools or colleges – [get involved with LEAF Education](#) for ideas, support and training.



# Case Study: The GWCT Allerton Project, England



The Allerton Project, partnered with the Game & Wildlife Conservation Trust (GWCT), is a commercially run mixed arable and livestock demonstration farm based on 320 hectares of silty clay loam on the Loddington Estate, England. It is a LEAF Innovation Centre, and has a comprehensive Integrated Farming Management system with a strong focus on cultivation systems with the overall goal of working towards regenerative agriculture.

The Allerton Project has an award winning 'eco-build' visitor centre which welcomes over 2,000 people a year, including environmental groups, farmers, policy makers, food manufacturers and retailers, as well as the general public at LEAF's Open Farm Sunday events.





Head of Sustainable Farming, Joe Stanley, explains how the project works to generate relationships and encourages the uptake of regenerative farming practices:

“A key part of our charitable remit is to host visitors on the farm and engage in practical knowledge exchange. It’s easy to generate data, whether in the lab or out in the field, but it’s much more challenging to get that data to those who would most benefit from it in a usable, credible format.

Our key aim is not only to pioneer more sustainable farming practices, but to help guide others on that path, often by learning from our mistakes and thus avoiding the pitfalls we have discovered. Being able to talk to farmers and other stakeholders in a practical language that they can understand and apply to their own businesses is really important.

We like to host groups of around 20, mixing indoor learning and the presentation of data with farm walks where we can demonstrate the reality of what we are talking about. This format always generates good conversation and debate, with a key part of what we aim to achieve being moving from the dogmatic to the pragmatic; from the anecdotal to the evidential. Often, our visitors have their own insights and experiences which are as valuable to the group as those which we can present at the Allerton Project.

Regenerative Ag’ is a fast-moving picture, and its final state – if there is to be one – will certainly be the work of many hands.”

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# Further Information:

[AgriCaptureCO2 - What is regenerative agriculture](#)

[Agroecology, regenerative agriculture, and nature-based solutions](#)

[7 methods of grazing](#)

[Farming for a better climate - regenerative agriculture](#)

If you are a LEAF member, visit the [LEAF Sustainable Farming Review \(LSFR\)](#) for further practices on regenerative agricultural management practices and IFM

# About LEAF

LEAF is a charity that promotes and supports more sustainable farming to create a resilient food and farming system for future generations.

We connect, we build trust, we educate.

For more information, or to get involved, visit our website: [www.leaf.eco](http://www.leaf.eco)





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Registered charity no: 1045781

LEAF is a company limited by guarantee registered in England number: 3035047

*Published 2024*