GUIDEBOOK FOR REGENERATIVE FARMING
FOUNDATIONS

Soil Heroes Foundation

SUMMARY

1. INTRODUCTION

Welcome to the Regenerative Farming Guidebook – Foundations.

Our planet is facing an ecological emergency. The way in which we produce our food, through intensive conventional agriculture, is destructive for planetary and public health and is no longer tenable. A growing world population, climate change and an unbalanced power relationship throughout global supply chains, place even more pressure and challenges on farmers already struggling to survive. Agriculture alone is responsible for more than a third of global emissions, while negative farming practices are severely degrading the capacity of soils worldwide to store sweet water and are depleting nutrition levels. In short, artificial inputs and heavy machinery degrade soils and biodiversity, which further undermines the progress of farmers.

Change is needed from a climate point of view and also for the future existence of farmers. More than 50% of the world's habitable land (51 millions of square km) is used for agriculture. If we change the way we farm, we can regenerate natural ecosystems on a large scale. In this guidebook, we explain why and how.

We present the 20 most effective and impactful practices of regenerative farming. If you want to learn more about how to execute these practices on the field, the requirements in terms of financial investment, machinery, headcount and time, the extent to which these practices are currently implemented in Europe, and which practices work best when executed together, please refer to Layer 2 and Layer 3 of the Regenerative Farming Guidebook.

Please note that all of the knowledge we share in this Guidebook is drawn from more than seven years of experimenting with regenerative agriculture practices on our own farm. Our Experience Farm, the Klompe Farm, is located in the Netherlands, just 20 km south of Rotterdam. Out of the 360 hectares of the farm, more than 100 hectares are farmed regeneratively, which makes the Klompe Farm one of the largest experiments of regenerative farming in North Western Europe. While we don't yet implement all of the 20 core practices on our farm, we are working to implement all of them in the future.

Additional data for our guidebook came from our partner farmers, other leading European farms and esteemed academic partners, including the University of Amsterdam, the University of Wageningen and the Waterboard Hollandse Delta.

Finally, please note that the knowledge about regenerative farming is always evolving. Therefore, this document is an evolving body of work. We invite you to join our learning journey and reach out to us if you see anything to add or modify.

Enjoy the reading!

2. WHAT IS REGENERATIVE FARMING?

Regenerative agriculture is a set of farming practices that work with nature rather than against it, increasing biodiversity, enriching soils, improving water retention capacity and enhancing the ability of soils to deliver precious ecosystem services like carbon sequestration and water retention. We believe that nature holds the key to its own restoration.

The core principles guiding regenerative agriculture vary depending on the sources. Terra Genesis International, an international regenerative design consultancy, presents the 4 core principles of regenerative agriculture like so:

1. Progressively improve whole agroecosystems (soil, water and biodiversity)
2. Create context-specific designs and make holistic decisions that express the essence of each farm
3. Ensure and develop just and reciprocal relationships amongst all stakeholders
4. Continually grow and evolve individuals, farms, communities, to actualize their innate potential

Regenerative agriculture is a holistic system where all stakeholders are considered at their true value. From these four core principles emerge a variety of farming practices that are unique to each specific geographic area and determined by the climate, soil type and socio-economic context. The 20 principles that we will present later have been tested in North Western Europe and, therefore, are best suited to be executed in this area. We can't ensure the same efficiency of these practices if executed in other geographic areas.

What is the difference between organic and regenerative agriculture?

- Regenerative agriculture emerges from a different paradigm than organic. In organic, the goal is to “do less harm” while in regenerative agriculture, the goal is to “restore and enhance capacity”.

- Regenerative agriculture is more holistic, inclusive and expansive than organic, especially regarding social justice and cultural equity.

- Organic is included as a base for regenerative agriculture. On many points, regenerative agriculture sets higher standards than organic.

- Organic is defined as a set of technical checklists that can be audited, informing mostly “what not to do” (i.e., don’t use chemicals, don’t use GMOs...) while regenerative agriculture is a set of principles that can be applied in many different ways.

- Organic focuses on complying with existing standards that are defined very clearly and precisely. Regenerative agriculture focused on enhancing natural processes and is defined by the creation of positive observable outcomes.

3. WHY USE REGENERATIVE FARMING?

Regenerative agriculture improves the mineral balance

Some regenerative practices, like using leguminous plants, enhance mineral fixing (see description of the practice) and reduce the need for the application of minerals. Adding artificial fertilizers creates a dependency of soils and disturbs the natural mineral balance. As discovered by the great chemist Justis von Liebig in the 19th century, plant growth is limited by the least available nutrient (law of the minimum). Once the least available nutrient is supplied, another nutrient will become the least available nutrient. So, it is very important to have all minerals available in the soil in a balanced ratio.

Regenerative agriculture boosts above-ground and below-ground biodiversity

Underground biodiversity is essential in the decomposition process of organic matter. Without soil life, nutrients will not be available to plants.

Currently in North Western Europe, the amount and diversity of soil fungi (Mycorrhiza) and bacteria (Rhizobacteria) in agricultural soils is low. Through the regular use of toxic pesticides and herbicides, saline fertilizers and the reliance on monoculture, conventional agriculture eliminates biodiversity from the soil. Yet, these microorganisms are precisely what can prevent minerals from leaching. Microorganisms colonize the rhizosphere, or interior of the plants, enabling plants to absorb nutrients and minerals that are available in the soil. The conventional methods don't just kill native species and debilitate the ecosystem, they also make farms more vulnerable to pests and diseases. All it takes is one strong threat to wipe out an entire crop if no other species is there to curb the damage.

With practices like crop rotation, cover cropping, the introduction of natural predators like birds or bats or the integration of livestock, regenerative agriculture supports a strong and vibrant biodiverse ecosystem, enabling crops to become more resilient to pests and disease. There is a symbiotic relationship between above-ground and below-ground biodiversity ecosystems. Both ecosystems are equally important to restore soil.

Regenerative agriculture helps create more Soil Organic Matter

Soil Organic Matter (SOM) is the organic matter component of soils, consisting of plant and animal residues at various stages of decomposition, cells and tissues of soil microbes, and substances that soil microbes synthesize.

Organic matter is incorporated into the soil via crop residues (leaves, stems and roots) and animal manure. Bacteria, fungi and other soil living organisms break down these elements until only indigestible residues remain. These remains are what we call humus, or stable organic matter. Because no light penetrates into the soil, soil living organisms can't use sunlight as an energy source. Therefore, organic matter is the only energy source for many soil living organisms. The degradation process involves all living organisms in the soil food web.

With practices like composting, crop diversity, cover crops or limited-to-no-tillage, regenerative agriculture boosts the creation of SOM.

A high level of SOM has several benefits:

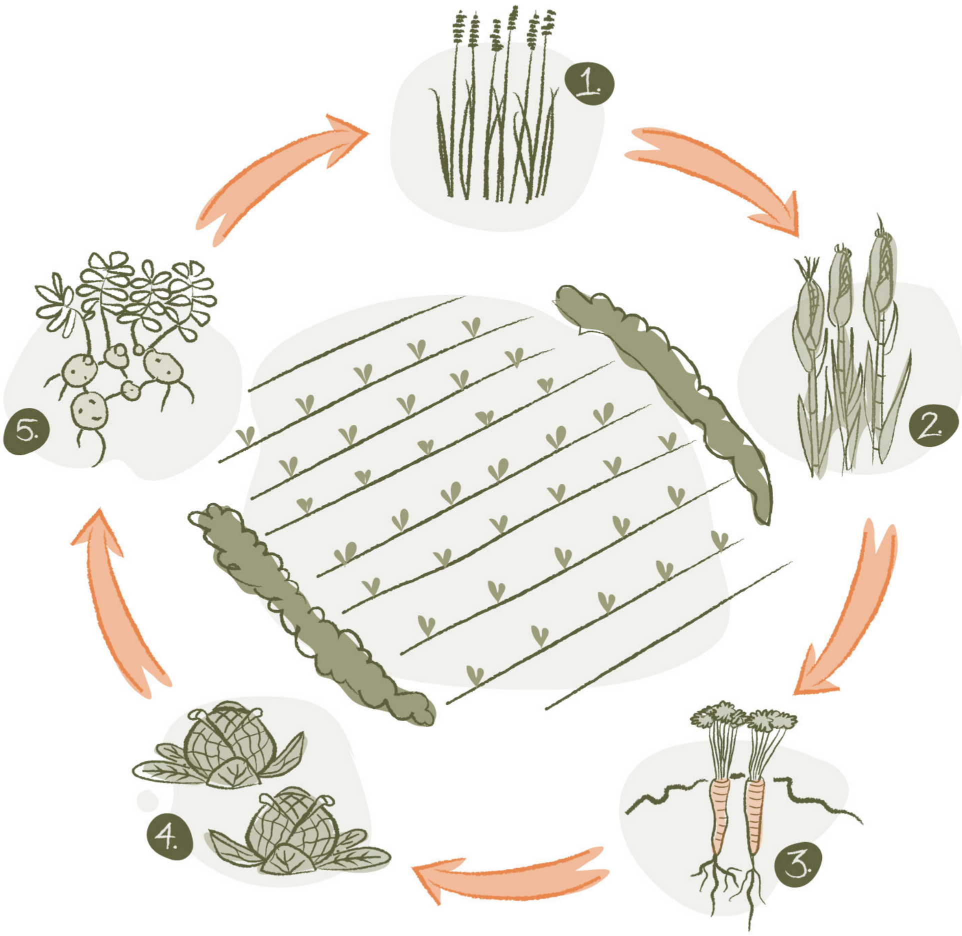
- SOM is one of the most important drivers of **soil fertility**. During the breakdown of organic matter by soil microorganisms, minerals (i.e., nitrogen, phosphate) and micronutrients (i.e., copper, manganese, zinc) are released in a form that plants can use easily.
- SOM can absorb up to 20 times its own weight in water. As a result, SOM plays an important role in preserving soil's moisture. This is called **water retention capacity**. The higher the water retention capacity, the lower the need for irrigation. Crops become more resilient to extreme weather events like floods or droughts, which reduces the climate risk for farmers and enables them to produce a steady supply of food, regardless of weather variations.
- SOM promotes a **good soil structure**. SOM glues soil particles together, creating stable soil aggregates. The soil becomes less likely to turn into dust and thus reduces the risk of wind erosion. On heavy clay soils, where clay particles are already heavily glued together, SOM improves the soil's ability to crumble. In light sandy soils, SOM limits internal mud caused by very small soil particles. SOM increases the size of the pores in the soil, which leaves more room for plants' rooting systems
- SOM drives **soil carbon sequestration**. Soil carbon sequestration is the long-term storage of carbon in soils. Through the process of photosynthesis, plants assimilate carbon and return some of it to the atmosphere. The carbon that remains as plant tissue is then consumed by animals or incorporated into the soil when plants die and decompose. The primary way that carbon is stored in soils is as SOM. Currently, soils contain approximately 75% of land-based carbon – three times more than the amount stored in living plants and animals[1]. Carbon can remain stored in soils for millennia or be quickly released back into the atmosphere when soil is turned upside down, during tilling for instance. Because it focuses on reducing soil disturbance, regenerative agriculture can increase soil carbon sequestration and help mitigate climate change.

[1]Source: https://www.esa.org/esa/wp-content/uploads/2012/12/carbonsequestrationinsoils.pdf

4. THE 20 CORE PRACTICES OF REGENERATIVE FARMING

1. Expand the crop rotation plan
2. Use your own seeds
3. Increase crop diversity
4. Select deep-rooting crops
5. Use leguminous crops
6. Plant winter covers
7. Plant perennial crops
8. Geographic optimisation
9. Use lighter tools
10. Incorporate straw and crop residues
11. Employ shallow tillage or no till
12. Phase out artificial fertilizers/nitrogen (N)
13. Use cover crops as green manure
14. Mob grazing
15. Use biofertilizers
16. Use solid manure and green compost
17. Mix crops (2 crops)
18. Install cultivation strips and agroforestry (more than 2 crops)
19. Implement field margins and biodiversity lanes
20. Install rugged vegetation/steppingstones

In this Regenerative Farming Guidebook – Layer 1, we provide an overview of each practice and the benefits. For further detail about financial, machinery, personnel and time requirements, the extent to which these practices are currently implemented in Europe, and which practices work best when executed together, please refer to Layer 2 and Layer 3 of the Regenerative Farming Guidebook.



1. EXPAND THE CROP ROTATION PLAN

The crop rotation plan refers to the organization of the different types of crops grown annually on a farm. A more diverse crop rotation plan improves soil structure, natural pest control and biodiversity.

Benefits:

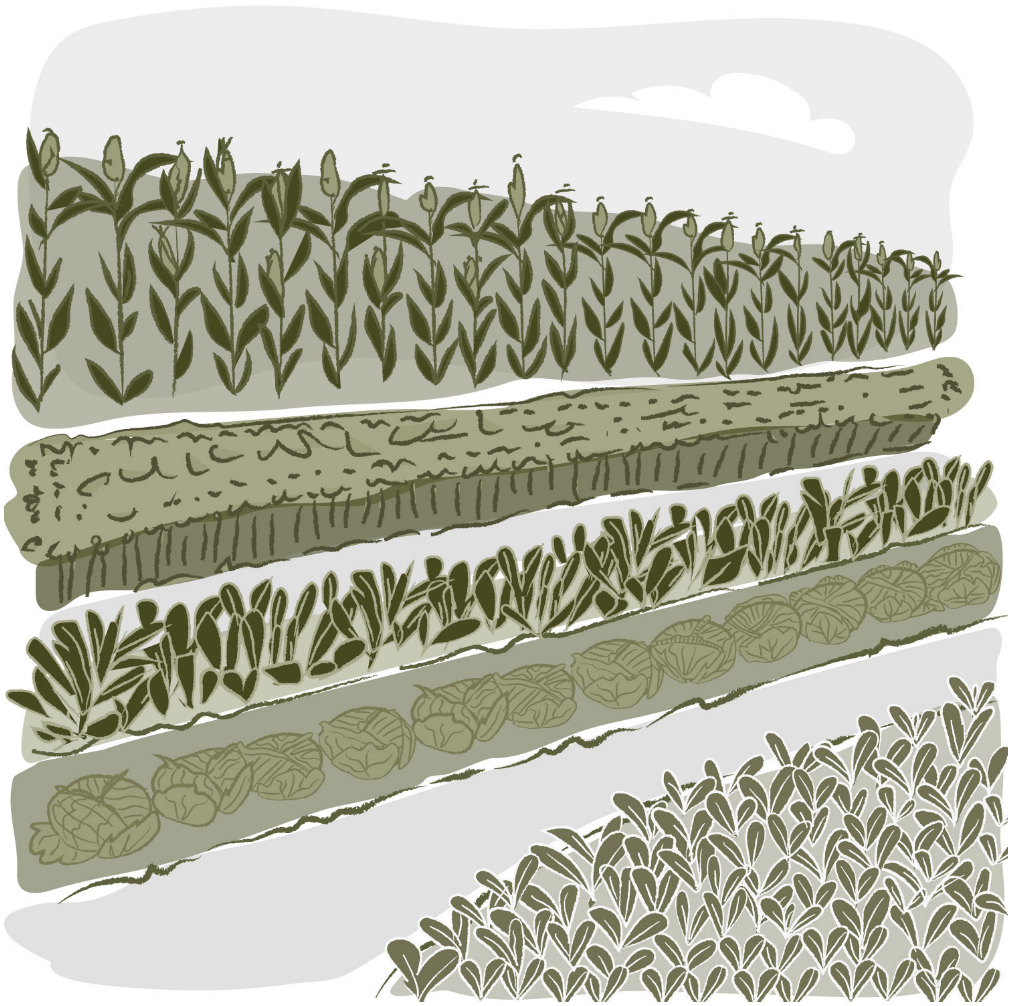
- The top layer of soil is less disrupted, which allows more carbon to remain underground.
- Rotation builds resilience to soil-bound disease and pests.
- Some crops demand a higher supply of artificial fertilizers to thrive. Diversifying the crop rotation plan may reduce that need.
- Soil compaction decreases, because different crops are harvested in different ways with a variety of machinery.
- Soil water retention capacity improves – by growing crops that have a deep and dense root system, the size and number of pores in the soil increase.
- Biodiversity level improves – different types of crops attract different species.

2. USE YOUR OWN SEEDS

Plants use a complex mechanism to protect themselves against external threats. This complex mechanism involves the production of metabolites. Regenerative agriculture increases the concentration of metabolites in the plants. This means that their natural resilience is greater than conventionally grown products. By always using a small part of your own harvest as seeds for the next crop, the concentration of metabolites will increase repeatedly, and plants will become stronger and stronger.

Benefits:

- Use your own seed mix as a starting material to reduce the need for external inputs.
- It will also increase the resistance of soil and crops to pests and diseases.



3. INCREASE CROP DIVERSITY

Crop diversity is the foundation for agriculture, enabling it to evolve and adapt to meet the challenge of food production. Intensive agriculture encourages the use of the same crops globally. Increasing crop diversity means encouraging smaller farmers to select and grow the crops they need to suit their geographic area, soil type, diet, culture, market and socio-economic environment. Each plant has its specific properties – differences in rooting system, seasonality, nitrogen fixation and production of organic matter.

Benefits:

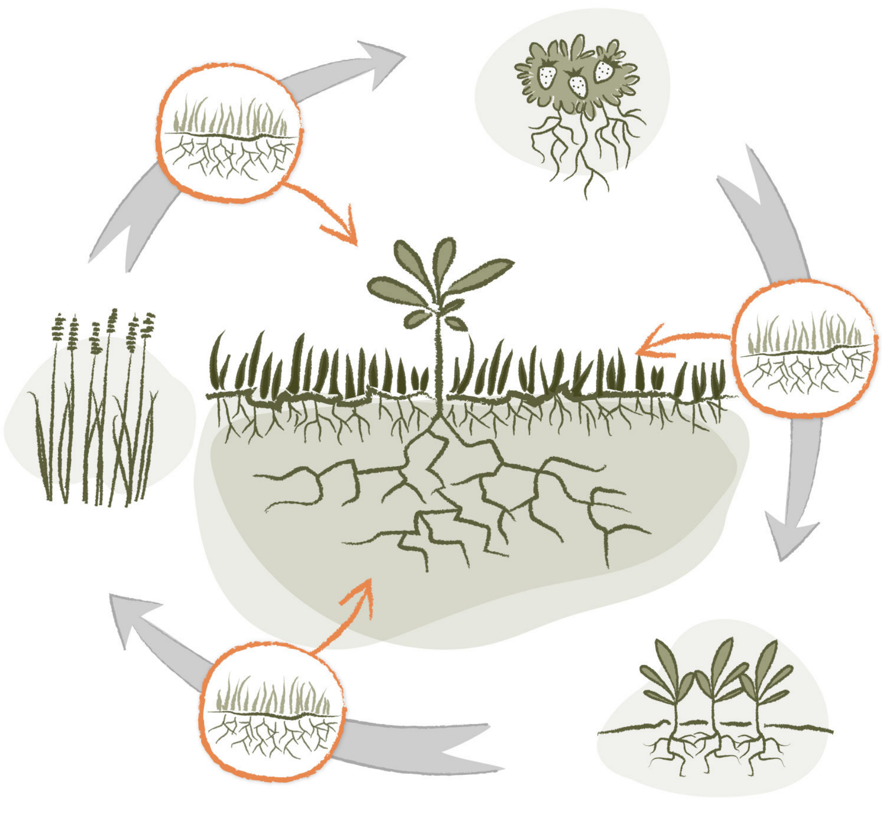
- Crops become more resistant to pests and disease.
- The crop variety creates a welcoming environment for above-ground and below-ground biodiversity.
- The soil's water retention capacity is improved.
- By choosing crops with different rooting depths, the soil structure is improved.
- The relationship between people, their food and their environment is deepened.

4. SELECT DEEP-ROOTING CROPS

The use of deep-rooting (or resting) crops in a crop rotation plan allows the soil to recover and regenerate in between crops that are more demanding for the soil. Crops with deep rooting systems have a positive effect on soil structure and provide good soil cover. This is beneficial for water infiltration, water holding capacity and also for retaining nutrients in winter. Some good deep-rooting crops are lucerne (also known as alfalfa), grass-clover and cereals, such as winter wheat.

Benefits:

- Deep-rooting crops contribute to SOM balance. After harvest, crop residues remain on the land and become a source of organic matter.
- Resting crops improve soil structure. Their deep root structure remains in the soil even after harvest, which improves oxygen level, water retention and biological life in the soil.
- Deep-rooting systems reduce the risk of erosion by diminishing leaching and indirect leaching of organic matter and nutrients.
- Resting crops reduce soil-bound diseases and pests, thereby increasing the resilience of all crops and lessening the need for external inputs, such as fertilizer.
- Resting crops create a welcoming habitat for biodiversity, especially foraging insects.



5. USE LEGUMINOUS CROPS

Leguminous plants have been used in agriculture for thousands of years. They fix nitrogen in the soil, which allows farmers to reduce the use of chemical fertilizers. Nitrogen fixation is the process that changes inert N into biologically useful NH. Legumes live in symbiosis with rhizobacteria, which absorb nitrogen from the atmosphere and convert it into nutrients. Examples of leguminous plants are lucerne, legumes and clovers.

Benefits:

- Leguminous plants draw nitrogen (N) from the air in a natural way. This reduces the need to add nitrogen as an external input.
- They create a welcoming habitat for foraging insects, which enhances biodiversity.
- Their root system reduces the risk of erosion and, thus, indirect leaching and leaching of organic matter and nutrients.

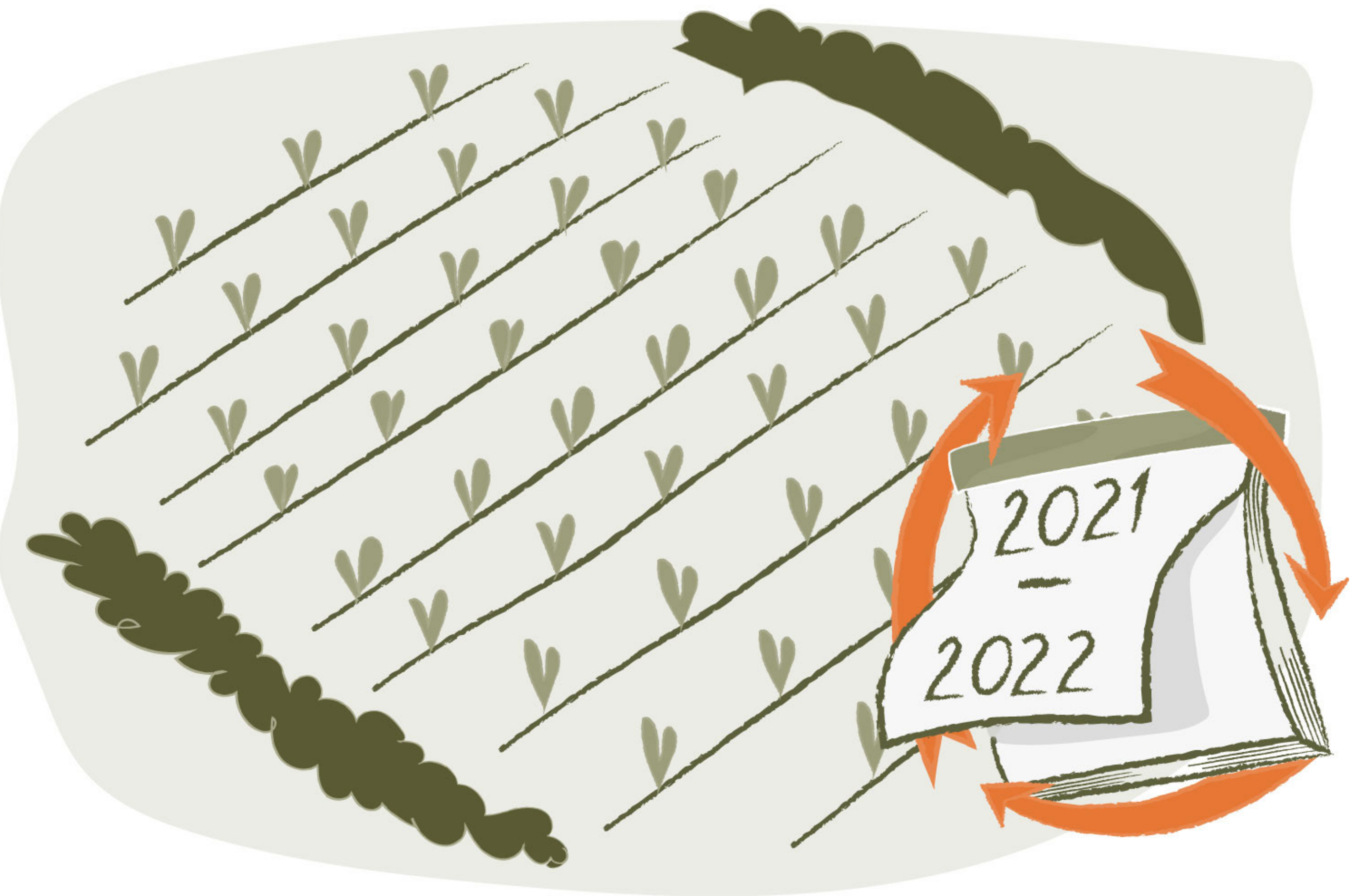
6. PLANT WINTER COVERS

Winter cover is when the soil is covered during the winter season with, for example, a cover crop (or its residues) to prevent erosion of the soil. The rooting system of the cover crop will hold the soil particles together for longer. Without a cover crop and its rooting system, external disturbances like rainfall, irrigation or melted snow will separate soil particles from one another. When water flows over the soil, it takes away organic matter, nutrients and even fertilizers that have just been applied. Fertilizers are not dissolved in the ground and are not fixed for plants to absorb, so all the farmer's effort are lost. It is important to note that a cover crop will protect soils from both runoffs (water flowing horizontally) and leaching (water flowing vertically and directly into water tables). Using only residues from cover crops will protect against runoffs, but leaching can still happen.

Another purpose of winter cover is to protect the soil against extreme temperature fluctuations. Large fluctuations in soil temperature can deteriorate and kill soil life. Above-ground biodiversity also benefits from more winter cover, because it provides much-needed shelter for small crawling organisms, insects, bees and birds.

Benefits:

- Winter covers help prevent erosion and, thus, indirect leaching and leaching of organic matter and nutrients.
- Covers promote the availability of habitat and foraging that enhance biodiversity.
- Cover crops ensures that the biological life in the soil is maintained so that it is active at full strength at the start of the growing season.
- Cover crops act as a temperature and water buffer to help level out large differences that can be detrimental to the soil surface balance. In turn, this improves water retention capacity.



7. PLANT PERENNIAL CROPS

Almost all the major food crops in the world, such as cereals and corn, are annual crops. They germinate, flower, bear fruit and are harvested within a season. The disadvantage is that they require a lot of attention in the form of nutrients, crop care and because they suffer an increased risk of erosion. This is much less of an issue with perennial crops. Perennial plants remain in place for more than a year on a field and successively play the role of intercrops and cover crops throughout the rotation. They also store larger amounts of carbon because they build larger root networks.

Benefits:

- The soil is not disturbed for several years (both from agricultural machines and with nutrients).
- Perennial crops' dense root system reduces/prevents erosion and soil compaction.
- Perennial crops' dense root system ensures that biological life is protected so that it can be active at full potential when the new season starts. It also improves habitat for foraging insects and enhances above ground biodiversity.

8. GEOGRAPHIC OPTIMISATION

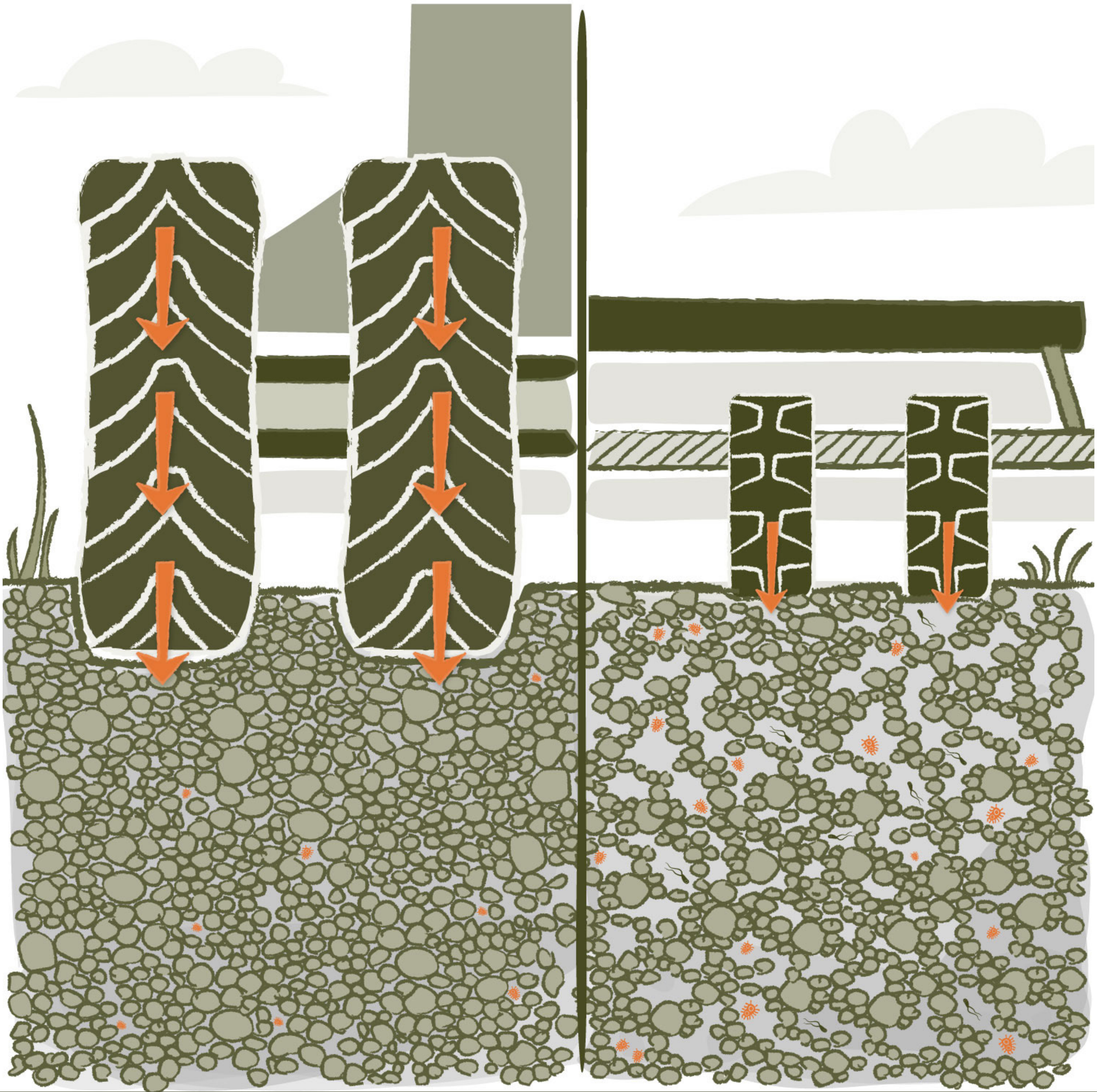
By making use of geographic optimization, land parcels are used more effectively and efficiently. Geographic optimization includes precision cultivation and fixed trail paths.

In precision cultivation, the soil and plants receive the treatment they need very precisely with the help of technology. GPS and sensor technology are used for this. The aim of precision cultivation is to keep external input to a minimum and to apply it only where it is needed.

In a fixed trail path system, the vehicle is driven over the smallest possible surface area with all necessary passes (tillage, sowing, crop care and harvesting) being driven year-round on the same paths. The objective of a fixed trail path is to minimize the soil load and to preserve soil structure. The soil is only loaded on the paths, and the rest of the cultivation surface doesn't bear any weight; therefore, you keep the soil structure as untouched as possible.

Benefits:

- The fixed trail system reduces and prevents soil compaction.
- Both practices reduce the need for external inputs.



9. USE LIGHTER TOOLS

In the last 50 years, agricultural equipment has become bigger and heavier, leading to soil compaction and erosion problems. Compaction leads to poor water absorption and poor aeration, which can stunt root growth of crops. Erosion can negate soil fertility and result in drought or flooding issues, hence the importance of a lighter touch to our soil.

Benefits:

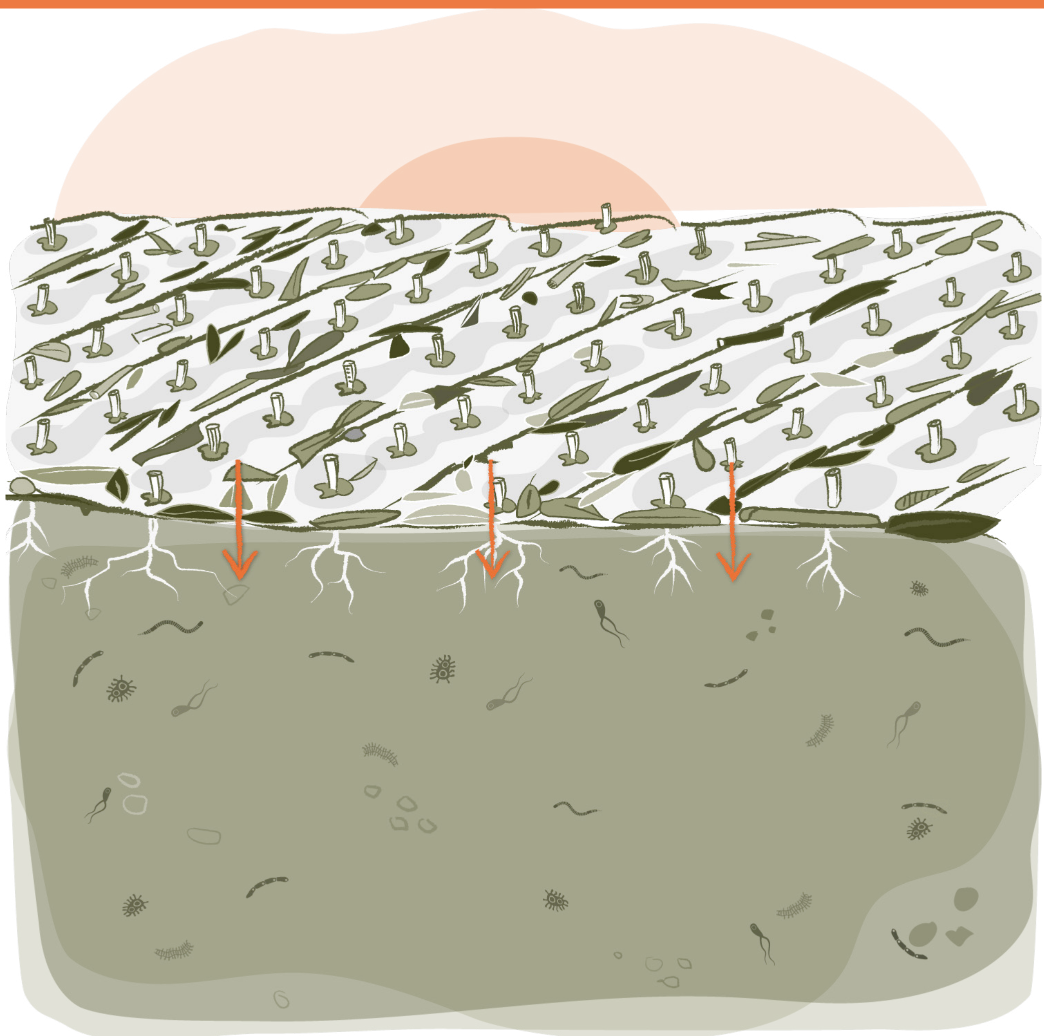
- Lighter machinery prevents further soil compaction.
- Lighter machinery may improve the soil structure and soil health by allowing greater oxygenation (because the pores remain wide).

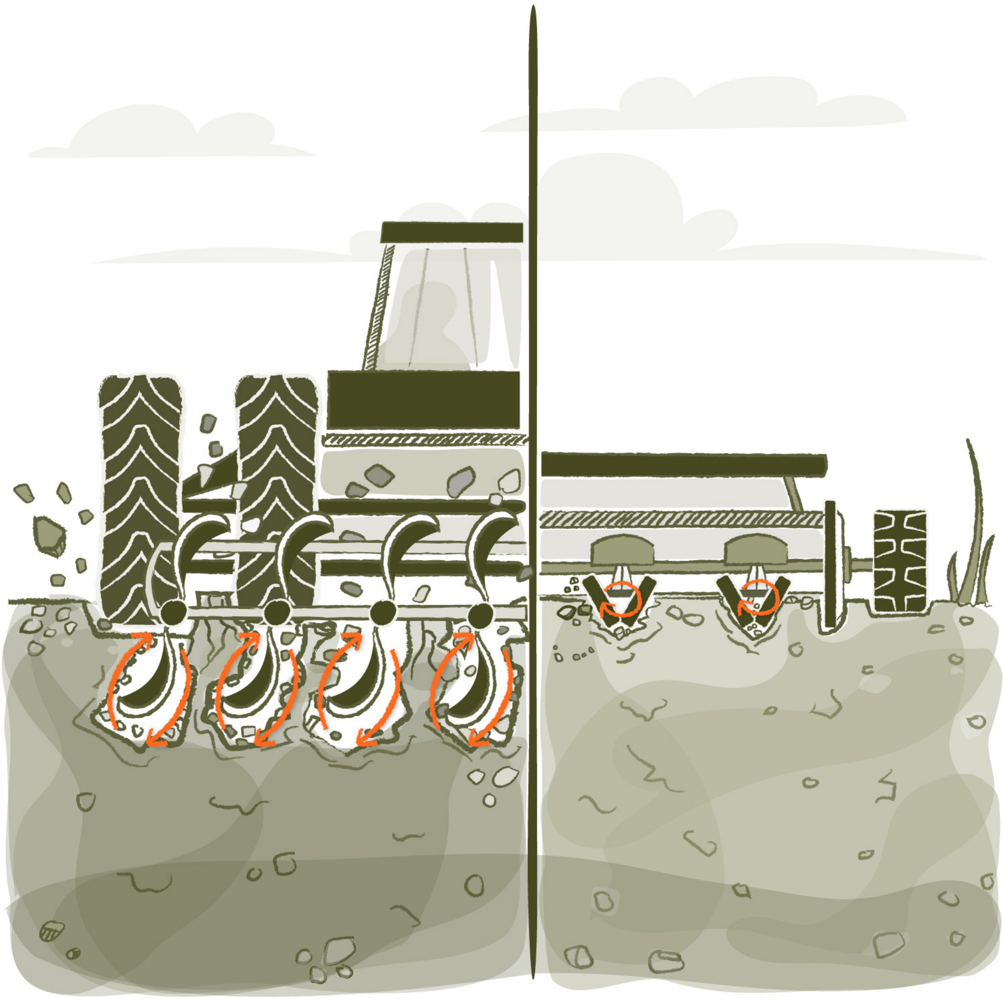
10. INCORPORATE STRAWS AND CROP RESIDUES

Leaving crop and straw residues on the fields will let soil microorganisms "digest" and incorporate these residues in the top layer of the soil. The incorporation of crop residues contributes to building organic matter in the soil. More organic matter means that nutrients are better retained and available for the next harvest.

Benefits:

- Incorporating straw and crop residues contributes to better organic matter balance in the soil. After harvest, crop residues remain on the land as a source of organic matter for soil microorganisms to digest. Note: Only use shallow tillage or no till when executing this practice.
- Because residues build SOM, the water retention capacity improves.
- Biodiversity levels rise as soil microorganisms feast on the crop residue.





11. EMPLOY SHALLOW TILLAGE OR NO TILL

Shallow tillage cuts through the soil no deeper than 10-12 cm; plus, there is no turnover of the soil. As a result, biological life in the soil is minimally disrupted: root and worm channels are maintained, and more CO_2 remains captured underground. Meanwhile, in ploughing/regular tillage, the soil is worked as deep as 40 cm, and soil life is thrown upside down.

Benefits:

- The physical, chemical and biological balance of the soil remains intact.
- Little to no SOM is lost from the soil in the form of CO_2 release, and the organic matter content can build up to the maximum.
- Because SOM content increases, soil's water retention capacity and soil structure improve (Refer to our earlier discussion on Why Use Regenerative Farming for more information about the positive effects of SOM on water retention capacity and soil structure).

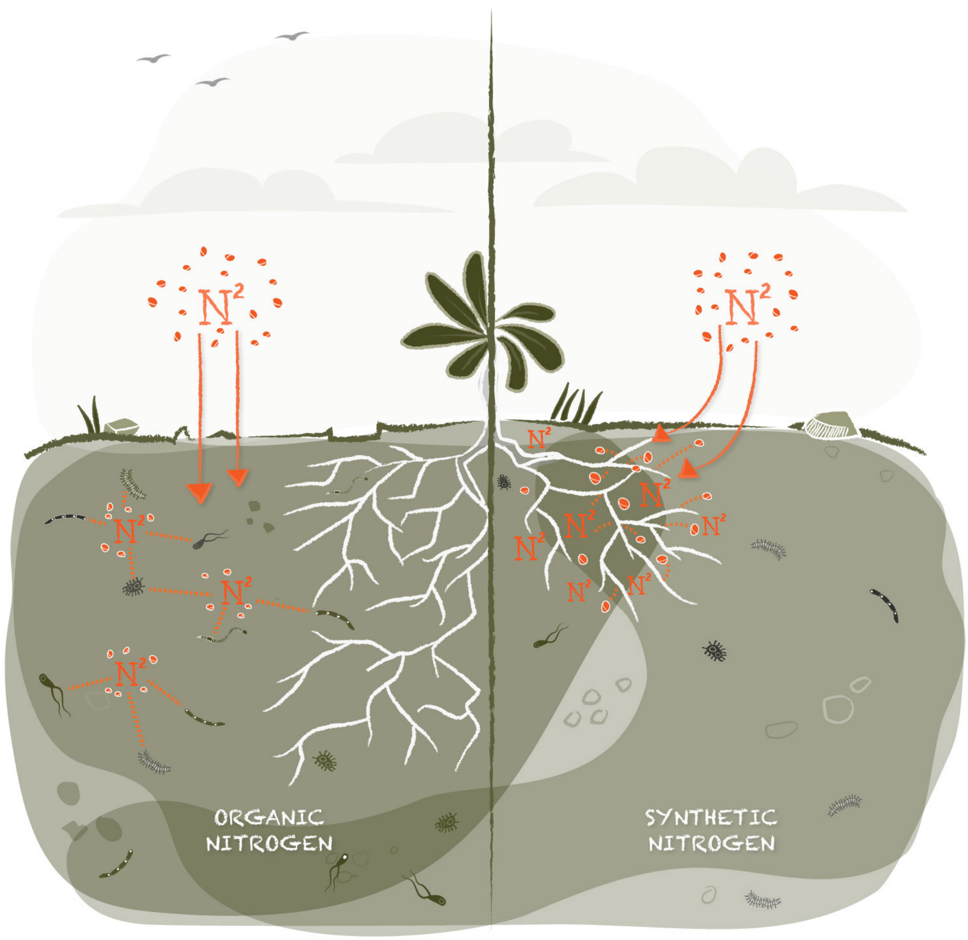
12. PHASE OUT ARTIFICIAL FERTILIZER, ESPECIALLY NITROGEN (N)

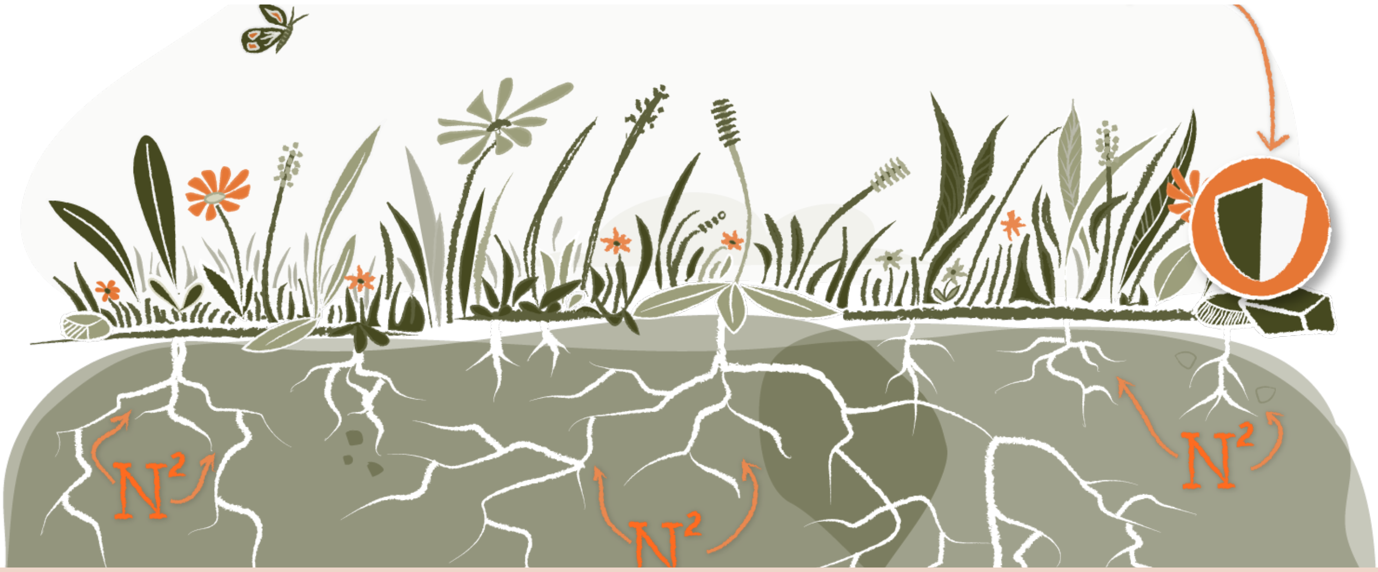
Plants can absorb minerals in only limited quantities. Organic fertilizers, such as compost, retain this surplus of minerals and release them little by little over a longer period of time. The minerals are balanced, and the risk of over-fertilization disappears.

The use of artificial fertilizers and especially nitrogen (N) should be kept to a minimum. Artificial N is a very salty substance that causes a great imbalance in the mutual cooperation of minerals and creates a “dependency” in crops (they won’t be able to fix nitrogen by themselves anymore). Too much nitrogen in the soil reduces the availability of other minerals. By making as much use as possible of natural N sources, plant needs can be met in a safe way. Unlike artificial N, natural N becomes available to the plant more slowly and can be better converted by biological life.

Benefits:

- A healthy mineral balance reduces the need for external artificial inputs.
- Soil biodiversity can thrive because it is not disturbed by artificial inputs.
- Because nitrogen is released slowly to plants, it prevents the risk of leaching.





13. USE COVER CROPS AS GREEN MANURE (NATURAL FERTILIZER)

A cover crop, such as alfalfa is sown on an agricultural plot in order to fertilize the soil for the following crop (mainly through the intake of nitrogen). This cover crop is sown between the seasons of cash crops (usually between two highly demanding nitrogen crops) or in combination with the previous crop. Unlike a cash crop, a cover crop is not often grown to be sold.

Cover crops support improvement of the soil structure with their root system and need a relatively small supply of stable organic matter. The decomposition of the cover crop by soil's microorganisms' releases nitrogen and SOM for the following cash crop.

Benefits:

- The SOM content increases.
- The water retention capacity improves.
- The soil structure improves. Choosing a mix of crops with different rooting depths ensures maximum soil structure restoration.
- The need for artificial fertilizers, such as nitrogen, decreases, since some cover crops (especially legumes) draw nitrogen and other nutrients from the air to the soil in a natural way. It is possible to substitute (at least partially) conventional inputs of synthetic nitrogen fertilizer with legume seeding as an intercrop.
- By maintaining a dense rooting system, the soil is protected against negative impacts of rain and wind (compaction, dispersion, leaching and erosion).
- A cover crop works as a temperature and water buffer. It levels out large differences in temperature that are detrimental to maintaining the soil surface balance.
- A cover crop boosts the habitat for insects, bees and birds during the winter when natural vegetation is less abundant, which improves pollination and, thus, plant reproduction.

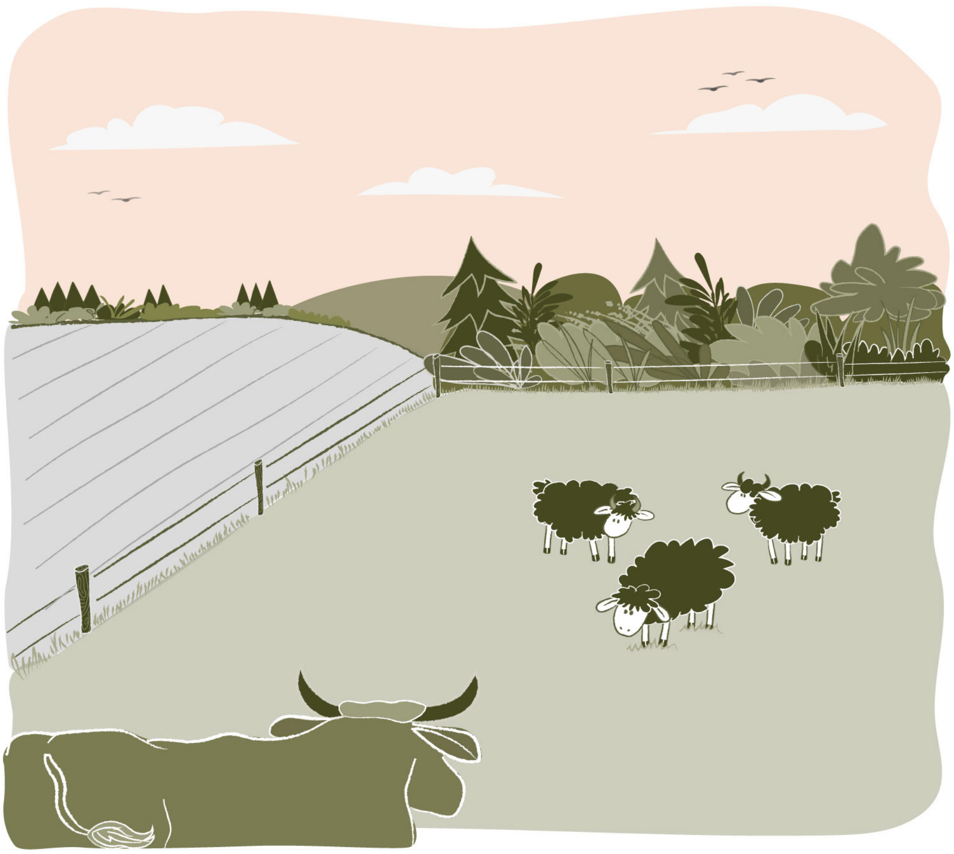
14. MOB GRAZING

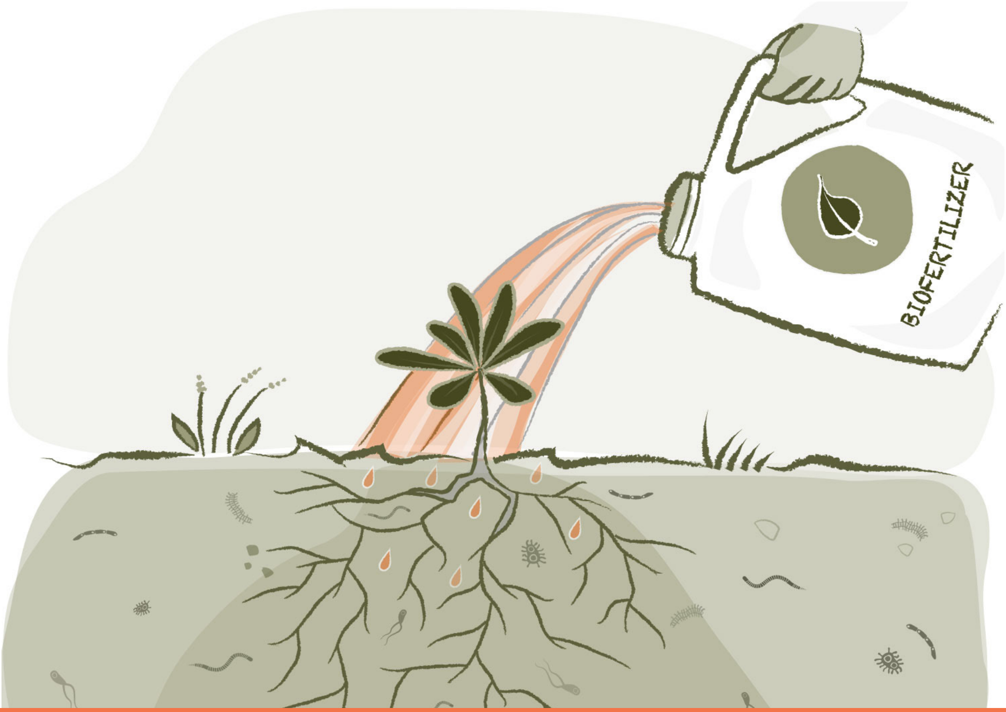
Animals are an integral part of a healthy, balanced ecosystem. As a result of specialisation in agriculture, there has been a split between livestock farming and arable farming, which has resulted in a loss of the dynamics between minerals, organic matter and soil biodiversity. The (re)introduction of grazing animals is often described as one of the most efficient regenerative practices. Grazing animals act as living "compost makers" because they mulch straw and crop residues into the soil when they walk, and the manure they produce is a source of organic matter, minerals and a great diversity of fungi and bacteria.

Mob grazing (sometimes called holistic planned grazing or tall grass grazing) is short duration, high-insensity grazing with a longer than usual grass recovery period. According to mob grazing expert Tom Chapman from East Hall Farm, the ideal is to move a large group of cattle on average once a day and to leave the grass to recover between 40 and 100 days.

Benefits:

- Animals grazing on the fields reduce the need for external inputs.
- Animals mulch crop residues in a natural way. Farmers no longer need to use machinery to do so, which reduces the pressure on soils and the risk of soil compaction.
- Soils have a better water retention capacity.
- It promotes soil biodiversity.





15. USE BIOFERTILIZERS

Biofertilizer is a mixture in which micronutrients from natural sources are dissolved in a liquid base (most often dechlorinated water). During the fermentation process (about 6 weeks), microelements (which enhance fertilization) and amino acids (which enhance resilience) are created. You can then filter the mixture and obtain a liquid that you can spray on the fields.

Biofertilizer brings nutrients to plants and soil microorganisms. It is used to increase the resilience or growth of seeds and plants and to promote the development of soil biology. It increases nitrogen fixing and the availability of phosphate and boosts the development of plants through photosynthesis.

On our Experience Farm, we are currently experimenting with 10 different recipes for homemade biofertilizer. The goal is to determine which ones score best in terms of microelements and amino acids and which ones require the most efforts to brew.

Benefits:

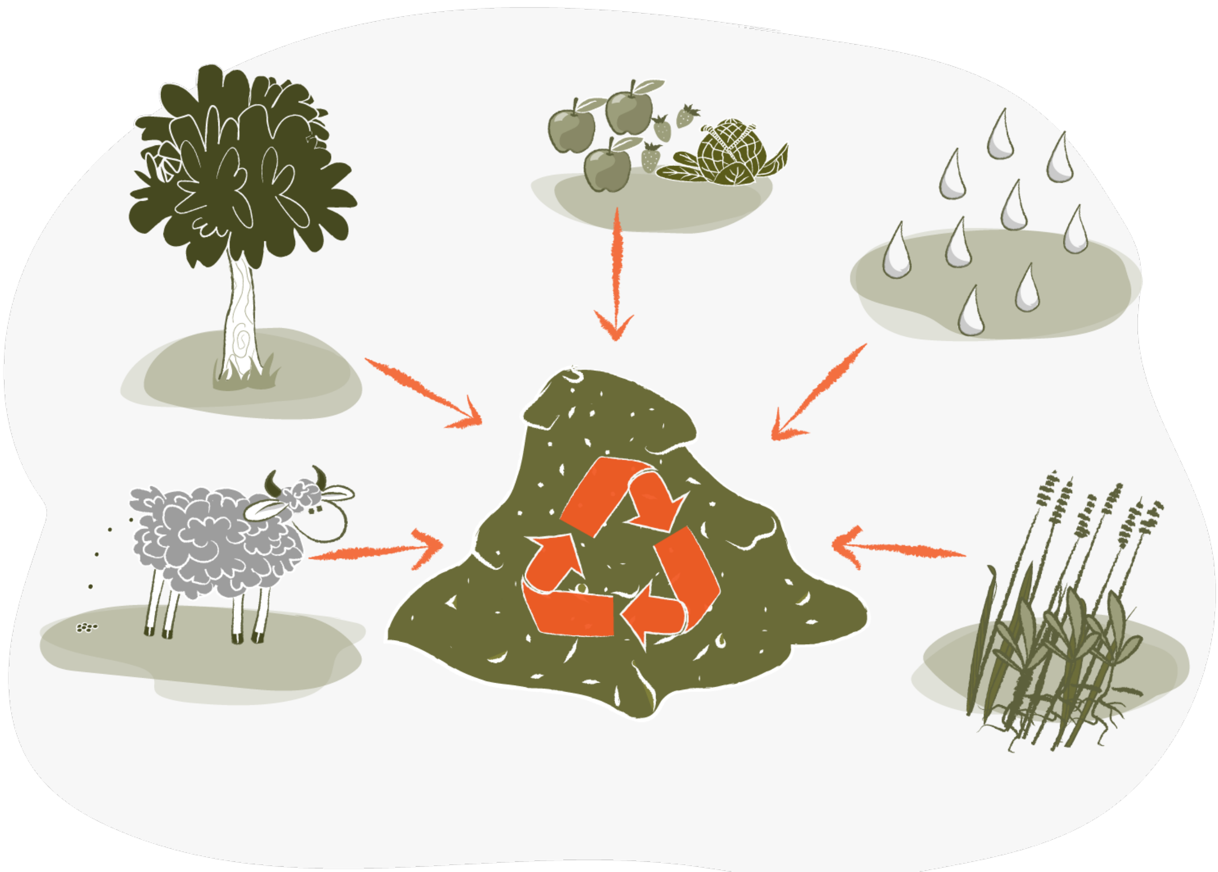
- Biofertilizer will increase nitrogen fixing in a natural way.
- Biofertilizer promotes interactions between fungi (mycorrhiza) and bacteria (rhizosphere) and between nutrients and the root system of plants in the soil.
- Plants become more resilient to both droughts and diseases.
- Biofertilizer can partially replace other external inputs, as well as make up for the lack of grazing animals on a farm.
- Biofertilizer accelerates the recovery of biological soil life.

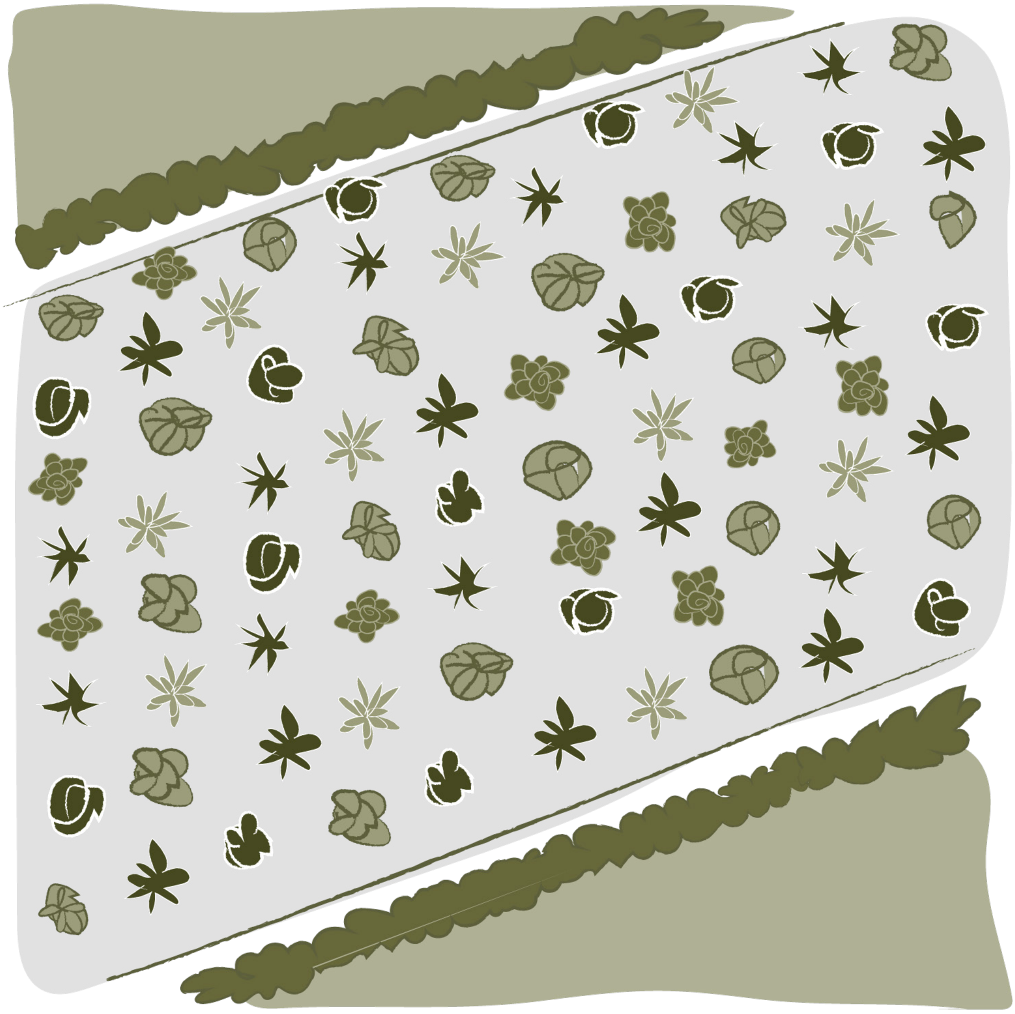
16. USE SOLID MANURE/GREEN COMPOST

Fertilizing components directly or indirectly produced by living organisms (manure or compost) will supply organic matter to the soil in a natural way and boost crop development and soil fertility. This is important for a stable soil structure, a healthy and active soil life that ensures the release of nutrients and good permeability to water and air. Organic matter has a direct influence on the soil structure because it binds soil particles together. This creates a crumb structure that is less sensitive to compaction, absorbs moisture better, drains well (infiltration), can be rooted well and is workable.

Benefits:

- Using solid manure and green compost is a way of increasing the organic matter content of the soil in a natural way. Organic matter will bind soil particles together for longer.
- Because they stimulate soil life, solid manure and compost help create larger pores in the soil.
- With bigger pores and the aggregate effect (soil particles binding together), the water retention capacity improves. Organic matter can hold up to 20 times its weight in water.
- Solid manure and green compost can partially replace the addition of external inputs.





17. MIX CROPS (2 CROPS)

The practice of planting one massive crop, such as soy, has made the agricultural system vulnerable because of the depletion of vital soil nutrients. It takes one pest or fungus, and the entire plot may be affected if action is not taken quickly. A crop mix combines two different plant species on the same plot to facilitate good soil and reinforce each other

Benefits:

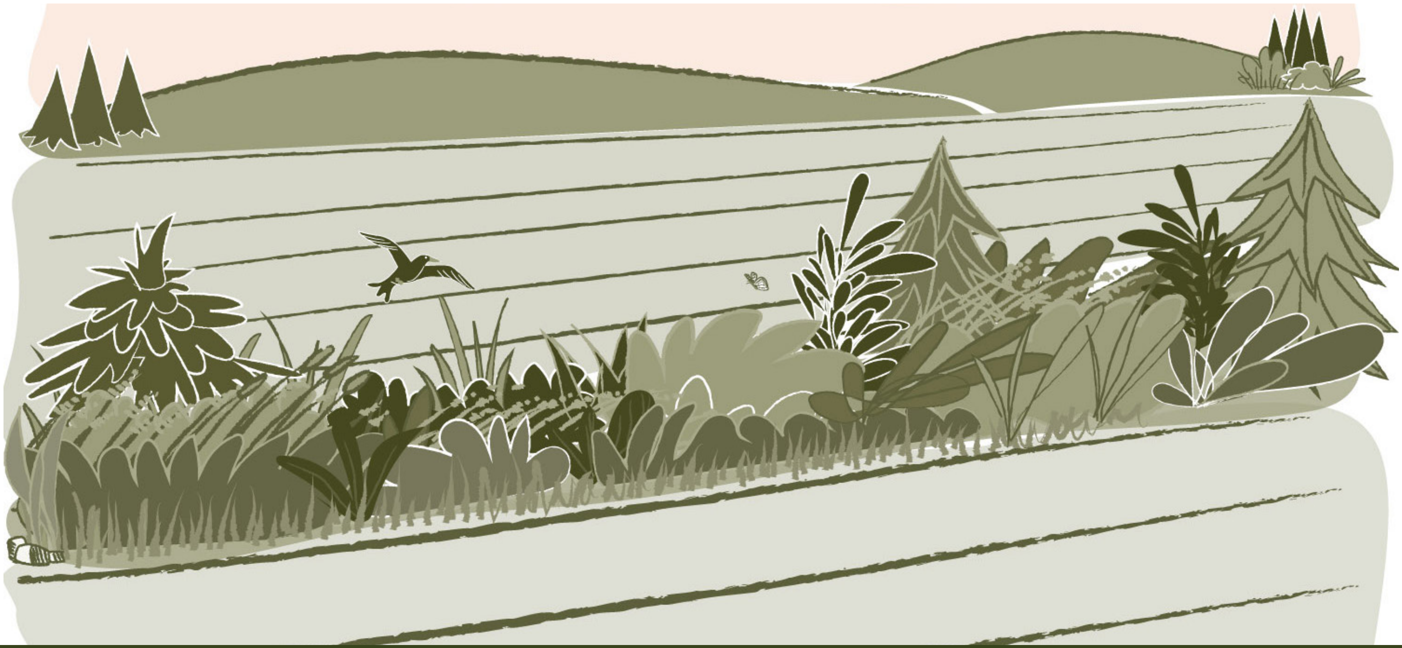
- Crop mixes don't need as much external inputs because they supply nutrients to each other.
- Crops become more resistant to pests and diseases because they help protect each other.
- If chosen well, crops can enhance above ground biodiversity by providing different types of habitat to different species.
- The rooting system will be denser and improve the water retention capacity.
- Different rooting systems will also improve soil structure and reduce erosion.

18. INSTALL CULTIVATION STRIPS AND AGROFORESTRY (> 2 CROPS)

The implementation of strip cultivation (see picture below) and/or agroforestry techniques (in which woody plants, fruit-, nut-bearing trees and other trees are also integrated) can make the agricultural system more resilient to diseases, pests and external weather conditions. The more diverse the plantings, the stronger the agricultural system.

Benefits:

- It reduced the need for external inputs like herbicides and pesticides.
- Different heights and rooting systems provide a varied habitat for many species, which enhances the biodiversity ecosystem.
- The rooting system will be denser and improve the water retention capacity.
- Different rooting systems will also improve soil structure and reduce erosion and thus indirect leaching and leaching of organic matter and nutrients.



19. IMPLEMENT FIELD MARGINS AND BIODIVERSITY LANES

Field margins are the areas between the crop and the field boundary, and, in most cases, they are adjacent to hedgerows (In the case of our Experience Farm, they are adjacent to canals and ditches). The field margin is often neglected. The tendency to maximize land use has led to minimal or non-existent field margins, allowing the crop to grow directly adjacent to the hedgerow border. However, having a wide field margin will provide multiple benefits of food and shelter for biodiversity.

Creating a field margin means leaving space between the crop and the adjacent habitat (usually a hedgerow) and planting flowers or grass-herbs instead. It contributes to natural pest regulation and increases pollination by bees, spiders, beetles, hoverflies, parasitic wasps and lacewings.

Biodiversity lanes follow the same principle, but they are located between two fields or within a field.

Benefits:

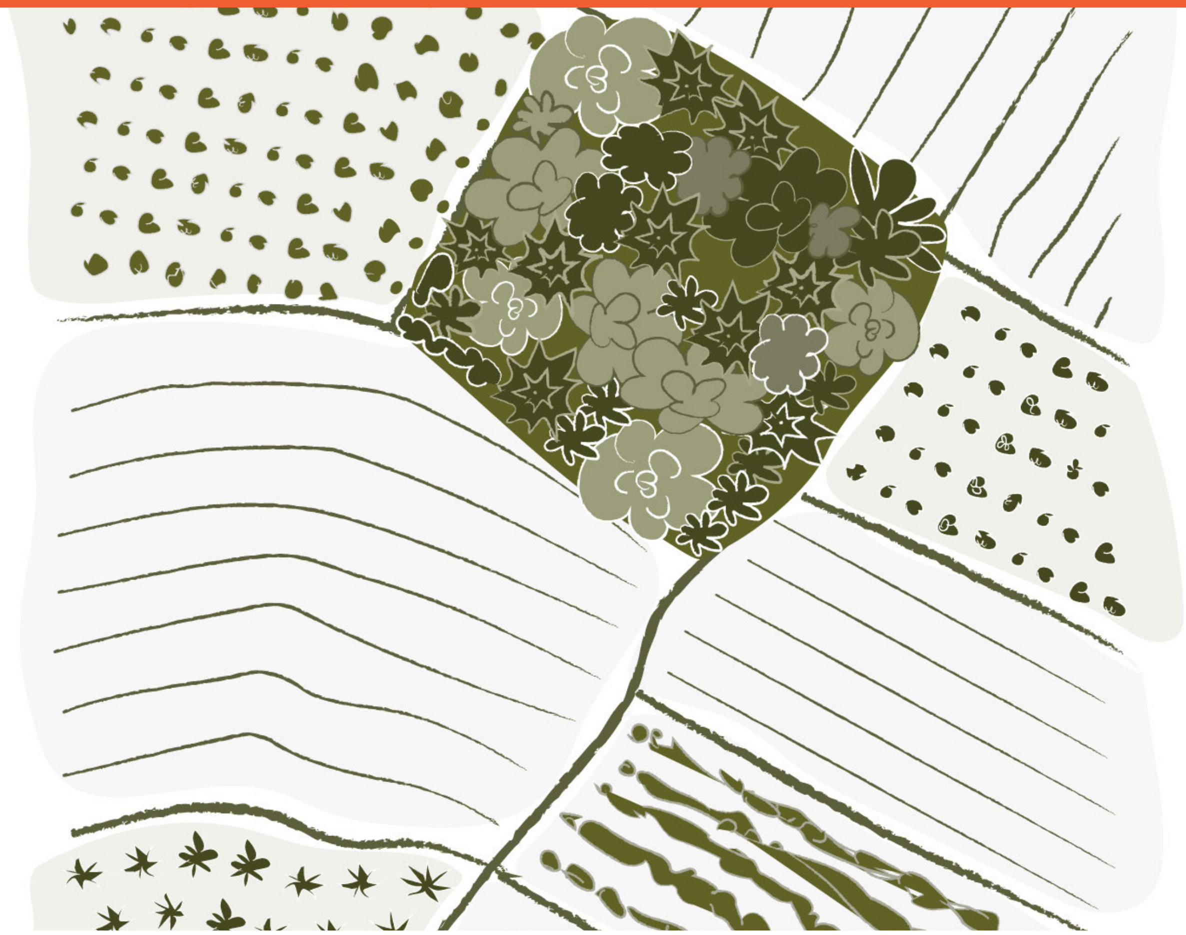
- Pest regulation happens naturally because field margins and biodiversity lanes become habitat for predator species like birds and bats.
- Pollination increases because the field margins become habitats for foraging species. Combined with the cultivation of leguminous plants, the improvement in pollination can be up to 30% higher than plots without field margins.
- The need for external inputs decreases, because crop resilience increases.
- Soil diversity improves due to the above enhancements.

20. INSTALL RUGGED VEGETATION/ STEPPINGSTONES

Steppingstones are large surfaces of land (> 0.5 ha) decorated with woody landscape elements (bushes and solitary tree stands) that have a positive impact on natural pest regulation and natural pollination by bees. They also provide cover and nesting opportunities for birds, insects and small mammals. A dense network of steppingstones, together with the implementation of flower field margins will boost natural pest control. The value-added of the steppingstones compared to field margins is mainly that they create a more complex biodiversity ecosystem. They are present all year round.

Benefits:

- More robust natural elements can be integrated within the agricultural lands.
- Landscape elements further support natural pest regulation because they become habitat for predator species like birds and bats.
- Higher natural pollination occurs because the vegetation provides habitats for foraging species.
- Soil biodiversity improves.
- The need for external inputs decreases because crop resilience increases.

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