CLIMATE FARMERS

CARBON+

Common Practices for improving a farm's carbon balance

WHAT TYPE OF PRACTICES ARE RELEVANT IN THE CARBON+ PROGRAM?

Within Carbon+, farming practices are classified into three categories:

1. CARBON SEQUESTRATION PRACTICES

Agricultural practices that are **directly related to sequestering carbon in the soil and trees**, such as a changes in ground cover, residues management or grazing.

Those practices will have **the biggest impact** on C+ credits calculations.

2. PRACTICES RELATED TO THE GREENHOUSE GAS BALANCE

These are **on-farm activities** that **reduce (or increase) emissions of greenhouse gases** and hence impact a farm's total carbon balance.

Emissions from **Carbon Dioxide** (CO_2)**, Nitrous oxide** (N_2O) and **Methane** (CH_4) are considered.

Examples are changes in livestock numbers (related to cattle methane emissions), reductions of fossil fuel usage (agricultural machinery) or changes in manure deposition.

3. OTHER PRACTICES (CO-BENEFITS)

Those are agricultural practices or **on-farm activities** that **are not directly linked to the Carbon balance** but will positively affect biodiversity, water management and general ecosystem health.

Understanding and implementing these practices is an important part of a holistic farm management and will help us sell your credits at a higher price.

TRANSITION EXAMPLE - OLIVE

Before / Conventionally managed

- Regular conventional tillage (high fuel usage)
- Bare soil / erosion
- Compaction / low water infiltration rates
- Regular application of herbicides
- Application of synthetic fertilizers
- Removal / burning of pruning residues

After / Regeneratively managed

- No -till and implementation of permanent ground cover (seeded or spontaneous)
- Increased organic matter & water infiltration / retention
- Application of organic inputs (compost, manure,..)
- Elimination of herbicides & synthetic fertilizer
- Shredding & integration of pruning residues into soil

TRANSITION EXAMPLE - EXTENSIVE LIVESTOCK

Before / Conventionally managed

- large parcels
- rotations every few weeks or months
- bringing in external feed to cover lack of pasture
- constant over/undergrazing of land
- selective grazing (not using all available plants)

After / Regeneratively managed

- smaller parcels - using electric fencing
- rotations every few days
- allowing long rest periods between grazing
- concentrated animal impact (trampling & manure)
- increased productivity of pastures - slowly reducing external feed

TRANSITION EXAMPLE - ARABLE CROPS

Before / Conventionally managed:

- regular conventional / deep tilling
- high usage of synthetic inputs
- high usage of herbicides
- leaving traditional fallow - bare soil
- monocultures - lack of rotations

After / Regeneratively managed

- reduction or elimination of tillage:
- replacing bare fallow with seeded cover crops
- replacing synthetic inputs with organic matter (manure, compost,..)
- improve rotations with diverse & nitrogen-fixing crops
- leaving more crop residues on the field
- integration of grazing / animals on the fields
- biodiversity strips or trees on field borders

COVER CROPS | GROUND COVER

Definition

Cover crops as practice in arable crops, refers to sowing plant species whose use is intended primarily **to improve the physical, chemical, and biological characteristics of the soil** and it can be implemented before, during or after a cash crop. Cover crops can be grazed, harvested, incorporated into the soil, or left as residue after cutting or crimping.

In tree crops it refers to implementing a seeded or spontaneous vegetation cover that can be permanent or during a few months of the year (e.g. integrated into the soil as green manure in spring) and cover the soil either fully or partially (e.g. with vegetation strips between tree rows). Seed mixes of native local species are preferred to increase success probability.

Benefits

Implementing cover crops or ground cover **keeps the soil covered and living roots for longer periods**: it can help prevent soil erosion, improve soil structure, regulate moisture, attract pollinators, assist in weed and pest management, serve as mulch and as a source of green manure and organic matter, and are used for grazing or forage. Depending on the types of cover crops, they add or uptake nitrogen. **Leaving residues of your cover crops in the field will be very beneficial for soil organic carbon sequestration.**

REGENERATIVE GRAZING

Definition

Regenerative grazing (also known as Adaptive Multi-Paddock or holistic grazing) refers to a grazing technique **that utilizes short-duration rotational grazing at high stocking densities** between long periods of forage rest. The system cannot be standardized but moves the animals in response to considerations such as animal needs, local available natural resources and the recovery needs of pasture. The system **mimics the natural pattern of dense herds of wild ruminants** moved frequently by the forces of predation and food availability.

A grazing chart is used to plan, record, monitor and adapt accordingly.

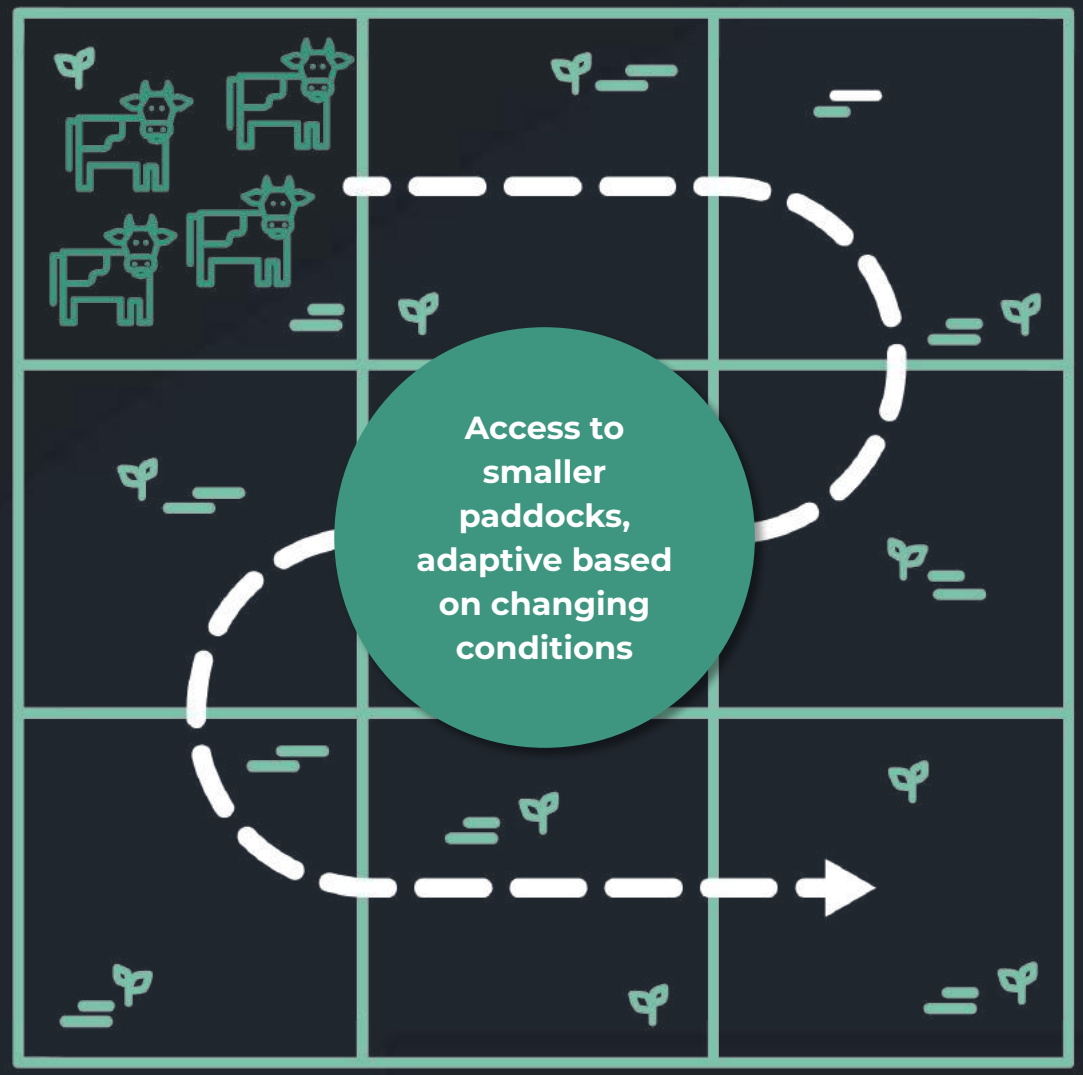
Benefits

Several research studies have documented the potential for AMP grazing methods to build soil organic matter, soil carbon, and **improve overall soil health**, including improvements to soil texture, reduced erosion and better water infiltration and retention.

In Carbon+, a result to indicate the successful implementation of this practice is a measurable increase of forage quantities (amount of biomass produced). Hence, regenerative grazing can **improve the profitability and resilience** of the business due to decreased dependency on external inputs and a general improvement of animal welfare.

Unplanned Grazing

Regenerative Grazing



RESIDUE MANAGEMENT

Definition

This refers mainly **to leaving organic materials in an agricultural field after the crop has been harvested and/or grazed** and includes stalks, stubble, leaves and seed pods. The intention of this is to keep the soil surface covered, protect the soil against nutrient loss & erosion and to add organic matter to the soil.

Our model distinguishes between crop & leafy residues and woody residues such as for example pruning leftovers.

Benefits

Crop residues are important resources, not only as **sources of nutrients for succeeding crops** and hence agricultural productivity, but also for improved **soil carbon sequestration**. Two significant advantages of surface-residue management are increased organic matter near the soil surface and enhanced nutrient cycling and retention. Greater microbial biomass and activity near the soil surface acts as a reservoir for nutrients needed in crop production and increases structural stability for increased infiltration. It also allows water to infiltrate slower in the soil, increasing soil moisture.

APPLICATION OF ORGANIC MATTER — MANURE, COMPOST, STRAW / MULCH, HAY

Definition

This refers to the application of **hay** (including bale grazing for livestock), straw (as mulch), **manure** or **compost** directly to the soil in different types of land use e.g. arable crops or in tree orchards. If manure is brought in from outside the farm, this will lead to a significant reduction in carbon credits (external leakage).

Composting manure before applying it reduces the volume and produces a lighter, easier to handle, product. It can be stored until ready to use and the available fertilizer nutrients in compost are released at a slower rate than those available in raw manure.

Benefits

Adding organic matter in various forms to the soil can **improve several soil characteristic**s such as a general increase of soil organic matter, improved porosity, water infiltration rate and increased soil biological activity. It positively **impacts soil organic carbon accumulation** and can lead to increased productivity.

AGROFORESTRY

Definition

Agroforestry defines a land-use systems where **woody perennials** (trees, shrubs, bushes, etc.) are deliberately used on the same land-management units as agricultural crops or grasslands.
The selection of species of trees and shrubs are based on the available natural resources, local climate and topography, the desired positive landscape function outcome, the needs of wildlife and economic considerations.

A **planting map** is used to plan, record, monitor and adapt accordingly

Benefits

Implementing agroforestry can lead to a number of benefits for the farm such as **increased diversification and productivity** of the farm (timber food, biomass), the improvement of various soil characteristics (increase of organic matter, increase of porosity and water infiltration rate, nutrient cycling). Agroforestry systems can provide habitat for wildlife, improve erosion control and sequester carbon in soil and biomass.

It should be noted, however, that the biomass of newly planted trees (eligible for Carbon+) remains small within the duration of the Carbon+ contract. Therefore, **the impact of planted trees on total farm sequestered C is relatively minor**.

MINIMUM TILL | NO-TILL (DIRECT SEEDING)

Definition Minimum till
Soil disturbance through cultivation is only allowed either **up to 10cm deep** if in entirely, or when keeping at least 30% of the previous crop residues on the soil surface between crops. Subsoiling is allowed as long as using tines that do not cause destruction of soil structure and stratification.

Definition No-till | Direct seeding
No-till refers to **no soil disturbance** through tilling, plowing, disking, chiseling or any other kind of soil cultivation

For direct seeding, **seeds are directly deposited into untilled soil which has retained the previous crop residues**. Special no-till seeding equipment with discs (low disturbance) or narrow tine coulters (higher disturbance) open a narrow slot into the residue covered soil which is only wide enough to put the seeds into the ground and cover them with soil.

Benefits
Reduced tillage or no-till farming practices can help to keep soil structure intact, reduce compaction or the formation of hardpans, reduce erosion and increases soil biological activity. It can also help to increase the soil's organic matter and water-holding capacity.

REDUCTION OR ELIMINATION OF SYNTHETIC FERTILIZER

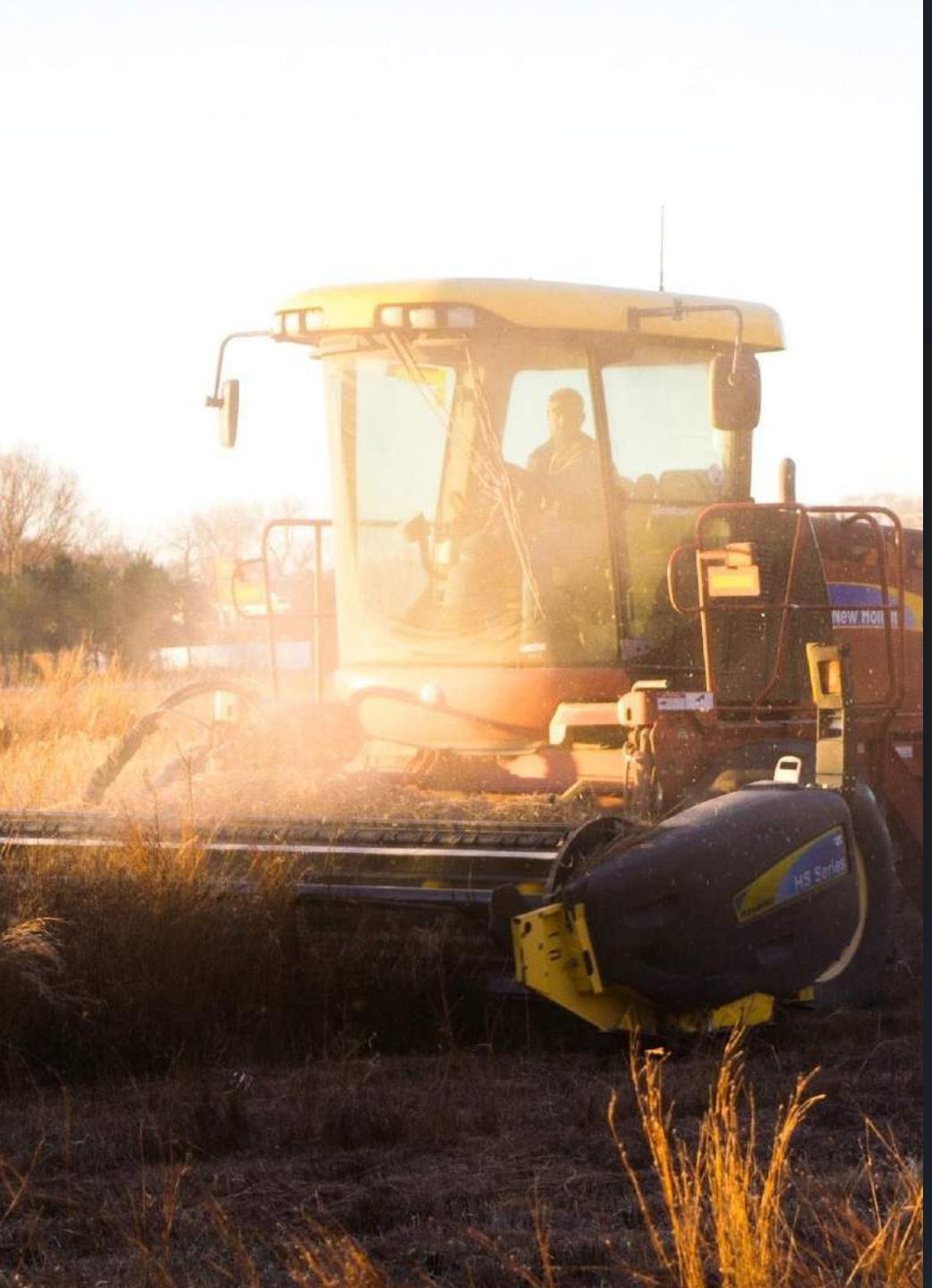
Definition

This refers to **reducing or completely stopping the application of synthetic fertilizers of any kind** in the farm, namely Nitrogen based ones. The only exception is the application of synthetic microelements occasionally after soil analysis finding a complete absence of them. Synthetic fertilizers are phased out and replaced with organic fertilizer and other inputs such as compost or manure.

Benefits

Reducing synthetic fertilizer leads to **a reduction of NO_2 (nitrous oxide)** emissions. It can reduce nitrates leaching and hence the negative environmental impact such as groundwater pollution.

It can furthermore **decrease farm expenses** and the farm's dependency on external inputs. Further benefits are improvements to general ecosystem health and biodiversity, therestoring of natural nutrient cycling over time and increased resilience of plants and agroecosystem.



REDUCTION OF FOSSIL FUEL USAGE

Definition

The farm's CO_2eq balance is calculated from both the removals (carbon sequestration) and reductions of other emission sources. This specific project activity refers to emissions due to use of CO_2 fossil fuels such as diesel or petrol. Relevant sources are **vehicles such as trucks, tractors, etc. and mechanical equipment** required for the land management. A change to new management practices such as no-till leads to a reduced fossil fuels usage.

Other activities can include the **implementation of renewable energy** sources such as solar panels on the farm.

Benefits

Reducing fossil fuel usage on the farm will improve your overall emissions balance and can significantly reduce farm expenses.

Other activities | Co-benefits

MULTI-SPECIES GRAZING

Definition

Multi-species grazing refers to the use of **at least 2 different species** between:

- grazing/browser ruminants (e..g. cows, sheep, goats,..)
- equids (e.g. horses)
- camelids (e.g. Llama)
- pastured pigs or fowls

The rotation of livestock is performed according to **optimized stocking density and grazing duration** per paddock. Grazing multiple species is the typical condition of grassland and savanna ecosystems.

Benefits

Benefits of grazing multiple species include **improved ecological resilience and pasture health**. Different animal species have different grazing habits and select various forages, pastures that are grazed with multiple species have more-uniform defoliation. This uniformity of grazing contributes greatly to **forage quality** and resilience by keeping forage growth constant. Multi-species grazing can also support the **reduction of parasite populations**, due to timing of grazing and the characteristics of the parasites that infect each species of livestock.

Other activities | Co-benefits

MANAGEMENT ACTIVITIES TO FOSTER BIODIVERSITY

Examples

- Creation of flower & biodiversity strips to attract pollinators
- Creation of habitat for birds, insects and other wildlife
- Introduction of apiculture / bee hives
- Stopping the application of insecticides
- Creation of ponds or water areas
- Creation & maintenance of hedge rows & trees
- Leaving unmown crops or grass to allow shelter for wildlife

Benefits

Benefits vary greatly but include positive impacts such as:

- **biological pest control** - presence of beneficial insects
- **improved pollination**
- **improved soil health and nutrient cycling.**

Other activities | Co-benefits

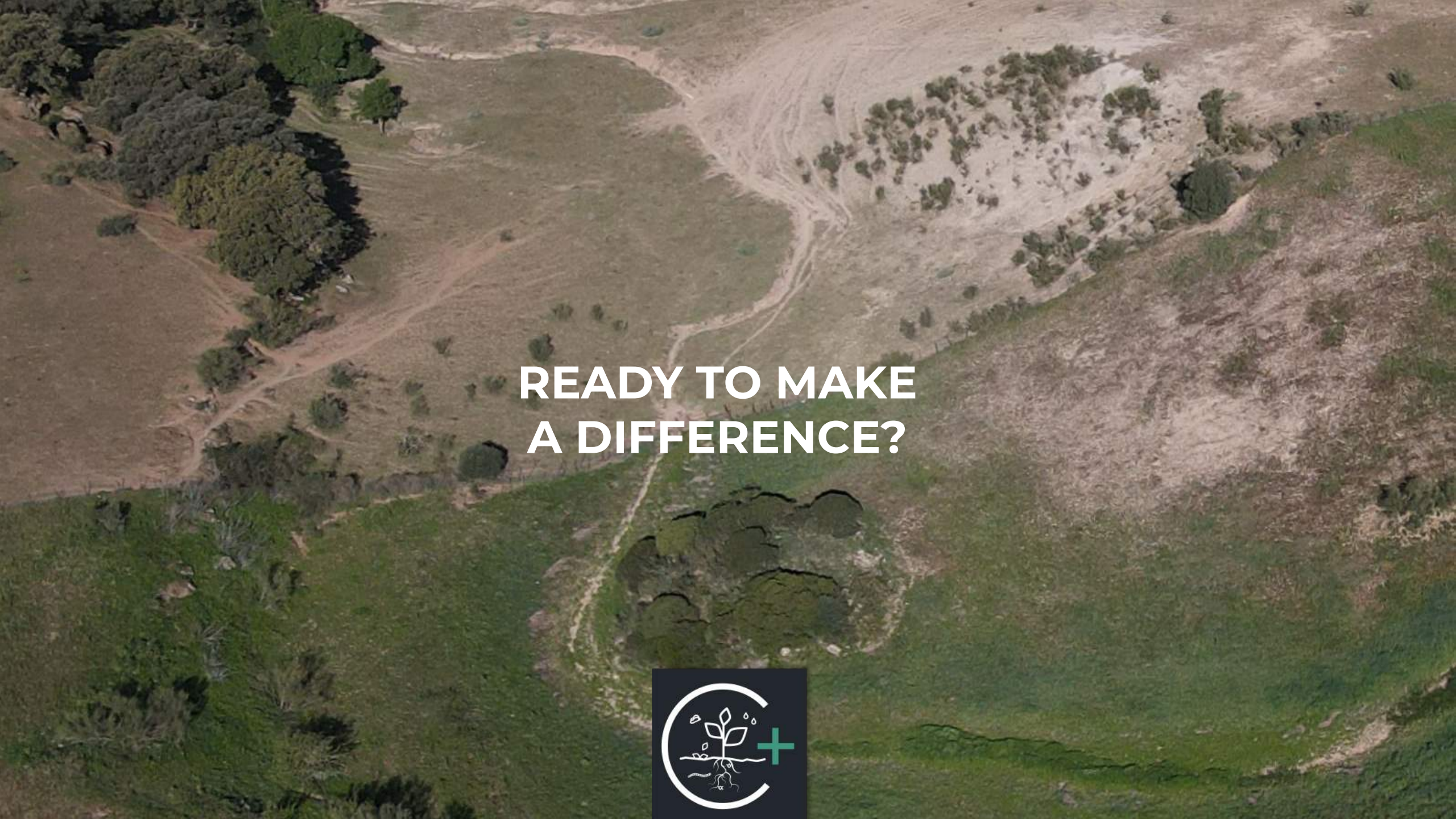
ACTIVITIES TO IMPROVE WATER MANAGEMENT & EROSION CONTROL

Examples

- Implementing keyline design in fields, pastures, orchards or vineyards
- Addition of ponds
- Creation of Swales
- Addition of windbreaks

Benefits

Water is becoming more and more scarce. **Using and harvesting this resource efficiently is key to success.** Next to this, water bodies on farms promote biodiversity hotspots. The use of key-line design, ponds, and swales can help retain and infiltrate rainwater on your farm.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A DIFFERENCE?