HOLISTIC RESOURCE MANAGEMENT FOR
CLIMATE RESILIENCE OF FARMING

Training Handbook - Summary

ClimateFarming

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Farming in a changing climate

- Agriculture has different roles in the context of climate change - as a **GHG emitter, a potential GHG sink** and **as an affected party**.
- Global warming today is observed above 1°C, and is expected to increase well over 1.5°C during the 21st century.
- Indiscriminate use of adverse agricultural practices like continuous monoculture and intensive tillage have contributed to **widespread land degradation**.
- Ongoing land degradation leads to the risk of exceeding the soil's capacity to overcome climate disturbances, such as drought and severe and frequent weather events.
- **Extreme weather situations** like extended periods of drought or heat or strong precipitation events will increase with climate change.
- Many farms are trapped in **dependencies on external inputs** like fertilizers and fuel. Agricultural soils often have been degraded over decades, an adjusted fertilization strategy can only follow after the management has slowly prepared a soil to function within its capabilities again.
- **Animal welfare issues** will be intensified by climate change.
- Farmers are under a lot of pressure to produce enough healthy food for all, at the same time as preserving healthy ecosystems, being subjected to market demands, land-use conflicts and changing environmental conditions.

Climate protection & climate adaptation

In this project, we use the terms **climate mitigation** and **climate protection** synonymously. They describe actions to reduce further climate change by reducing greenhouse gas emissions (and enhancing sinks).

Climate adaptation refers to the actions that are taken to adjust to the impacts of actual and expected climate change. This can be performed on many levels, e.g. through flood protection, drought-resistant crops, or government policies that help deal with climate impacts.

"**Adaptation and mitigation are complementary strategies for reducing and managing the risks of climate change** (IPCC AR6, 2023)".

Climate Change Management

At the farm-level, following terms are used:

- **Climate impact**: comprising climate hazards (e.g. new pests and diseases) as well as climate impacts (e.g. yield losses, higher veterinary costs etc.)
- **(Farm) Vulnerability**: The predisposition of a farm to be adversely affected by actual or projected changes in climate parameters
- **(Farm) Resilience**: The capacity of a farm to remain functional and achieve farm objectives across a spectrum of different changes and disturbances, including the ability to learn and adapt after shocks or in response to new knowledge.

Climate protection and adaptation to climate change are both necessary to tackle climate change. At the farm-level, both must be considered and related measures should be planned together to exploit synergies

Adaptation is the planning and implementation of measures that moderate negative impacts of climate change and take advantage of beneficial developments.

- Adaptation is supposed to enable a farm to **act preventively** (in order to reduce risks) and to **react flexible** in the face of abrupt and unforeseen climatic and non-climatic changes

Core challenge: Uncertainty concerning climate change and its impacts

- **Uncertainty must be integrated** in the adaptation process
- **Adaptation** must be considered **as a continuous process** based on observation, preparation and learning
- In the absence of adequate planning, adaptation measure can end up being maladaptive
    - **Maladaptation**: Negative consequences of adaptation decisions which hamper the adaptive capacity of a farm or entail negative external effects

It is difficult to determine the success of adaptation, as this depends on the temporal and spatial dimension of the observation. This entails that **no "one-size-fits-all" adaptation measures exist**

- At the farm level, the individual **farm objectives are decisive for verifying the success of adaptation measures.**

Successful climate adaptation is a challenging task and therefore requires a comprehensive approach to be effective and successful in the long run. The ClimateFarming project combines approaches and methods from adaptation management and regenerative agriculture in order to provide a comprehensive approach to enable successful farm level adaptation planning

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Regenerative agriculture

Regenerative agriculture is an unprotected term that has **many different understandings**, which makes it necessary to define it when used. As our understanding of **regenerative agriculture fits the requirements of transformative climate adaptation**, it is used as a conceptual framework within the ClimateFarming method.

The term *regenerative agriculture* was first coined in the 1980s but a sole origin is not clear. It came back into use around 2015 and shortly thereafter different stakeholder groups started to use the term, leading to misunderstandings, especially for consumers.

In our understanding, regenerative agriculture can be defined as "*an approach to agriculture that uses soil conservation as a starting point for regeneration and contribution to **multiple provisioning**, **regulating and supporting services**, with the aim that this improves not only the **environmental** but also the **social** and **economic dimensions** of sustainable food production (Schreefel et al. 2020)*", or as
*„an **ever-developing, complex,** and **context-dependent** agricultural approach aiming to restore and regenerate degraded land and **contribute to climate change adaptation** with mitigation co-benefits. In RA [regenerative agriculture], the soil is the entry point to **rethink food systems** with the aim of enhancing **biological, physical, chemical,** as well as **cultural ecosystem services** in response to ecological conditions and the climate crisis, on a local as well as a global level (Daverkosen and Holzknecht et al. 2022)*".

In this sense, regenerative agriculture also largely overlaps with concepts like permaculture, agroecology, organic agriculture, climate-smart agriculture or carbon farming. The promoted practices are often similar and could simply be considered *good agricultural practices*. While generally regenerative agriculture does not rule out synthetic inputs like fertilizers, pesticides or herbicides, many proponents argue for organic principles or strive to reduce the use of synthetic inputs to a minimum.

Soil health and soil carbon storage are seen as central in many definitions, and also comply with the goals of climate protection and adaptation. While scientifically it is controversial whether soil carbon can or should be quantified for carbon certificates, many certification systems have emerged in the last few years. These must be critically evaluated.

Climate protection and adaptation go hand in hand. While their starting points are different- protection aims to prevent further climate change, adaptation aims at adjusting to the change that is present or to come- their ultimate goal is the same: enabling a pleasant life for all in the light of climate change.

Some examples of practices and principles, that applied in an adequate context, may be regenerative, are listed in the table below:

Operational category	Practical measures

Management & planning	- Holistic Management - taking into account the farm context and regional conditions - Farm planning with a focus on water as a resource (Keyline-Scale of permanence) - Community-supported agriculture
Inputs & material flows	- Circular economy at farm and regional level - Use of compost - Compost tea - Biochar, Terra-Preta - Fermentation products - Woody biomass and fresh branch chippings - Targeted use of mycorrhiza - Soil analysis and fertilisation according to Albrecht/Kinsey
Overarching land use	- Increase plant diversity - Reduction of synthetic inputs (sprays and fertilisers) - Horse work - Agroforestry - Management pattern according to keyline design - Natural Sequence Farming - Rewilding
Arable and vegetable farming	- Wide crop rotations - Leave crop and root residues on the surface - Occasional ploughing, no-till farming, minimum tillage, direct seeding - Permanent soil cover: cover crops, undersowing, catch crops, mulch systems, green manures - Permanent living roots in the soil - Mixed crops - Use of perennial crops (e.g. perennial cereals) - Integration of animals in arable farming - Biointensive vegetable production ("market gardening")
Animal husbandry	- Essential element - Animals as shapers of ecosystems - Increasing the diversity of livestock - Holistic grazing management: adaptive rotational grazing management, mob grazing, holistic planned grazing - Pasture cropping

Table 1: *Overview of possible practical measures of a regenerative economy Structured according to possible fields of application within a farm (Own compilation and outline;. Sources: Brown 2018; Burgess et al. 2019; Fortier 2014; General Mills 2021; LaCanne and Lundgren 2018; Merfield 2019; Newton et al. 2020; Perkins 2019; Rodale Institute 2014; Savory and Butterfield 2017; Shephard 2013)*

Connecting: Regenerative agriculture and the ClimateFarming Cycle

Both the concept of Regenerative agriculture and climate adaptation have similar starting points and premises, e.g.

- acknowledging climate change as a complex challenge that must be met with proactive measures,
- valuing long-term impacts over short-term benefits,
- process-orientation, feedback loops and constant learning,
- demanding to step away from business as usual,

as well as similar needs:

- contextualisation and flexibility,
- multifunctionality

and similar goals:

- holistic and systematic approach,
- understanding interconnectedness.

Therefore, we see potential in applying the ClimateFarming Cycle, to translate climate adaptation principles to real-life farm conditions.

Theoretical Background: Methods and Foundation of the ClimateFarming Cycle

Strategic Farm Management (Barnard and Nix, 1979; Kay et al., 2016) is a cyclical process and consists of the phases of.

- Analysis (problem definition)
- Goal formulation
- Planning
- Implementation
- Monitoring, control and replanning (target-performance comparison)

In principle, this process can be compared to approaches dealing with adaptation planning (e.g. Adaptation Action Cycles; Park et al., (2012)), as essential elements are similar.

- It is an ongoing process of analysis, implementation, monitoring and reassessment. There is a focus on learning, adaptability and flexibility.

Strategic farm management needs to be complemented by DMDU (Decision-making Under Deep Uncertainty) approaches to deal with the problem of increasing uncertainty.

Decision-making Under Deep Uncertainty:

- Definition from U.S. Climate Resilience Toolkit (2023):
  "*Deep uncertainty occurs when decision makers and stakeholders do not know or cannot agree on how likely different future scenarios are.*
    - *If there's not an agreement or knowledge or confidence in these future scenarios.*
    - *When decision makers or stakeholders do not agree or do not know what consequences could result from their decisions."*
- Various approaches and methods exist that help decision-makers to make decisions in situations of deep uncertainty, comprised under "Decision-making under Deep Uncertainty (DMDU)" (Marchau et al., 2019)

The **Dynamic Adaptive Pathways Approach (DAPP)** provides the methodological basis for the climate farming cycle.

- DAPP is integrating uncertainty in the planning process via the ability of the plan to be modified over time with the availability of new knowledge or changed conditions (Marchau et al., 2019).

Additional Methods exist which can be integrated in the ClimateFarming Cycle in order to improve its results

- Additional Methods 1: TOWS-Analysis (Step 2)
- Additional Methods 2: SWOT-Analysis and Contingency-Measures (Step 4)
- Additional Methods 3: Adaptation Tipping Points and Opportunity Tipping Points (ATP and OTP)