

Water Management Guidebook

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01

Introduction



Purpose and Goals of the Guidebook

Water is an essential element in all farming systems (and ecosystems in general), the health and productivity of crops and animals, as well as the overall capacity for life above and below the ground. This guidebook is designed to offer a simple introduction on the vast topic of water management to help farmers across Europe to plan and implement effective water management strategies that enhance resilience in the face of climate change and ecosystem degradation. Whether dealing with droughts, floods, or soil and biodiversity loss, the strategies outlined here can assist you to assess your land, develop a tailored water management strategy, and implement practical techniques for capturing, storing, and utilizing water effectively.

The primary goal of this guidebook is to provide a broad overview and a step-by-step approach to holistic water management, ensuring that you can apply these methods regardless of farm size or system. By integrating both traditional and modern techniques, large land change projects and small scale interventions, we hope this resource will serve as a hands-on manual regardless of where you farm, your resources and budget, and what stage of your water management journey you're on.



The Importance of Water Management in All Types of Farming

Water availability directly affects all aspects of a farm business and ecosystem, regardless of what you grow, care for, or produce. Too often, water is either insufficient, leading to drought stress, or water concentration is excessive, causing erosion and inundation. Managing water effectively means designing systems that capture and store rainwater, improve soil moisture retention, and optimize its use in applications like irrigation, animal watering, sanitation, and post processing. It also means designing your system to be antifragile in the face of the inevitable weather extremes that are becoming more common each year. Ideally your water management strategy also reduces reliance on external inputs, such as groundwater extraction, artificial irrigation, and even the fuels that power these mechanisms, making your farm more self-sufficient and resilient.

Water management is not a one-size-fits-all approach. Each farm has unique water challenges and opportunities based on its landscape, climate, and agricultural practices. For example, an arable farm with heavy clay soils in northern Europe may struggle with waterlogged fields, while a dry vineyard in southern Europe could be threatened by seasonal drought. A farm along a major waterway might struggle with contaminated water ingress, while another faces depleting groundwater levels due to over extraction from their neighbors. Understanding the principles of landscape water retention, soil hydration, and runoff control will allow you to develop site and context specific solutions that balance water use and availability, ultimately leading to greater long-term productivity and ecological stability.



Overview of Challenges and Opportunities

European farmers face a range of water-related challenges. Some are climate related, but others come from contamination, insufficient infrastructure, regulations, rising prices, and irrigation restrictions, just to name a few. Climate change has exacerbated some of these issues, leading to more frequent droughts, heavier storms, and erratic seasonal shifts. Poor soil structure, erosion, and inefficient irrigation systems can make these problems worse, reducing the ability of farms to produce reliable yields. However, there are many opportunities in creating a holistic water management strategy and implementing appropriate techniques. Over time, you may be able to turn these challenges into a whole farm landscape that improves your water resilience.

A well-designed and maintained water management system not only addresses immediate challenges but also creates long-term benefits. By slowing and spreading water across the landscape, you can increase groundwater recharge, prevent topsoil loss, and create microclimates that support diverse plant and animal life. Additionally, integrating both traditional and modern water retention methods can improve farm profitability, reduce input costs, and contribute to regional water security.



Key Steps in Developing a Water Management Strategy

1.



Assess your farm's water needs, the landscape's current resources.

2.



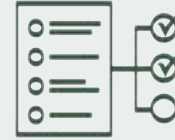
Identify opportunities, limitations, and risks.

3.



Select strategies based on your landscape, unique context, and farming goals.

4.



Plan and prepare for implement.
Consider small-scale interventions first and monitor results.

5.



Scale up solutions gradually based on careful observation and feedback.

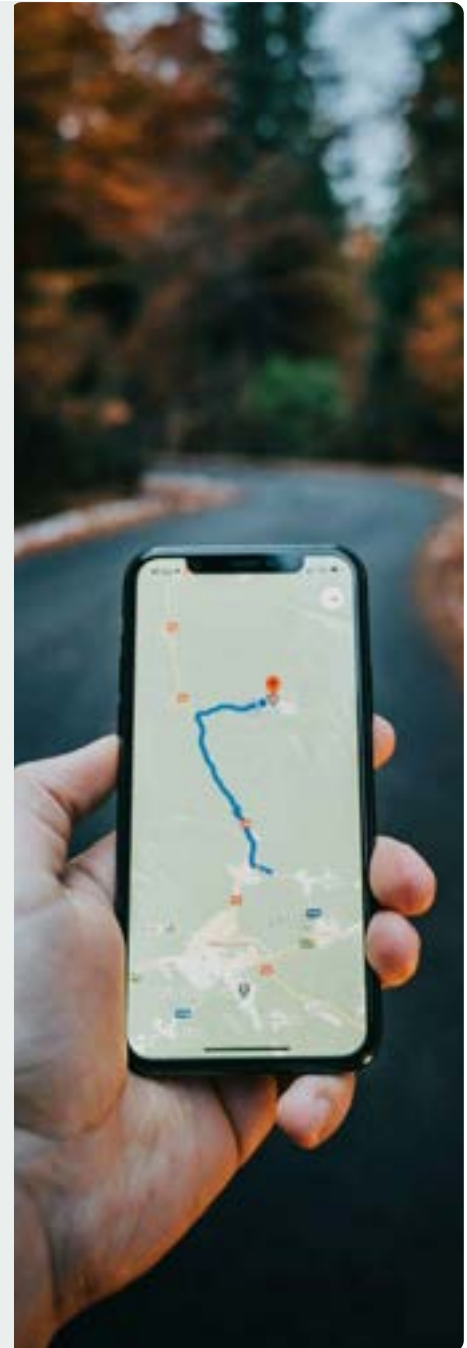
How to Use This Guide

This guidebook was co created by members of our Climate Farmer community and is designed to be both comprehensive and practical, providing a clear (if somewhat simplified) process for assessing and managing water on your farm. Our hope is that anyone could develop a holistic water management strategy for their farm by following the sequence of observations and analysis, consideration of available options, initial implementation steps, and regular monitoring and reflection.

Rather than a book intended to be read from cover to cover, we recommend that you jump to sections that are relevant to the stage of water management planning that you're in. If you're just beginning, work through the strategy creation process to develop a plan that you can trial as soon as possible in order to build experience and confidence.

This guide begins with foundational knowledge about the small water cycle, followed by simple instructions for conducting a landscape hydration assessment. From there, you will be guided through various water management strategies, with key considerations to keep in mind, step-by-step instructions for implementation, and ways to monitor and measure results to inform your progress.

Each section includes visual aids such as site photos, maps, diagrams, and schematics to illustrate key concepts. It's essential though that you adapt the techniques profiled here to your own conditions and experiment with different approaches to find the best solutions for your land and context. Whether you are new to water management or looking to refine existing practices, this guide is intended to serve as a valuable reference for improving water security and farm resilience.



Action Steps for Using This Guide

If you're new to water management, start with '[Assessing Your Landscape](#)'.

Looking for inspiration to get you started? Look at the use case studies for real-world insights into practical applications

If you're seeking solutions to particular challenges, explore '[Strategies for Water Management](#)'.

If you're troubleshooting a pre-existing water management system, refer to '[Troubleshooting and Problem Solving](#)'.

02

The Big Picture

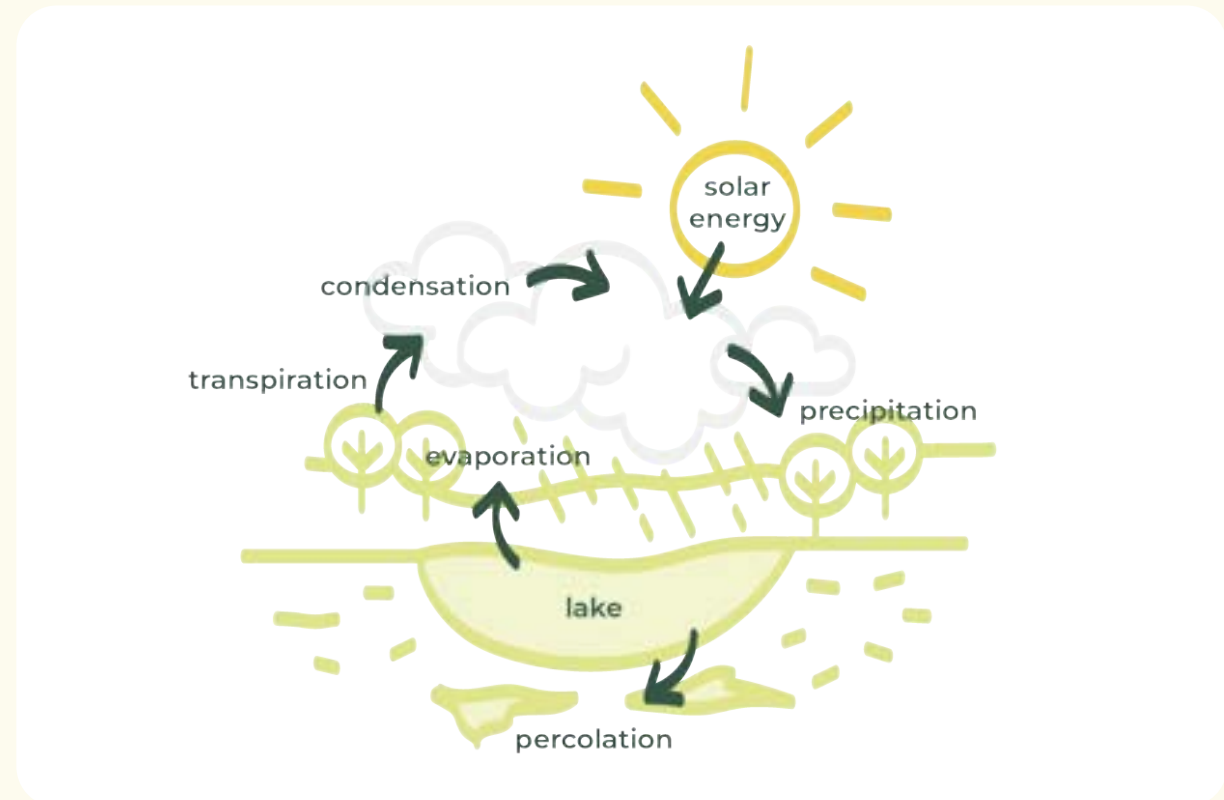
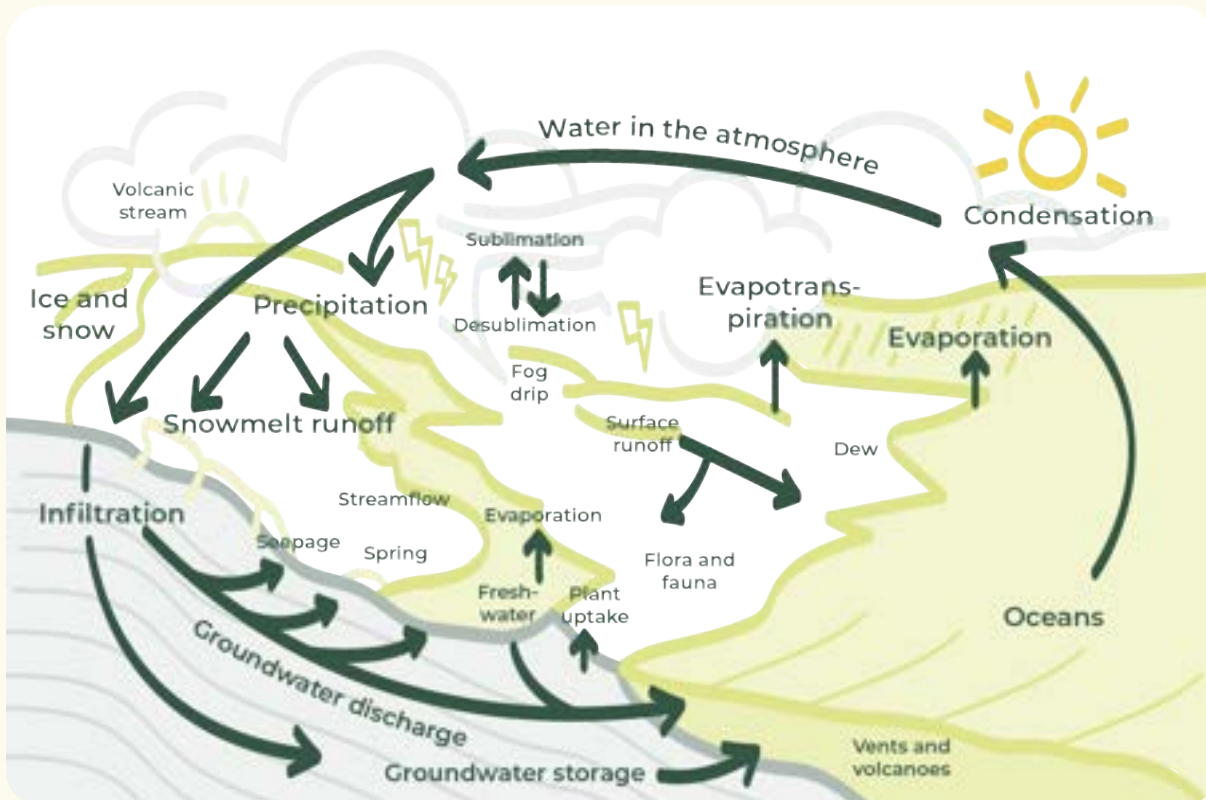


The Small Water Cycle and Regenerative Agriculture

Water moves through the landscape in two key cycles:

1. the large water cycle, which mainly involves ocean evaporation and precipitation

2. the small water cycle, which governs how water circulates within ecosystems and bioregions.



The Small Water Cycle and Regenerative Agriculture

The small water cycle however, is predominantly influenced by land use, vegetation, and soil health. When this cycle is intact, moisture is retained in the soil, and transpired through living plants, supporting many trophic levels of biology and helping to seed further precipitation via atmospheric dispersal of cloud nucleating bacteria. However, many land use and farming practices such as excessive tillage, deforestation, overgrazing, and paving or roofing over vast areas, can disrupt this cycle, leading to reduced water retention in the ground, a lack of moisture and cloud inoculation in the atmosphere, and increased water runoff. Ultimately, the combination of non-organic aerosols in the air (such as dust and synthetic pollutants), and de-vegetated and degraded soils on the ground can create a heat dome effect which effectively repels atmospheric moisture and the low pressure systems needed for precipitation.

A holistic water management strategy seeks to restore the small water cycle by enhancing soil moisture infiltration and retention, increasing vegetation cover, and working with landscapes in ways that capture and recycle rainfall. By working with natural processes, you can rebuild soil structure and fertility, improve drought resilience, and reduce dependence on irrigation. This shift is not just beneficial for individual farms; it also contributes to broader watershed health, improving local water security and reducing the risks of floods and droughts.





Climate Realities Across Europe

Droughts, downpours, wildfires, and seasonal water availability

Europe is an extremely diverse continent which contains a wide range of climate and landscape conditions. Unfortunately, climate change is intensifying the extremes of local weather variations like:

- shifting precipitation patterns
- prolonged droughts
- erratic temperature swings
- and more severe storms.

In some areas, excessive rainfall causes soil erosion, inundation, and nutrient loss, while in others, a lack of water leads to desertification and reduced crop viability. Increasingly these same catastrophes are happening in the same places within a single year. At the same time available water reserves, either as ground water, reservoirs, and even snow packs and glaciers, are disappearing, while existing reserves are becoming ever more contaminated (largely due to agricultural runoff) to the point of being toxic. As the largest industry by far in terms of water consumption, agriculture must adopt a stewardship approach to how it uses, interacts with, and releases water.



Climate Realities Across Europe

Droughts, downpours, wildfires, and seasonal water availability

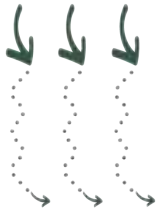
Understanding local climate realities is essential for effective water management and stewardship. Farmers must assess not only their own rainfall patterns but also the broader watershed dynamics that affect their land. Adapting to climate change requires a proactive approach that integrates

- water storage
- soil regeneration
- and ecosystem management

to create resilient and long-term farming systems. These strategies ensure that your farm can continue to produce food, fuel, fiber, and medicine while mitigating the risks of a changing climate.

Principles of Holistic Water Management

Effective water management follows four principles:



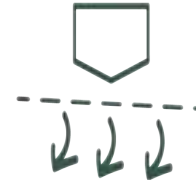
Slow

Reduce water runoff.



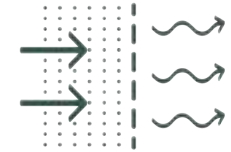
Spread

Distribute water evenly across the landscape.



Sink

Enhance water infiltration into the soil.



Clean

Filter and purify water before use or release.

This serves as a contrast to many common modern agricultural practices which cause rainwater to run off quickly, and be lost to the system. Farms instead have the potential to be designed to retain and infiltrate water where it falls, and then recycle that water through living entities in the ecosystem as many times as possible before it leaves again. In a later section we'll give an overview of some of the most common design strategies and techniques available to accomplish this.

Though the final action is very often left out, holistic water management also includes filtering and purifying water before it is both used on your farm, or leaves the land. Elements like wetlands, sediment traps, and plant-based filtration systems can reduce pollution and improve water quality. By integrating these principles into farm design, you can create ecological systems that are not only more resilient but that also contribute positively to your surrounding environment.

03

Assessing Your Landscape



Assessing Your Landscape

Steps to Conduct a Landscape Hydration Assessment



Observing and mapping
water flow on your landscape



Identifying areas of erosion,
compaction, and poor infiltration



Understanding the context
and challenges of your farm



Step-by-Step Landscape Hydration Assessment

Understanding your farm's water dynamics begins with a thorough assessment of how water moves across and through your land. It's important to collect data on your annual rainfall, seasonal distribution, and on-farm water usage as a reference in this process. Knowing when and how much water is available helps you identify

- critical dry periods
- risks of water shortages
- risks of inundation or saturation
- and potential for rainwater harvesting.

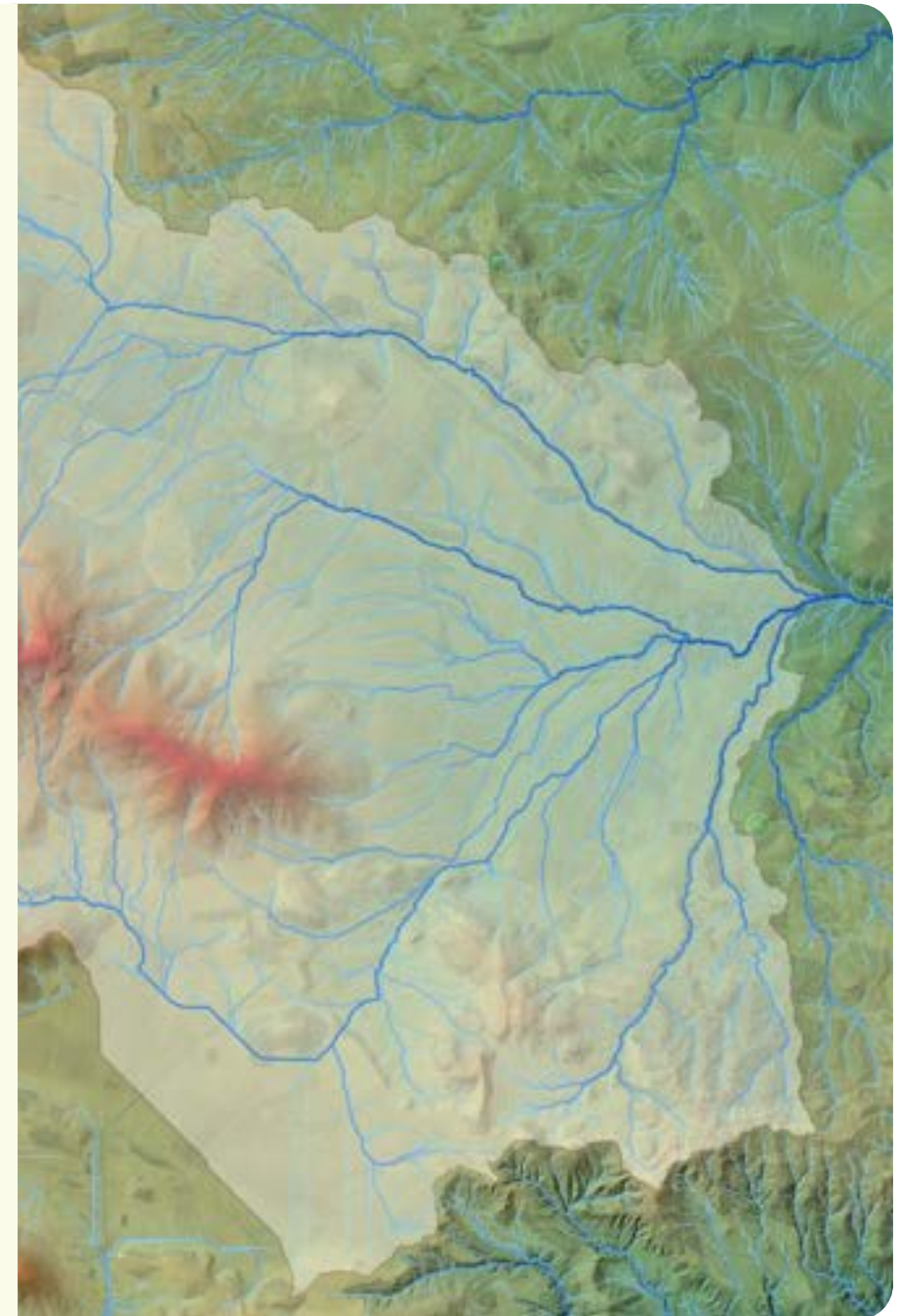
Additionally, studying your farm's water sources—such as springs, wells, streams, or municipal access—will provide insights into water availability and reliability. Once basic data is gathered, it's essential for you to walk your land during different weather conditions to observe water movement. During and after a rainfall, look for signs of pooling, runoff, erosion, and infiltration. Identify compacted areas where water fails to absorb, as well as natural drainage lines that channel excess water. This step allows you to map out problem areas and opportunities for water retention and dispersion. These observations are critical in guiding the design of a more effective water management system.

Step 1

Observing and mapping water flow on your landscape and larger water catchment (where water enters and is captured)

A key aspect of water management is understanding how your farm fits within the larger water catchment. Water rarely originates or ends within a single farm—most properties are part of a greater catchment area that influences water availability and movement. Identifying where water enters and exits your farm, how much is capable of coming, and how it behaves during different seasons, is crucial to designing interventions that work with existing natural hydrological patterns.

Mapping water flow includes marking high and low points, natural drainage pathways, and areas prone to flooding or erosion. Creating simple hand-drawn maps or using GPS tools can help visualize water dynamics. Obtaining accurate topographical maps and overlaying contour lines on your own base maps can provide an insight to how gravity directs water, aiding in the evaluation of key interventions such as terraces, ponds, and infiltration basins.



Step 2

Identifying areas of erosion, compaction, and poor infiltration (where water leaves and does damage)

Erosion is one of the most visible signs of poor water management, stripping away topsoil and reducing farm productivity. There are 4 main types of erosion: splash, sheet flow, rills, and gullies. Sediment deposits can also indicate areas where water flows too quickly, removing valuable nutrients and organic matter. In contrast, bare and compacted soils often show surface capping indicating splash erosion, minimal water absorption, surface pooling, and increased runoff. You should work to identify these problem areas and prioritize them for restoration efforts.

Poor infiltration often results from overgrazing, heavy machinery use, or bare and exposed soil. Loss of organic matter in the soil also decreases its porosity and ability to infiltrate and hold moisture. Performing [a simple infiltration test](#) and measuring absorption time can reveal how well the ground receives moisture. Depending on your context, different interventions such as deep-rooted cover crops, reduced tillage, timed subsoiling, holistic managed grazing, and biological or mineral amendments can help rebuild soil structure, improving water retention and infiltration over time.



Common landscape signs and indications

4 types of erosion



Splash Erosion

The impact of raindrops on bare soil dislodges particles, creating surface sealing and preventing infiltration.



Sheet Erosion

A thin, uniform layer of soil is removed across a large area by runoff, often going unnoticed until significant topsoil is lost.



Rill Erosion

Small, visible channels form on sloped land as runoff carves into the soil, which can grow larger if left unmanaged.



Gully Erosion

Severe erosion where deep trenches form, often from concentrated water flow, making land unusable without major intervention.



Common landscape signs and indications

Soil capping

Capping is the process by which a hardened crust forms on the soil surface due to compaction, raindrop impact, or chemical reactions. Soil capping prevents water infiltration, increases runoff, and reduces seed germination by creating a physical barrier. It is common in degraded or disturbed soils



Common landscape signs and indications

Sediment and debris buildup

This is the accumulation of soil particles, organic matter, and loose materials in low-lying areas like waterways. This often indicates upstream erosion and can reduce water quality, block drainage, and disrupt natural hydrological cycles. The size and mass of the material you observe will indicate the force of the water that was needed to move it.



Plants have evolved to thrive in high and low water environments

Common landscape signs and indications

Presence of hydrophilic and hydrophobic plants

- Hydrophilic plants thrive in wet conditions and indicate areas with high water retention or poor drainage (e.g., reeds, willows, rushes).
- Hydrophobic plants prefer dry conditions and signal poor water infiltration or drought-prone areas (e.g., lavender, sagebrush, succulents).

Observing these plants can help you assess water distribution and soil moisture levels on your land, even if it's hard to see where water moves on the surface



Common landscape signs and indications

Indications of high winds and major storms

- Wind-sculpted trees, leaning or broken branches, and exposed roots suggest prevailing wind direction and intensity.
- Deposits of sand, silt, or organic debris in patterns indicate past storm runoff and flood impacts.
- Stripped topsoil, especially in open fields, is a sign of wind erosion that can lead to long-term soil degradation if not mitigated.





healthy and damaged riparian zones



Common landscape signs and indications

Riparian zones

The transition area between land and a body of water (streams, rivers, wetlands, etc) is usually characterized by high biodiversity and water filtration functions. Healthy riparian areas are densely populated with water loving plants.

These zones stabilize banks, reduce erosion, and act as natural buffers against contaminants. Their presence and condition can indicate the overall health of the water cycle in a given landscape.

Mapping landform patterns and water flows

Ridges, valleys, peaks, and depressions

Ridges and spurs

Elevated landforms with higher ground on both sides, directing water runoff away from their crest. Ridges often act as natural drainage divides.

Valleys

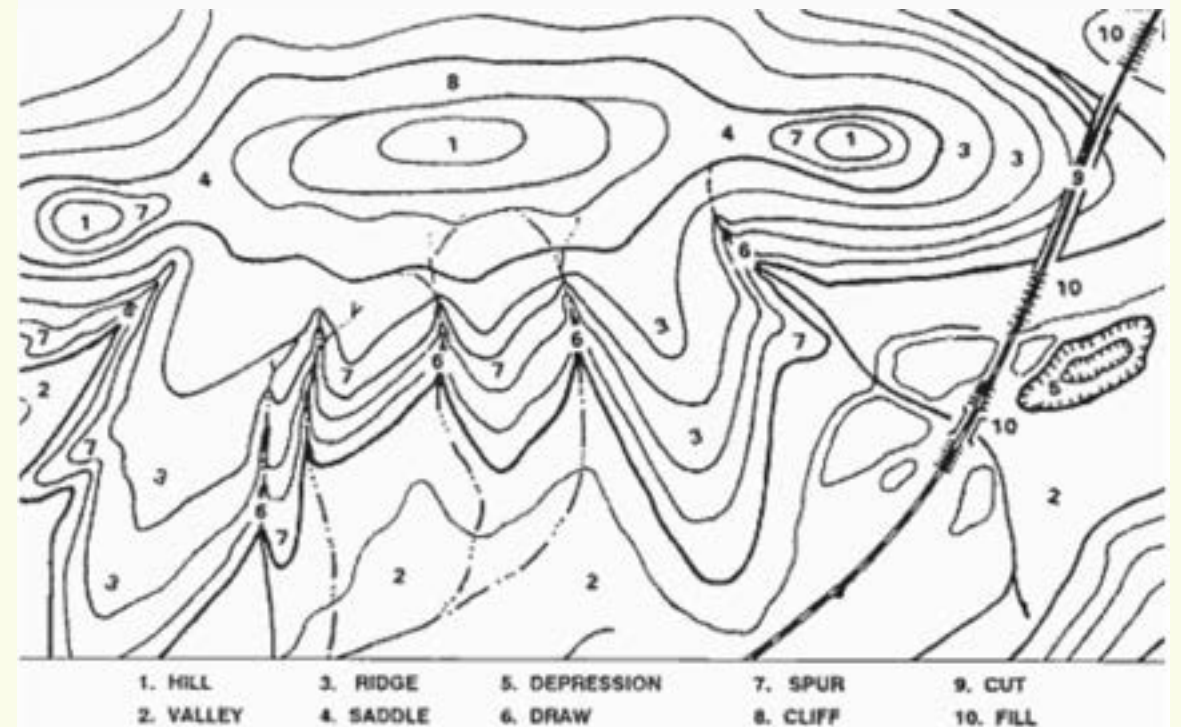
Low areas between ridges or hills where water naturally flows and accumulates, forming streams or wetlands over time.

Peaks / hills

The highest points in a landscape, marking the summit of hills or mountains. Watersheds away from peaks in all directions.

Depressions

Low-lying areas that collect water due to their enclosed nature, sometimes forming seasonal or permanent ponds, wetlands, or sinkholes.



Mapping landform patterns and water flows

Different orders of streams

First-order streams

The smallest and most basic streams that originate from groundwater seepage, springs, or runoff. They have no tributaries.

Second-order streams

Form when two first-order streams merge. They are slightly larger and begin shaping the landscape more visibly.

Third-order streams and higher

Created by the joining of two streams of the same order. As the order increases, streams become wider, deeper, and more influential in the watershed.

Understanding stream orders helps determine water movement, erosion risks, and where interventions like check dams or riparian restoration may be most effective. What order are the streams on your farm?

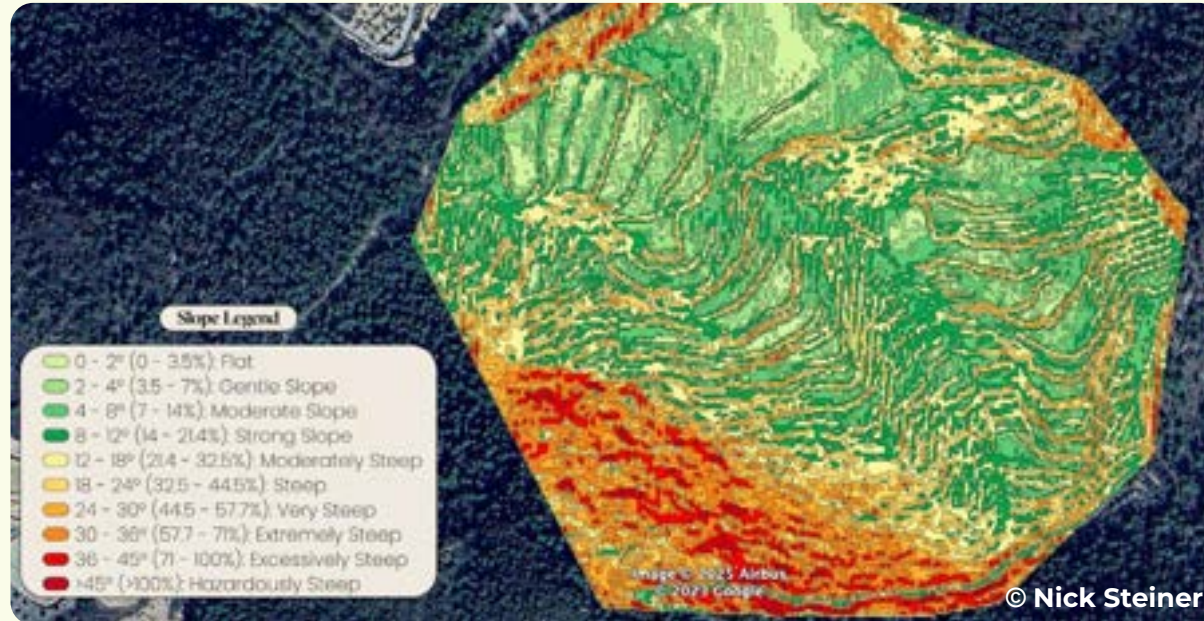


Mapping landform patterns and water flows

Topographic maps and degrees of slope

Topographic maps are detailed representations of land elevation, using contour lines to indicate terrain shape. Closely spaced lines indicate steep slopes, while widely spaced lines show gradual inclines.

Degrees of slope measure how steep or flat land is, often expressed as a percentage or angle.



0-2% slope

Nearly flat, ideal for infiltration-based water management.

3-8% slope

Gently rolling, suitable for keyline plowing and controlled runoff management.

9-20% slope

Moderate inclines where terraces, swales, or check dams may be necessary.

Above 15-20% slope

Too steep for safe installation of most features. These are almost never areas where intervention is advisable. Planting and stabilizing vegetation become the primary viable option. If erosion is occurring in these areas, it's better to locate a flatter zone up slope and work to disperse water rather than working in these potentially dangerous and unstable areas.

Mapping landform patterns and water flows

Calculating catchments: The Manning equation

Catchment calculation determines how much water can be harvested from a given area based on rainfall and surface area. The basic formula is:

The diagram shows the formula for Catchment Volume in a central yellow box. Three vertical lines connect the variables in the formula to their definitions: one line from 'Rainfall (mm)' to its definition above, one from 'Catchment Area (m²)' to its definition below, and one from 'Runoff Coefficient' to its definition below.

$$\text{Catchment Volume (Liters)} = \text{Catchment Area (m}^2\text{)} \times \text{Rainfall (mm)} \times \text{Runoff Coefficient}$$

The total precipitation over a given time period.

The total surface area collecting water (e.g., a field, rooftop, or watershed).

The percentage of rainwater that is actually collected, depending on surface type (e.g., rooftops = 0.9, compacted or heavy clay soil = 0.5, forested areas or sandy soil = 0.2).

This calculation is crucial for designing water storage systems, estimating pond capacity, and calculating spillways and other safety features for your water retention elements.

Step 3

Understanding the context and challenges of your farm

(rainfall and water usage patterns)

Each farm has a unique set of challenges and opportunities that go far beyond basic statistics of the land and climate. Though a full assessment of the unique context of each farmer is beyond the scope of this guidebook, we'll attempt to cover some essential considerations to prevent blind spots in your analysis. A baseline assessment of your context will help to later set benchmarks for improvement towards your specific water management goals.

Some common observations can be paired with likely outcomes. For example, sandy soils usually allow rapid water infiltration but struggle to retain moisture, whereas clay-heavy soils often experience surface runoff and poor drainage, but hold moisture for a long time, especially at lower depths. Sloped land accelerates water movement, increasing erosion risks, while low-lying areas may accumulate moisture and become waterlogged easily. Recognizing these factors is key to designing an effective water strategy tailored to the farm's characteristics and specific needs.



Each farm presents unique challenges and opportunities that go beyond climate data and soil types. While this guide can't provide a full context analysis for every farm, it does highlight essential considerations to help avoid blind spots. A clear baseline of your farm's context will help you set meaningful goals and measure improvement over time.

Common landscape features often point to likely outcomes. Sandy soils absorb water quickly but don't hold it well. Clay-heavy soils may resist infiltration but retain deeper moisture. Sloped land increases runoff and erosion, while flat or low-lying areas can become waterlogged. Recognizing these patterns is key to designing effective, site-specific interventions.

Once you understand your land's basic characteristics, assess the needs of your farm enterprises. Different systems—cropping, livestock, horticulture, or agroforestry—require different water volumes, delivery methods, and timing. Infrastructure like ponds or terraces may benefit one system but hinder another, such as limiting machinery access in grain production. Consider not just your crops and animals, but how each management option fits the physical and logistical realities of your operation.

Finally, don't overlook the broader context. Local water laws, protected zones, communal systems, and funding programs can all shape what's possible. So can your available labor, equipment, and budget. Aligning your strategy with these factors will help ensure long-term success—and avoid costly setbacks.



Step 3

Understanding the context and challenges of your farm
(rainfall and water usage patterns)

Evaluating potential interventions based on your context, landscape observations, and available resources

After making all of the previous observations and analysis, the next step is to evaluate which interventions best fit the farm's needs. Some solutions, such as installing low tech erosion control features in places of identified erosion, require minimal investment and can be implemented immediately. Others, like constructing ponds or terraces, or installing irrigation systems, demand more planning, labor, and financial resources.

You should prioritize interventions based on effectiveness, cost, and long-term maintenance requirements. Solutions should be integrated into a cohesive strategy that prioritizes safety and considers both how each intervention interacts with others and the larger farm ecosystem, while attempting to anticipate how the interactions might evolve over time. By starting with simple, small-scale, low-risk measures and gradually implementing more complex systems, you can develop a resilient and integrated water management approach suited to your landscape and unique context.



Step 3

Understanding the context and challenges of your farm

(rainfall and water usage patterns)

Tools and Techniques

The right tools can greatly enhance your ability to assess and manage water effectively. Basic tools include soil probes for testing compaction, flags or markers for mapping water flow, and GPS apps for locating points of observation. More advanced options, such as drones for aerial surveys or software for digital mapping, self leveling lasers with receivers, and excavation machinery can provide higher precision and enhance your capabilities, but are often not essential.

Simple DIY methods can also yield valuable data. Creating a "rainfall simulator" using a watering can to observe runoff, or digging small test pits to measure soil moisture at different depths, can also inform decision-making. The combination of modern technology and honed observational skills will allow you to gain a comprehensive understanding of your land's water dynamics.

- How to make basic soil tests
 - [Soil aggregate field test](#)
 - [Infiltration rate field test](#)
 - [Soil compaction field test](#)
- Mapping your observations and potential intervention sites. (analog and GE map examples)



04

Strategies for Water Management

There are countless options for design systems, flow and movement management, and capture and retention features available to choose from.

In an attempt to avoid a sense of overwhelm at all these possibilities, we've outlined some of the most common categories of design approaches and installations that came up in our group discussions. There are many free resources available online and in libraries that can offer in-depth understanding.

Be sure to check out the resources section of this guidebook to see some that we recommend.



KEYLINE PATTERN CULTIVATION LINES



Keyline Design

Keyline design is a strategic approach to water distribution across sloped landscapes, developed by Australian agriculturalist P.A. Yeomans. This method focuses on identifying “keypoints” and keylines in the terrain to guide water movement, ensuring even infiltration and reducing runoff. By plowing or subsoiling along keylines or designing farm layouts around them, farmers can improve rainwater distribution by directing water across the contours of the landscape, improving moisture dispersal and retention.

Unlike conventional contour plowing which promotes following contour lines precisely, and can sometimes create stagnant water zones, keyline design subtly moves water where it is most needed with slightly off-contour patterning to avoid stagnation and enhance the entire farm’s hydration capacity.



© manel badia

Keyline Design

Implementing keyline design requires careful observation and mapping of topography. A designer will begin by identifying main features of the landscape, locate ridges and valleys, and then locate the key points — the highest point where natural water flow in valleys decreases its slope. By establishing keylines from this point, they create a pattern based framework for placing terraces, ponds, planting trees, or designing other farm infrastructure systems that work in harmony with the hydrology of the landscape. While keyline design is particularly useful for large-scale farms with rolling terrain, its principles can also be adapted to smaller farms or flatter landscapes by integrating smaller sized installations and gentle slope redirection techniques.



Keyline Design

In cases where machinery access needs reduce the practicality of traditional keyline based pattern design, there are a few expansions and adaptations to the original keyline design strategy that can be considered, most notably “straight keyline” by Darren Doherty and the team at Reagrarians.



© Mark Shepard

Keyline Design

It's important to be aware of the fact that almost every farm has unique characteristics that may require modifications to standard keyline principles. In steep areas, careful spacing of keyline plowing or the use of terraces may be necessary to prevent excessive water accumulation and erosion. On flatter land, subtle undulations in the landscape can be enhanced with gentle earth shaping to encourage water infiltration where it is most needed. People working in sandy soils, which tend to drain quickly, may need to supplement keyline techniques with soil health strategies and organic matter inputs, such as mulch and compost, to slow water movement. Conversely, heavy clay soils may require additional aeration or subsoiling techniques to improve percolation. Regardless of the terrain, the core principle of guiding water strategically across the land remains the same — maximizing hydration while minimizing runoff and erosion.

Earthworks for Water Retention

Earthworks are physical modifications to the land that help retain, slow, and distribute water. These interventions include swales, terraces, ponds, check dams, and other landscape features designed to enhance water infiltration and storage. Earthworks can be tailored to a farm's specific needs, offering solutions for both drought-prone and flood-prone areas. Swales, as a common example, are shallow trenches dug along contour lines to capture rainwater and allow it to soak into the soil rather than running off. Terraces help prevent erosion on steep slopes by breaking up water flow into manageable sections. Ponds and small reservoirs store water for irrigation, livestock, or ecological purposes, acting as a buffer against dry periods. When properly designed, these features work together to create a landscape that holds water efficiently, reducing reliance on external water sources.

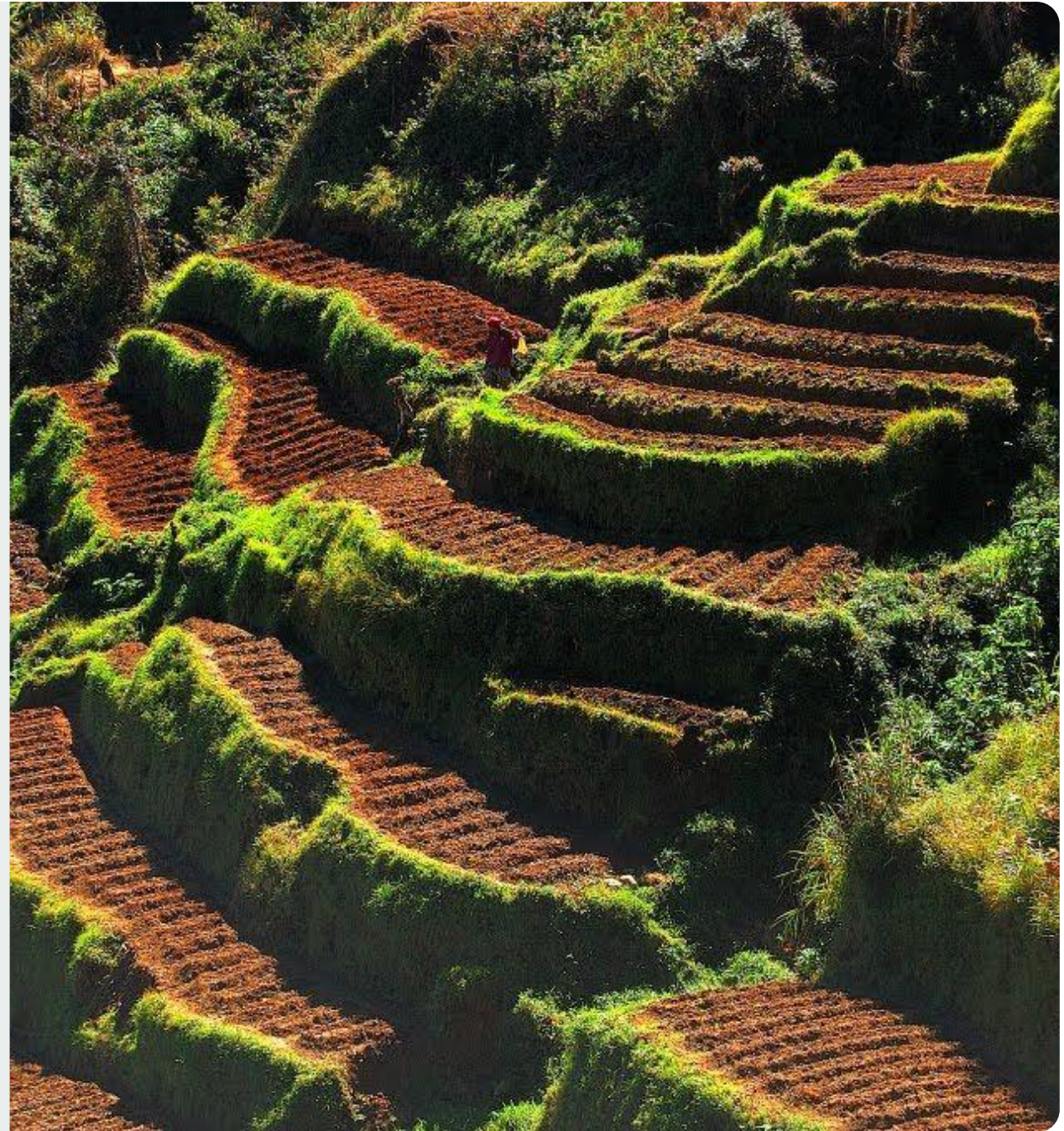
Let's take a closer look at the main categories of earthworks.
Terraces, ponds, check dams, and swales



Earthworks for Water Retention

Terracing

Terracing is an ancient technique that remains highly effective for managing water on sloped terrain. By creating stepped levels on hillsides, terraces slow down water movement, increase infiltration, and reduce erosion. This method is particularly useful for vineyards, orchards, rice paddies, and vegetable farms located on inclines. Terraces can also be used to slowly transport water over distances with very slight declines, usually less than 1-2% slopes. They can also be integrated with roads and access ways to serve multiple purposes, facilitating the movement of humans, animals, machinery, and water all at once.



Earthworks for Water Retention

Ponds

Ponds serve as critical water reserves, capturing excess rainwater during wet periods and making it available during droughts. When placed strategically, ponds can also enhance biodiversity by creating habitats for beneficial insects, amphibians, birds and other wildlife.



Earthworks for Water Retention

Dams

Dams function much like ponds, but crucially are located in spaces that are fed by a running waterway and serve to partially detain its flow. Since the scope of this guidebook is limited, in our case we're only speaking about earthen dams, whether lined with an impermeable membrane or unlined.

Check dams are small structures built in gullies or drainage channels, which help to slow down fast-moving water, preventing further erosion while allowing sediment to settle and rebuild soil.



Earthworks for Water Retention

Swales

Swales are similar to terraces with a few key differences. They are primarily meant as tree planting installations that lay perfectly on contour. They consist of three elements, the ditch, the berm, and a spillway. The berm is made from earth that is mounded on the downhill side from the ditch and a spillway is dug into the berm to allow for the safe overflow of water when the ditch is full. Despite their popularity as water harvesting features, there are a lot of essential considerations when determining whether swales may or may not be appropriate for your landscape.

Each of these earthworks can play a role in creating a more water-resilient farm landscape if they are installed in appropriate places, within consideration of the other elements of your context and landscape, and installed well with the proper safety measures.



Earthworks for Water Retention

Safety considerations and maintenance

While earthworks can be highly effective, they must be designed and maintained correctly to avoid unintended consequences. Poorly planned or installed ponds can overflow or breach and cause damage below, while improperly placed terraces or swales may direct or concentrate water towards sensitive and inappropriate areas. Farmers should always consider the natural hydrology of their land before implementing earthworks, ensuring that interventions enhance, rather than disrupt, existing water patterns.

The most common, but often overlooked, safety features in water harvesting earthworks include spillways and proper slopes for dam walls or terrace courses as well as maintenance.



Earthworks for Water Retention

Safety considerations and maintenance

In the case of **spillways**, their sizing should always be accompanied by careful calculations of the catchment area above, the infiltration coefficient of the land in that catchment, and the possible “worst storm” event. For best practices, the largest 100 year or even 500 year rainfall event should be calculated for. In earthen structures such as dams, ponds and constructed wetlands, spillways should always be installed into fresh grade, meaning earth off to the side of the constructed retaining wall that has not otherwise been disturbed by machinery. To avoid erosion in the spillway, discharge of water should occur over level courses that allow the water’s kinetic energy to be dispersed and spread out, or, if this isn’t practical, careful armoring of the spillway with stones and gravel in the area of concentrated water flow. In both cases establishing vegetation in areas of waterflow can greatly enhance erosion control, however regular maintenance and clearing of vegetation is also important to prevent blockages that reduce the function of the spillway.



Earthworks for Water Retention

Safety considerations and maintenance

In the case of long terrace or canal runs, the angle of slope directly relates to the risk of erosion of the earth the water passes over. As a general rule, slopes of 2% or less are not at risk of erosion. 1% or less is more commonly used when water infiltration is the goal as the slight slope prevents accumulation and stagnation of water along the water course.



Earthworks for Water Retention

Safety considerations and maintenance

Maintenance is also crucial. Over time, features may fill with sediment or vegetation and require clearing, while check dams may need periodic reinforcement to remain effective. Ponds should be monitored for leaks, excessive evaporation, or algae growth that indicates poor water quality and oxygen levels. Deep rooted plants must not be allowed to get established on the constructed walls of ponds, dams, or constructed wetlands for risk of creating leaks. They'll require regular clearing.

By conducting regular inspections and minor adjustments, you can ensure that your earthworks remain functional and safe for many years or even centuries.





Soil Infiltration and Moisture Storage

Healthy soil is the most effective water security system available to farmers. When soil has a high organic matter content, it acts like a sponge, absorbing and holding moisture for plant roots to access during dry periods. However, soil degradation caused by excessive tillage, chemical inputs, and compaction reduces its ability to retain water, leading to reduced infiltration, increased runoff, and drought stress.

Improving soil infiltration may require a combination of:

- organic matter additions
- chemical balancing
- reduced soil disturbance
- the introduction and maintenance of living plants on the surface.

As the health of your soil improves you can expect to see significant reductions in your dependence on irrigation as you become more resilient to fluctuating rainfall patterns.

Soil Infiltration and Moisture Storage

Techniques for increasing organic matter and soil porosity

The optimal strategy for improving the health of your soil will depend entirely on the soil you're working with and the options available to you within your context.

In general however, you need to follow the **soil health principles**:

**Minimize
Disturbance**

**Keep the Soil
Covered**

**Maximize
Biodiversity**

**Keeping Living
Roots**

**Integrate
Livestock**

Applied in combination, will likely accelerate your efforts in improvement. Over time, these practices can create a self-sustaining soil ecosystem that supports higher levels of moisture retention, ultimately reducing the need for supplemental irrigation.



Soil Infiltration and Moisture Storage

Techniques for increasing organic matter and soil porosity

Related to soil moisture is the topic of plant health and water drought resilience. Many of the same elements of healthy soil (high percentage of organic matter, presence of stable aggregates, diverse and robust microbial communities, lack of compaction) also contribute to plant health and nutrition. When plants are able to absorb all of the micronutrients they require to thrive through intact relationships with soil microbes, they are much more likely to self regulate their moisture requirements, even in drought conditions. Synthesis of secondary metabolites and lipids within plants allows them to withstand many severe conditions and external threats much in the same way that our own bodies are able to achieve immunity and resilience when they are well rested and nourished. In some cases, when micronutrients are unavailable in soil, or the necessary relationships with microbes are not yet established, techniques such as foliar feeding and soil inoculation can aid in nourishing your crops and accelerate the improvement of your soil in times of drought or other stressors. Only through accurate plant health and soil analysis will you know how to assist in this process, but similarly to the soil health principles, common plant health indicators such as leaf color, presence of disease or insect damage signs, dull or glossy leaves, and other observable factors can give you insights into when you should intervene and help your crops with their nutritional requirements. Not every plant health problem is caused by deficiency however. In some cases the presence of contaminants or toxic elements in the soil can inhibit proper plant growth and development. This is another reason why broad spectrum soil analysis can be helpful in diagnosing problems in your plant health issues.



Soil Infiltration and Moisture Storage

Techniques for increasing organic matter and soil porosity

One final consideration is that many industrially produced seeds have been bred for maximum yield, but only under highly controlled conditions. This may include, but not be limited to, precise fertilization regimes, resistance to toxic and proprietary pest and weed control chemicals, and regular irrigation. If you are trying to promote vigorous and productive growth without using these inputs, these seeds may not respond well to your management conditions and cause you problems even if your water and soil conditions are optimal. We highly recommend sourcing seeds from non-GMO, open pollinated, organic, and local sources whenever possible to compliment your efforts in regenerative management.

Contamination and pollution treatment

Water quality is just as important as quantity when it comes to farm resilience. Contaminated water sources can introduce pathogens, toxic chemicals, and excess nutrients into your farm ecosystem, leading to soil degradation and crop loss or livestock illness. Earthen and vegetative barriers help capture and filter contaminants before they reach points of use.

Water contamination can come from a number of sources. Irrigation water often comes from reservoirs or directly from rivers. Depending on the pollution that enters these sources, it may be necessary to send samples of your water for chemical analysis to see what contaminants you're dealing with. Similarly, municipal water and well water can have high levels of soluble minerals like lime, bicarbonates, and iron, as well as additives like chlorine and fluoride or trace amounts of pharmaceuticals. Depending on the concentrations these can present issues for soil, plants, and also your plumbing. Each contaminant may require a different strategy for purification, and that's a whole guide by itself, but there are a few general strategies that work as broad spectrum water cleaning methods:



Contamination and pollution treatment

Mechanical Filtration

A physical filtration process that removes suspended solids, sediment, and debris from water using barriers like mesh screens, sand filters, or gravel beds. This is effective for removing particulates but does not address dissolved contaminants like chemicals or pathogens.



Contamination and pollution treatment

Exposure to Open Air and Sunlight

A passive purification method where water is left in shallow, open containers or slow-moving channels to allow **ultraviolet (UV) radiation** from sunlight to kill bacteria and algae. This process can also help break down some organic pollutants through oxidation.



Contamination and pollution treatment

Aeration

Involves exposing water to air, often by bubbling or spraying it through a fine mist, to **increase oxygen levels and release volatile contaminants** like dissolved gases (e.g., ammonia, hydrogen sulfide) and certain chemicals (e.g., chlorine). It also supports beneficial microbial activity that helps break down organic pollutants.



Contamination and pollution treatment

Plant Roots and Biofilms

A biological filtration method that uses **wetland plants and microbial biofilms** to absorb excess nutrients, trap sediment, and break down contaminants. Root systems create habitat for beneficial bacteria that naturally degrade pollutants, making this an effective strategy for filtering greywater, runoff, and agricultural waste.

These methods are usually adequate, especially when used in combination, to clean water to the standards necessary for use on the farm. Creating potable water is another level of complexity and likely can't be guaranteed by these methods alone. In any case, you should regularly test the quality of your water, both before and after filtration to be sure that your cleaning methods are effective.

It's equally important to manage the quality of water that comes into your system as it is to care for the quality of water that leaves it. Managing nutrient runoff and filtering pollutants before they enter waterways are critical steps for maintaining water quality for everyone within your larger catchment.





Flood and Inundation Management

While many farmers struggle with drought, others face the opposite challenge — excess water. Heavy rainfall, or even light rainfall over an extended period of time, can lead to flooding. In many cases this washes away valuable topsoil and organic matter. Even if this doesn't occur, standing water can drown crops and promote anaerobic conditions in your soil. Managing water effectively during wet periods requires design and management of your land in ways that slow down, store, and redirect excess moisture in a controlled manner.

Diversion channels, sediment traps, and buffer zones can all help manage flood waters before they reach sensitive areas. Instead of allowing water to pool in low-lying fields, carefully considered drainage systems can guide excess water to designated retention areas, such as ponds or wetland zones. These solutions prevent damage while also making use of surplus water for future irrigation needs.

The main cautionary consideration when evaluating drainage options however, is that they don't end up depleting soil moisture altogether. Some of the most common methods like drainage tile have been used to drain wetlands and other natural ecosystems that rely on regular inundation to support wildlife. Draining these areas can lead to severe ecosystem degradation.



Flood and Inundation Management

Before jumping to drainage as a primary solution, consider how areas that remain wet for significant periods could be used to enhance the overall farm ecosystem and even be used for specific cultivation opportunities. Wetland ecosystems can yield incredible ecological benefits as well as specialty and high value crops.

Encouraging water to infiltrate rather than run off within the larger catchment is also an essential prevention strategy for flood management. Permeable surfaces allow water to seep into the ground rather than overwhelming drainage systems and waterways. Heavily compacted ground acts similarly to areas with a lot of roofed and paved surfaces. In both cases water can't infiltrate and collects in ever increasing amounts causing flooding and erosion.

Rain gardens, retention ponds, and constructed wetlands can act as buffers, capturing floodwaters and slowly releasing them back into the environment. These features help mitigate the impact of heavy rains while improving local groundwater recharge. By integrating these solutions into a holistic water management plan, you can turn excess water from a problem into a valuable resource.

Strategies for Fire-Prone Areas

In regions prone to wildfires, water management plays a crucial role in fire prevention and mitigation. Though it's important to remember that fire can be a natural and beneficial part of the disturbance regimes in your bio-region, there's a difference between natural burn cycles and catastrophic fires. Fire-adapted landscapes rely on maintaining moisture levels in the soil and vegetation while ensuring that key water sources are available for when suppression efforts are necessary. Strategies such as maintaining green firebreaks—areas planted with fire-resistant species — can help slow the spread of wildfires.

Water retention features like ponds, and terraces not only improve farm hydration but also create buffer zones that can halt or slow advancing flames. Another effective strategy is using irrigation strategically in fire season to keep vegetation hydrated, reducing the risk of dry, flammable material accumulating. Eliminating excessive fuel buildup, especially in forested areas, reducing the fuel ladder effect by pruning lower tree branches, and perhaps even performing controlled burns in the right season and conditions, can all contribute to a healthier relationship within fire-prone regions. Properly designed farm landscapes can integrate appropriate fire cycles and resilience against catastrophic burns into their water management strategies.



05

Modern and Traditional Irrigation Solutions



Ancient Water Wisdom

Throughout history, farmers have developed innovative methods to manage water efficiently, particularly in regions with low or unpredictable rainfall. Many of these ancient techniques remain highly relevant today, offering sustainable and low-tech solutions for modern agriculture. Systems like qanats, terraces, acequias, aqueducts, and cisterns have been used for centuries to channel, store, and distribute water effectively, ensuring a steady supply even in arid or semi-arid climates.



Terracing systems

widely used across Europe from the Alps to the Mediterranean — reduces runoff, prevents soil erosion, and enhances infiltration.



Acequias, traditional open-channel irrigation canal systems

found in Spain and parts of Latin America, rely on gravity to distribute water efficiently without the need for pumps.



Cisterns,

which collect rainwater for later use, have been a staple of water conservation strategies for millennia.

By incorporating these time-tested methods into modern farm designs, you can improve water security while reducing dependence on costly infrastructure and fragile energy networks.

Community Collaboration for Water Management

Water management is most effective when approached at a community level. Many traditional systems, such as acequias and shared irrigation networks, were designed to ensure equitable water distribution among many multiple farmers and land stewards. These cooperative approaches remain valuable today, particularly for small and medium-sized farms that may lack the resources to develop large-scale water infrastructure on their own.

Collaborative water management can take many forms, from community-built water retention landscapes to shared water storage and irrigation networks. In regions where drought is an increasing challenge, farmer cooperatives and local organizations can work together to restore watersheds, protect groundwater recharge areas, and advocate for policy changes that support sustainable water use. Modern technology, such as digital mapping tools and real-time water flow monitoring, can also enhance the management and monitoring of traditional water-sharing agreements, making them more adaptive to contemporary challenges.





Modern Irrigation Options

While traditional methods remain valuable, modern irrigation systems can offer additional tools to optimize water use. Advanced irrigation technologies can significantly improve efficiency, reducing water waste while ensuring crops receive adequate moisture. The right irrigation system for any given farm depends on many contextual factors including soil type, crop requirements, and climate conditions.

Methods range from simple flood irrigation, which remains widely used in certain contexts, to highly precise drip irrigation systems that deliver water directly to plant roots. Automated irrigation controllers, soil moisture sensors, and remote monitoring systems can further improve efficiency by ensuring that water is applied only when and where it is needed. These innovations help farmers balance productivity with sustainable water use, minimizing both consumption and environmental impact.



Modern Irrigation Options

Flood irrigation

Flood irrigation is one of the oldest and simplest irrigation methods, in which water is applied directly to fields and allowed to spread across the surface. Rice paddy flooding is the application that people are often most familiar with. This method is commonly used in lowland areas or where water is abundant. However, it is also the least water-efficient approach, as much of the applied water is lost to evaporation or runoff. Despite its inefficiencies, there are a number of advantages, and flood irrigation can be adapted to improve water retention as well. Much more than targeted irrigation, flooding a space can recharge the groundwater and even replenish aquifers. Techniques such as basin irrigation, where water is held in designated field sections for a set period, can help increase infiltration as well.

Precise leveling of fields also ensures even water distribution, preventing excessive runoff and improving moisture absorption. While flood irrigation may not be the best choice for water-scarce regions, when properly managed, it can still play a role in certain agricultural settings.



Modern Irrigation Options

Sprinkler systems

Sprinkler systems distribute water through a network of pipes and rotating nozzles, mimicking natural rainfall. These systems are widely used in arable farming across Europe, providing an efficient way to irrigate large areas. Overhead pivot systems, commonly seen in industrial-scale farming, rotate around a central point, applying water evenly across vast fields. The effectiveness of sprinklers depends on environmental conditions and setup quality. Windy areas may experience uneven water distribution, while hot, dry climates often experience significant evaporation losses.

Low-pressure sprinklers, coupled with automated scheduling based on soil moisture data, can improve efficiency. Additionally, modern variable-rate irrigation (VRI) technology allows farmers to adjust sprinkler output based on field-specific needs, conserving water.



Modern Irrigation Options

Drip irrigation

Drip irrigation is one of the most efficient watering methods available, delivering water directly to the base of each plant through a network of tubes and emitters. These systems minimize water loss from evaporation and runoff, making it particularly useful for water-scarce regions or high-value crops such as vegetables, vineyards, and orchards. Micro sprinklers function similarly to drip systems but distribute water over a slightly larger area, providing better coverage for certain crops.

These systems can be installed above or below ground, with subsurface drip irrigation offering additional benefits such as reduced weed growth and minimized water loss. While drip and micro sprinkler systems require an initial investment in infrastructure, they can offer long-term savings in water use and increased crop yields, making them an attractive option for irrigation in water scarce regions.

06

Practical Implementation



Practical Implementation

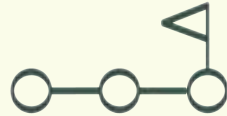
Steps for Implementing a Water Management Plan

1.



Assess your farm's water resources and challenges.

2.



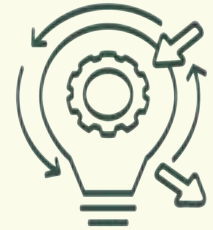
Set short-term and long-term objectives.

3.



Prioritize interventions based on cost, ease of implementation, and impact.

4.



Monitor and adjust your systems regularly.

Practical Implementation

A successful water management plan starts with a clear understanding of your context especially including your farm's water needs, challenges, and opportunities. The first step is conducting a comprehensive assessment of the farm's water resources, including rainfall patterns, soil infiltration rates, and existing infrastructure. Farmers should map water movement across their land and identify areas prone to drought, erosion, or excess water accumulation. This assessment serves as the foundation for designing an integrated strategy that balances water conservation, storage, purification, and distribution.

Once key issues and opportunities are identified, you should outline short-term and long-term objectives. Short-term actions may include simple fixes, such as adjusting irrigation schedules or applying mulch to improve soil moisture retention. Long-term strategies, on the other hand, might involve planning a keyline plowing schedule, building retention ponds, or planting agroforestry systems. By setting priorities and establishing realistic timelines, farmers can gradually build a resilient water system without overwhelming financial or labor resources.



Practical Implementation

Not all farms will require the same water management strategies, nor is it appropriate to install and begin everything at once, so prioritization is key. Farms in drought-prone areas should focus on soil moisture conservation and rainwater harvesting, while those facing flooding will likely invest in erosion control and infiltration improvement. Similarly, farmers with limited access to external water sources may prioritize storage solutions, whereas those in high-rainfall regions may focus on maximizing infiltration and groundwater recharge.

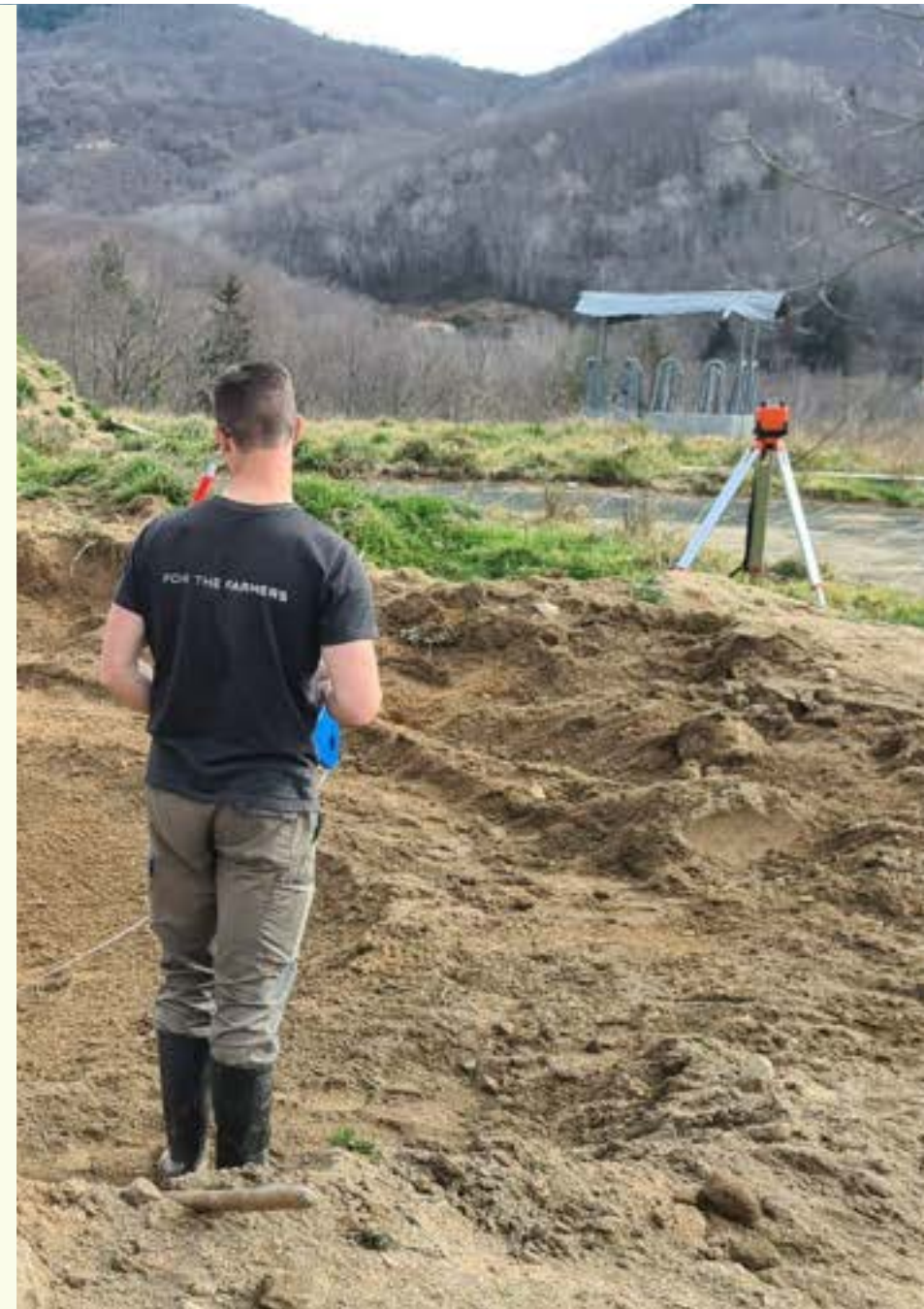
To determine priorities, you'll want to consider factors such as cost, ease of implementation, and expected impact. For example, planting cover crops to improve soil health and infiltration is a fairly low-cost, high-impact intervention that can be implemented quickly with minimal risk. Larger projects, such as constructing terraces or ponds, may require more planning and investment but offer long-term benefits. By tackling the most pressing water issues first and gradually scaling up solutions, leaving room for adaptation and adjustments, you can improve water resilience in a manageable, step-by-step process.



Practical Implementation

Implementing a water management strategy is an ongoing process that requires regular monitoring and adjustments. Changes in rainfall patterns, shifts in soil health, and unexpected weather events can all impact how well a water management system performs. You should routinely track soil moisture levels, water infiltration rates, and plant health to gauge the effectiveness of your interventions. Simple observation techniques—such as checking for signs of erosion after heavy rains or monitoring how long soil stays moist after irrigation—can provide valuable insights. Your monitoring strategy should reflect the priority outcomes you're aiming for. It can be easy to get caught up in data and collection, but often the simplest measurements that you perform regularly are much more useful than the complex or expensive analyses that you do infrequently.

In addition to field observations, keeping records of water usage, rainfall data, and system performance can help you refine their strategies over time. Remember that your farm is a living and dynamic ecosystem that is constantly changing and evolving. If a particular technique is not delivering the expected results, it's only right to make adjustments. For example, if an area of pasture that was previously dry and unproductive becomes lush and regrows forage quickly, it might benefit from more frequent and intense grazing. By treating water management as a dynamic and evolving process, you can continuously optimize your systems to ensure that your management evolves along with the environment itself.



Practical Implementation

A Budgeting or Pricing Guide for Calculating the Cost of Earthworks, Storage Tanks, Irrigation Systems, etc.

Investing in water management requires financial planning, as costs can vary significantly depending on the chosen interventions. Earthworks such as ponds and terraces require machinery and labor, while storage tanks and irrigation systems come with material and installation costs. Farmers should assess upfront expenses, long-term savings, and return on investment before committing to major projects.

Unless you have experience installing water retention earthworks, large irrigation systems, or complicated catchment structures, we highly recommend contracting an experienced and reputable professional to help you. It can be much more costly to install these systems poorly and need to fix or replace them than getting professional help to do them right the first time.



A few considerations for assessing qualified professionals:

- Ask to see their portfolio of work and if you can speak with some of their former clients
- Ask them to walk you through their design or implementation process, especially their process for calculating and installing safety features
- Try to get assessments and quotes from more than one professional for comparison
- Check if they are properly licensed and insured
- Ask if they have experience in the maintenance and repair of the system you want them to install for you
- If you are hoping to learn and build experience through the implementation process, ask if they are willing to have you work with them during the installation

Prices for professional services, machinery rental and operation, materials and tools, all vary significantly around Europe, and can change quickly depending on many factors, so offering price ranges in this guidebook is unrealistic. The best way to get estimates is to request them from experienced contractors, or speak to others who have had similar systems installed recently. In both cases these people can also offer advice about which parts of an installation represent opportunities for saving money by doing them yourself, or sourcing your own materials and tools.

If you have experience planning and budgeting for projects already, you can likely create your own cost estimates by asking others for material data sheets and labor time estimates from similar projects.



07

Troubleshooting and Problem Solving





Troubleshooting and Problem Solving

Water management strategies most often fail due to improper planning and design, poor implementation of features or their safety mechanisms, or a lack of system maintenance and adaptation. One of the most common mistakes is designing earthworks without a clear understanding of how water naturally moves through the land. For example, relying on swales for all your water harvesting goals can inhibit necessary movement of water through the landscape, concentrate water only in upland swales while lower ones remain dry, and leave you with stagnant pools that breed mosquitoes. Before implementing any intervention, farmers should conduct thorough site assessments, test small-scale prototypes, and consult with experienced practitioners.

Another frequent mistake is neglecting soil health when focusing on water retention. Even the most well-designed ponds, terraces, or irrigation systems will underperform if the soil lacks the organic matter and aggregate structure necessary to absorb and hold water. You should always aspire to integrate soil regeneration techniques as an integrated and complementary element of your water management strategies to ensure long-term success.



Troubleshooting and Problem Solving

Despite careful planning, water management interventions may not always work as expected, particularly in the face of extreme weather events. For this reason, it's always recommended to start small and simple when implementing a new strategy. Small and cheap installations have a low risk if they fail, and observing how they work over a season or two can give you the confidence to move forward with larger installations and investments, or give you the chance to change your strategy before taking bigger risks.

If a retention pond breaches during heavy rains, the surrounding infrastructure may need fixing as well, such as reinforcing berms or adding emergency spillways to safely direct excess water. Similarly, if an infiltration basin stops infiltrating water effectively, it may indicate compaction or sediment buildup, requiring periodic maintenance such as sediment removal or upstream vegetation planting to improve function.



Troubleshooting and Problem Solving

In cases where irrigation systems fail—whether due to clogged drip lines, uneven water distribution, or pressure loss—troubleshooting should begin by identifying whether the problem is mechanical, hydraulic, or environmental. Simple adjustments, such as cleaning filters, leveling irrigation lines, or adjusting water pressure, often resolve minor issues. However, larger-scale failures may require redesigning the system to better match needs and conditions. Keeping detailed records of crop and soil hydration, system performance, and water quality levels as well as conducting regular checks ensures that problems are identified early before they escalate into costly setbacks.

Water management is not a static process, or a set-it-and-forget-it installation, but an ongoing adaptation to changing weather patterns, soil and crop conditions, and your evolving farm context. What works well in one season may need adjustments in the next, especially as climate change continues to bring unpredictable rainfall and temperature shifts. You should continuously monitor your water management systems, making regular observations and data-driven decisions based on what is happening out in the field.



Troubleshooting and Problem Solving

The most reliable approach to adaptive water management is integrating multiple strategies that complement each other, in combination with community and water catchment scale coordination. This creates resilience against both drought and excess water. By maintaining flexibility and a willingness to experiment, you can refine your water strategies over time, ensuring they remain effective under evolving conditions.

Many water management failures stem from common mistakes, such as over-engineering systems that require excessive maintenance or neglecting seasonal variations in water availability. For example, some farmers install large retention ponds without considering evaporation rates, leading to water loss during hot months. Others invest in costly irrigation systems only to find that poor soil health prevents efficient water absorption.

By studying real-world failures, farmers can make more informed decisions. Key lessons include avoiding unnecessary complexity, ensuring maintenance is manageable, and designing systems with flexibility to adapt to changing conditions. A successful water management plan should be both effective and sustainable in the long run, requiring minimal intervention while delivering maximum benefit

Conclusion

Water management is a vast and complex subject that touches every part of a farm system and evolves with each landscape, climate, and season. In creating this guidebook, we've worked to strike a balance between the depth this topic deserves and the practicality that farmers need. Rather than attempting to cover every nuance, our focus has been on delivering a clear and actionable starting point: a roadmap for assessing your land, exploring available strategies, and beginning to implement a water management plan that's grounded in your context.

We know this is just the beginning. With support from our farmer members, partners, and technical experts, this guidebook will continue to evolve. We're committed to improving future editions and expanding into companion resources that explore key topics in greater detail—from soil biology and irrigation design to flood recovery, fire resilience, and greywater reuse. Your feedback, questions, and stories from the field will shape how this resource grows.

Above all, we hope this guidebook has helped you take the first steps toward a more regenerative and water-resilient farm. Whether you're just beginning or refining a mature system, you don't have to do it alone. The Climate Farmers community is here to support you. We encourage you to reach out to our network of farmers, facilitators, and coaches for guidance, connection, and continued learning as you bring your water strategy to life.

Acknowledgements

Our sincere thanks to the members of our farmer community, especially those who participated in the Working Groups around this topic:

Albert Saumell Guixà
Antonio Givelho
Cristna Lopez Escorial
Demijan Lukic-Hanomihl
Felipe Terrazas
Filippo Foglia
Gemma Gaitskell-Phillips
Gillen Abrego
Herberto Brunk
Jose Lopes
Jose Ramon Rituerto
José Ruas
Jorge Martínez Vicianá
Juan Olivares Fernandez
Kerstin van Eckert

Leonie Driessen
Marcelo Rezende
Maria Martinez
Matio Lopez
Matyas Bekecs
Miguel Carbayo Pérez
Nelson Bell
Pau Arasa Carot
Paulo Zoio
Philippine Mignot
Rafael Ponferrada Herrador
Richard Mee
Sergio Herrero
William Watson