Droughts and agroecology: let's make sense of it

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This document stems from a desire to make scientific knowledge about the benefits of agroecology in drought management accessible. It draws on a more comprehensive literature review produced by Isabelle Amsallem[1] for CARI[2], offering an educational, action-oriented interpretation for those working on the ground day-to-day.

Without claiming to be as comprehensive as a scientific report, it seeks to bridge the gap between research and practice, shedding light on the practical challenges of drought management through the lens of agroecology. The aim is to demonstrate, in a clear and practical way, how agroecological approaches can strengthen the resilience of agricultural systems and rural communities in the face of current and future crises.

[1] Scientific writer, editor and translator, in charge of publications at Agropolis International.
[2] Centre for International Action and Achievements, a non for profit organisation whose mission is to combat desertification and promote sustainable agroecology.

Publisher & editor: CARI - Adeline Derkimba
Writer: Valérie Noel
Based on the study by Isabelle Amsallem
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Introduction

Due to its wide-ranging consequences, drought is now the most significant climate hazard. This phenomenon, which is affecting more and more areas around the world, has major impacts on agricultural production, hindering it in the short term but also potentially slowing it down in the longer term. One of the best responses to drought today appears to be improving the resilience of farms, which is what agroecology aims to achieve.

To better understand the current situation and the potential contributions of agroecology to managing this hazard, this document provides answers to questions regarding drought, as well as an overview of the levers and tools that agroecology can offer to strengthen farms' capacity to withstand drought, adapt and transform. This overview is organised across three levels, as resilience is considered at the farm level, but also at the regional and national levels.

Finally, the final section explores the institutional approaches currently in place to manage droughts, as agroecology is not yet a commonly used framework in this matter.

Drought: what are we talking about?

Drought is not simply about plants withering, soil cracking or the inability to water one's garden. Multifaceted, with spatial, economic and social impacts that often extend beyond the affected areas, drought is a more complex phenomenon than it appears.

How is it defined? What are its consequences? These are the questions the following pages seek to answer.

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How is a drought defined?

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A drought is characterised by an abnormal lack of rainfall for a given area and/or period. Varying in duration and spatial extent, it may or may not be accompanied by high temperatures. It can occur in any climate and often develops insidiously.

Due to the great variability of the phenomenon, establishing a general definition is not straightforward, as everything depends on the context. During the summer of 2023, for instance, a very severe drought occurred in the Amazon, one of the wettest regions on the planet, which naturally did not share the same characteristics as a drought in sub-Saharan Africa.

Nevertheless, a drought always begins with a **meteorological drought**, which is a deficit in rainfall over a given period compared to the norm in a specific region. This drying out leads to a slowdown in photosynthesis and restricted plant growth, as well as a deterioration in plant health. This then leads to a cascade of effects.

Meteorological drought can lead to **agricultural drought**: the water available in the soil, which constitutes the usable reserve[3] for plants, is no longer sufficient to meet the needs of crops and, more broadly, vegetation. In more technical – and precise – terms, this is referred to as **edaphic drought**: the water content in the soil does not allow plants to compensate for the evaporation caused by photosynthesis, so they dry out. The next stage is **hydrological drought**: due to a lack of supply, surface water levels (lakes and rivers) and groundwater levels both decrease. Consequently, aquifers are no longer replenished.

These physical phenomena naturally have socio-economic and ecological impacts, which depend on the severity of the event. In an irrigated area, a hydrological drought can have dramatic consequences for agriculture, for example.

[3] Il s'agit de la capacité du sol à stocker de l'eau pour les plantes

What are the impacts of this type of climate-related hazard?

12 millions hectares
disappear each year due to drought and desertification
(FAO)

Globally, extreme temperatures and droughts are the natural hazards that cause the greatest impact per event. These are followed by floods, storms and forest fires.
However, just as it is difficult to define a drought, determining and assessing its impacts proves to be complex. Highly dependent on a context that is not always well understood, these impacts are often underestimated. While agriculture is often the first sector to be affected, **the impacts vary in nature and affect multiple sectors.** It can be immediate or appear in the long-term, be direct (such as crop failure) or indirect (such as the extinction of a species following the destruction of its habitat).

Additionally, impacts may extend beyond the drought-affected area itself, as natural, social and economic systems are interconnected and interdependent. A drought in a cereal-exporting region is likely to lead to a rise in global prices for that cereal and, consequently, affect supplies to importing countries. The impacts may be temporary or permanent and may emerge more or less rapidly after the drought. Their intensity is also difficult to assess and relatively poorly documented outside the context of agricultural drought, particularly as the effects of drought can be exacerbated by combined events, such as heatwaves or wildfires.

From an environmental perspective, drought has potential consequences for water resources, soils, vegetation and wildlife. The availability of surface and groundwater may be affected, as well as water quality and salinity where areas are close to the sea or the ocean. Water scarcity can degrade soil structure and reduce its fertility. Dry soil is more susceptible to erosion, and its ability to retain water may deteriorate over the long term. According to the FAO[4], droughts and desertification are responsible for the loss of 12 million hectares of land each year. Beyond reduced plant production, drought affects plant biodiversity, particularly by reducing its ability to regenerate. Wildlife may suffer from a lack of water, whilst herbivores struggle with diminished resources. Habitats may change or even disappear, and fertility issues (soil, livestock) may arise. As with plants, animal biodiversity may decline.

Economically speaking, only the direct effects of droughts are generally assessed, as they are more visible and immediate. These include impacts on agricultural production, in both crops and livestock. According to the FAO, over 65% of the losses caused by droughts affect agriculture globally. However, other sectors are also adversely affected, such as the energy sector due to reduced capacity to generate hydroelectricity, industry due to rising water prices, and tourism due to reduced interest in certain attractions.

Severe droughts can lead to
15 to 30% loss of agricultural GDP
in one single season
(FAO)

Socially, droughts exacerbate food insecurity and malnutrition in vulnerable areas, as food prices rise and access to drinking water diminishes. They bring with them health problems and can lead to famine. Even without reaching that point, they undoubtedly increase poverty and insecurity and can heighten conflicts and tensions. In some cases, they contribute to forced migration.

How do these impacts manifest in agricultural areas?

In the agricultural sector, the impact of a drought is of course linked to its intensity, but also to the time at which it occurs. During sowing or flowering periods, crops are more fragile. But beyond the nature of the hazard, its intensity and its duration, **the impacts of drought depend on the structural vulnerability of agricultural system the impacts of drought depend on the structural vulnerability of agricultural system.**

This multidimensional concept combines the system's sensitivity to the hazard with its capacity to adapt. The concept of sensitivity refers to a system's 'intrinsic disposition' (which depends on its characteristics) to be negatively affected by drought. For instance, certain crops are more sensitive than others to water shortages, such as maize, soya, or fruit trees. The nature of the farm's soils is also a key factor: shallow soils, poor in organic matter, have a lower water-holding capacity (they retain less water) than clay soils, for example. Sensitivity partly determines the extent of the potential impacts of drought: **the more 'sensitive' a system is, the more it will be affected by the hazard, especially if it is of high intensity.**


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A farm's resilience is defined by its ability to withstand potential damage, respond effectively to adverse conditions, and even take advantage of opportunities that may arise. The more flexible the agricultural system, the more resilient and the better equipped it will be. This adaptability depends on several factors, including the farm's level of self-sufficiency (in water, seeds, and know-how) or its organisational flexibility (whether or not it employs staff who must be paid daily, or owns equipment that allows it to intervene at the optimal time in the field, etc.).

Depending on the type of farm, the same drought will therefore have very different effects. Dependence on water resources is therefore a crucial factor. Rain-fed systems are naturally the most exposed as they cannot resort to irrigation in the event of

[4] Food and Agriculture Organization of the United Nations

meteorological drought, the first stage of drought. Irrigated systems are, in principle, less vulnerable, but they are also affected: drought can lower reservoir levels or lead to restrictions on water use. The level of diversification on the farm is another key factor in vulnerability. The more diversified a farm's crops are, the more likely it is to sustain yields for some of them during a difficult period.

The indirect impacts mentioned above must also be taken into account. In agriculture, the impact of a drought extends beyond the area directly affected. Market pressures, increased water costs or restrictions on water use can also affect areas geographically distant from the hazard.

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What factors exacerbate droughts?

Soil degradation is the main factor exacerbating the effects of droughts. This multi-causal process reduces the biological and economic productivity of land, particularly in arid and semi-arid regions, thereby increasing the vulnerability of communities. As land degrades, the ability of ecosystems to provide essential services (soil stabilisation, regulation of the water cycle, biodiversity protection, etc.) diminishes. Decline in agricultural yields and the resulting food insecurity are worsening. A further danger is that soil and vegetation degradation can trigger a feedback loop in which reduced soil moisture contributes to exacerbating the impacts of droughts, thereby creating a cycle of soil degradation.

Contrary to popular belief, climate change itself cannot be described as a truly aggravating factor.
The IPCC (Intergovernmental Panel on Climate Change) notes significant regional variability in its analysis of the historical frequency of droughts. In other words, they are not intensifying everywhere. Regardless of the type of drought (meteorological, agricultural, hydrological), experts have observed since the 1950s that these episodes have become more intense and longer-lasting in southern Europe and western Africa, but they appear less frequently, with less intensity and over shorter timeframes in central North America or north-western Australia.

Focusing specifically on agricultural droughts, IPCC experts have 'medium confidence' that these are increasing in several regions of the world. Given these difficulties in assessment and attribution, it is difficult to assert that there is an undeniable link between climate change and observed drought trends. One thing is certain, however: **when droughts recur in the same location, the cumulative stress on ecosystems increases vulnerability, exacerbating potential damage.**

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Can the consequences of drought be prevented?

Anticipating the effects of a drought requires assessing the risk of impact. This depends on the probability of the hazard occurring in a given area and at a given time, and therefore on climatic and meteorological conditions.
But we must also consider the assets or people exposed to this hazard in the area: is it densely populated? Is agriculture highly developed there? Finally, we must take into account the inherent vulnerability of the systems that may be affected.

The difficulty of prevention lies in the fact that people cannot influence weather conditions, population density or economic activities in the affected area in the short term. **The levers for action to reduce the risk of impact on an exposed system lie instead in reducing its vulnerability to droughts.** This means reducing its sensitivity to the phenomenon, improving its capacity to adapt, and more broadly improving its resilience. In addition to adaptive capacity, which includes the ability to self-organise, this concept encompasses the capacity to withstand shocks and absorb them, as well as the ability to cushion the effects of drought and then bounce back, thereby potentially transforming the agricultural system.

As we can see, the scope for action is limited: it is unrealistic to prevent a drought, a natural hazard over which humans have no control. But it is possible to prevent this event from becoming a disaster, which occurs when the hazard interacts with existing systems in a way that causes significant disruption and losses. It is in preventing this tipping point that the challenge lies for development practitioners and policymakers. The less vulnerable agricultural systems are, the better prepared individuals and communities are, and the more the effects of drought are mitigated. In this context, agroecology emerges as a highly useful concept.

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KEY LEARNINGS

Droughts, which come in various forms depending on their duration and nature (meteorological, agricultural, hydrological), have major impacts on agriculture. Globally, it is the sector most severely affected by this type of hazard.

The impacts vary depending on the adaptive capacity of the production system affected, which depends mainly on their organisational flexibility as well as their level of autonomy and vulnerability. Whilst it is difficult to prevent this uncontrollable hazard (which cannot really be attributed to human-induced climate change) it is possible to mitigate its effects. This requires work on the resilience of food systems... which is what the concept of agroecology offers.

The benefits of agroecology in the face of droughts

In the face of the complex phenomenon of droughts, agroecology emerges as an effective approach to preparing for and coping with them. As a scientific discipline that combines agronomy and ecology applied to agroecosystems with the humanities and social sciences, it proposes to redesign agricultural and food systems by integrating all these concepts.

In practice, agroecology aims to produce food by making the most of living organisms without threatening them. Natural processes are enhanced whilst reducing pressure on the environment and conserving resources. In other words, agroecology seeks to make 'the best possible use' (efficiently and sensibly) of the functions, dynamics and diversity of ecosystems. This involves constantly adapting agricultural practices to the local environment, but also not thinking solely at the level of the individual plot. Biogeochemical and hydrological cycles, epidemics or pest outbreaks must be understood on much larger scales. This is why the agroecological transition must also be considered at the regional level.

The ultimate goal is precisely to increase the resilience of farms and agricultural regions, that is their ability to absorb, endure, adapt to and withstand the impacts of such natural disasters. This amounts to developing both their capacity to cope with shocks, to adapt and transform themselves. In other words, by helping to improve the resilience of farms, agroecology helps to reduce the risks associated with droughts.

Agroecology to build long-term resilience[5] in agricultural systems in the face of drought

[5] In addition to adaptive capacity, which includes the ability to self-organise, the concept of resilience encompasses the capacity to withstand shocks and absorb them, as well as the ability to cushion the effects of drought and then bounce back, ultimately transforming the agricultural system.

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By reducing the vulnerability of farms and agricultural areas, agroecology offers a promising solution to droughts, events whose scale is difficult to predict. Because they optimise the use of natural resources through the diversification of crop species and the selection of suitable varieties, agroecological agrosystems have both lower requirements and better access to water, light for photosynthesis and nutrients.

Economically, income diversification provides households with security against crop failure and market fluctuations, whilst recycling and synergies reduce dependence on external inputs. Socially, the co-creation and sharing of traditional and scientific knowledge strengthen the region's capacity to adapt to droughts. The formation of a strong collective enables the establishment of responsible governance that facilitates the joint management of water resources. Additionally, the circular and solidarity-based economy that runs on short supply chains reduces vulnerability to crises.

While the effects of an agroecological approach are by nature limited (since agricultural practices alone cannot change the structural context that significantly influences exposure to and susceptibility of drought), it does have a real impact on the vulnerability of agricultural systems. **It is through a combination of levers, actions and tools (which can be deployed in a complementary manner across multiple spatial and temporal scales) that the agroecological approach works. Taken separately, each of these has only limited effectiveness. Together, they increase the resilience of farms.**

With a view to developing effective risk prevention strategies, some twenty tools are identified in the following pages, at the level of:

.a farm
.a region
.a country

Improving farm resilience to climate hazards: four areas where agroecology makes a difference

As the first link in the production chain, the farm is the most immediate and central level at which to implement agroecological practices. These practices make it possible to manage the soil by limiting its degradation, whilst also making the most of local resources, thereby contributing to greater farm self-sufficiency (a goal further supported by the diversification of crops and income streams).

Better structured and healthier soils

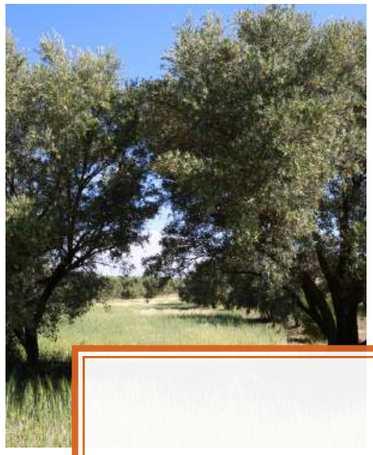
Fallow land, mulch, crop rotation, intercropping, integration of legumes, reduced tillage… These are all agroecological practices aimed at improving soil fertility and structure. This is a crucial point since degraded soils are one of the primary factors exacerbating droughts (see p. 11).

These 'good practices' help, among other things, to reduce erosion and boost soil biodiversity, which in turn increase organic matter and its mineralisation, all without potentially polluting external inputs (such as chemical fertilisers). These practices improve two key elements: soil fertility and its water-holding capacity, i.e. its ability to store water for plants. When the latter is at a good level, the need for irrigation is reduced and plants 'hold out' longer during a drought. In agroecology, working to improve these two parameters involves, in particular, soil enrichment with organic matter, a key practice.

At the plot level, this can be achieved by adding biomass from the incorporation of crop residues, the introduction of catch crops into crop rotations, grazing (which introduces animal manure), or the addition of external organic matter (compost, manure).

These inputs help to replenish the soil's organic carbon content and, in all cases, improve crop productivity through their positive effects on the soil's chemical, organic and physical fertility. Yields become more consistent from one year to the next on farms that monitor the organic matter content of their soils. In rain-fed systems, maintaining organic carbon helps to retain moisture in the soil.

More broadly, organic matter promotes the development of soil microorganisms (bacteria, mycorrhizal fungi, earthworms, etc.), which play a vital role in the functioning of major biogeochemical cycles. By forming humus, they maintain and sustain the physical and chemical properties of the soil.

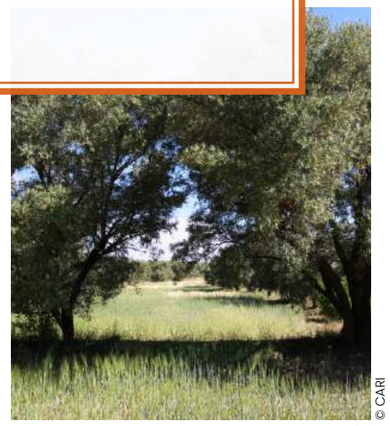


Techniques that improve soil

Conservation agriculture. This is based on reducing tillage, maintaining permanent ground cover and crop rotation. It helps to retain moisture in the soil, prevent erosion and improve water retention in the soil.

Ground cover. Planted with legumes or grasses, ground cover protects the soil from erosion, limits water evaporation whilst improving soil structure and reducing nutrient leaching. Another way to cover the soil is mulching, which involves covering it with a layer of organic matter (hay, straw, dead leaves) to limit water evaporation, reduce runoff and maintain a stable surface temperature.

Agroforestry. When grown alongside crops, trees play a crucial role by providing shade, improving water retention, reducing soil erosion and creating a more favourable microclimate for crops. They can also provide an important supplementary food source for livestock, particularly during periods of drought, or serve as an additional source of income through the production of firewood or fruit. By promoting rapid regeneration, pollarding is one of the practices that enhance the benefits of trees.



Improved water use at plot level

When water becomes scarce, the aim is to improve the efficiency of its use, which involves reducing demand. The challenge is also to anticipate this and store water when it is abundant. Agroecological approaches to water management address these three aspects: **limiting requirements and losses, optimising collection at the plot level, and optimising its use and conservation in the soil.** Various practices address these challenges, often in combination.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Among the strategies for saving water are the selection of drought-adapted cultivars, species or breeds. Meanwhile, certain traditional techniques such as zaï farming, terraces, or stone ridges promote the capture and infiltration of rainwater. Crop diversification, for its part, encourages plants to collect more water from the soil, for example through the introduction of 'water-lifting' plants that draw water from deep underground. Water retention in the soil is further enhanced by no-till farming, ground cover, windbreaks, hedges, agroforestry and intercropping.
These practices not only increase the availability of water in the soil for the plant,but also reduce losses through runoff and evaporation of water stored in the soil. Used together, they have other positive effects. By promoting the activity of certain invertebrates, no-till farming and ground cover improve soil macroporosity[6] , which aids water infiltration into the soil.

These practices can be combined with water supply via irrigation. Used sparingly, in line with the needs of agroecosystems and water availability (which is, of course, low during droughts), they aim not for maximum agricultural production, but for its stability over time. This backup irrigation can be implemented in rain-fed agriculture, provided farmers create rainwater reservoirs.

However, this requires prioritising essential crops and plots during periods of drought... potentially difficult decisions.

[6] Soil porosity refers to the empty spaces between soil particles, occupied by nutrient-rich water (solution) or air. Macroporosity refers to pores larger than 8 microns, which hold water after rainfall, whilst microporosity refers to pores smaller than 8 microns. When significant, macroporosity contributes to good water infiltration into the soil.

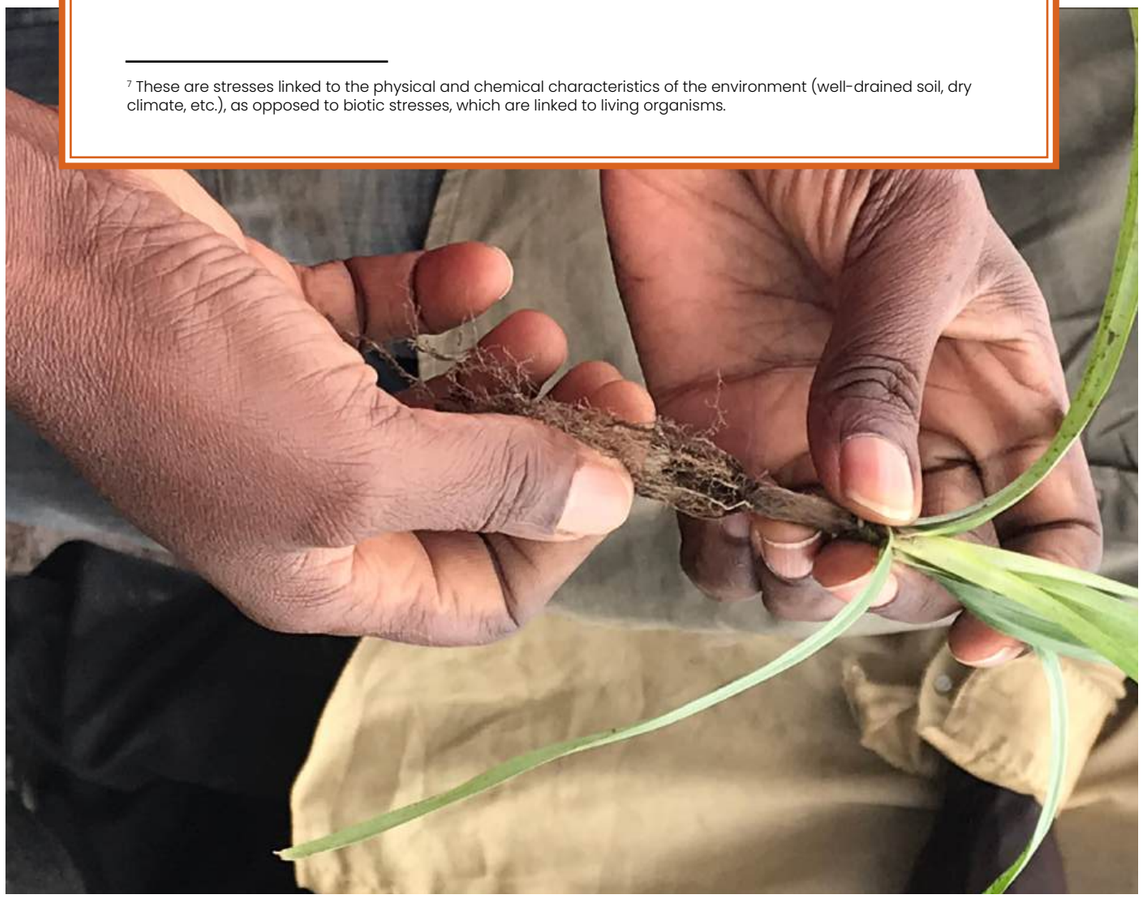
To optimise water management, it is essential to use it in precise quantities, only where it is needed. Innovations such as micro-irrigation, drip irrigation or precision irrigation, particularly those using soil moisture sensors, are of interest. Developed through agricultural and hydrological engineering, these tools enable optimised water management by limiting losses through evaporation and excessive infiltration.

All these practices, which are based on minimising water consumption even where water supplies are available, are designed to maintain agricultural production during periods of drought.

Mycorrhizae to reach water further down

By forming a symbiotic relationship with plant roots, mycorrhizal fungi increase a plant's ability to absorb water from deeper in the soil. During a drought, crops can therefore make better use of water reserves in the soil and prolong their survival. Scientific research has shown that mycorrhizal symbiosis facilitates plant development in environments subjects to abiotic stresses[7].

[7] These are stresses linked to the physical and chemical characteristics of the environment (well-drained soil, dry climate, etc.), as opposed to biotic stresses, which are linked to living organisms.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Production diversification: a key to resilience

One of the principles of agroecology is to collaborate, to form partnerships, to foster synergies… including within plant communities or between plants and animals. This is one of the many benefits of diversified cropping systems. Because they occupy different ecological niches[8], plants compete less for water and nutrients, which stabilises (or even increases) production, even during periods of water stress.

Interactions between species (which may compete or, conversely, complement one another) occur both above ground (through the interception of sunlight) and at the root level (through the uptake of water and nutrients). From a biogeochemical perspective, niche complementarity typically applies to associations between legumes and grasses. By fixing atmospheric nitrogen through symbiosis with microorganisms (rhizobia), legumes enrich the soil with nitrogen which, once mineralised by the microorganisms, is reused by other plants.

Other types of associations are of interest. Synergies exist, for example, between woody plants (trees) and herbaceous plants: the former draw resources from deep in the soil, leaving the more accessible resources (such as water) for the latter. They also capture these resources and make them available to the latter via litter or roots (in the case of nutrients). Synergies between crops and livestock, meanwhile, help create a system where soil fertility is maintained or even improved, thanks to the recycling of organic matter (compost, crop residues, manure, etc.), whilst reducing dependence on chemical inputs.

Overall, production diversity reduces the agroecosystem's vulnerability to climatic disturbances, particularly because it improves the distribution and utilisation of resources, thereby reducing the risk of depletion of both nutrients and water. It also limits economic dependence in the event of market price fluctuations or poor harvests caused by drought.

[8] An ecological niche refers to the set of environmental conditions under which a given species can form viable populations.

Combining fruit trees with arable crops

In dry areas, combining fruit trees with cereals and pulses provides income and food during the first 3 to 10 unproductive years of orchard establishment, whilst creating favourable conditions for positive synergies between field crops and trees once the orchard is mature. Trees also play a vital role in the water cycle by improving soil infiltration, increasing soil porosity around the roots,which promotes water retention.

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Securing incomes by focusing on farm self-sufficiency

Reducing external economic dependencies is what agroecology promotes. Many agronomic practices contribute to this, such as biological synergies which help reduce inputs, or recycling (wastewater, organic matter, etc.) which limits needs for these inputs. Livestock by-products can then be used as fertilisers for crop production, whilst crop residues can, for example, be used to feed livestock, creating a virtuous cycle.


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These practices reduce waste and make farms less vulnerable to fluctuations in both markets and the availability of inputs (including seeds).

In a solidarity-based economic system, farmers can also share expensive equipment, such as irrigation systems, through mutual aid or leasing. This is a way of reducing initial costs and acquiring equipment suited to resource management during periods of drought. The pooling of resources at the local level can also extend to seeds, compost or labour, reducing production costs and making them less vulnerable to the economic impacts of drought.

Diversification of crops and production **is another key tool for spreading economic risks, maintaining a minimum level of food production** and ensuring a degree of food security despite water scarcity. The diversification of farming activities includes processing. By making use of methods for storing, transporting and processing agricultural products, farmers and communities in general are better able to cope with food shortages caused by drought. Being more self-sufficient, they can all, thanks to their reserves, more easily adjust their cropping schedules when necessary. Processing agricultural produce can increase profits by allowing sales to be spread over a longer period. It can thereby facilitate access to new markets or more lucrative markets.

Diversification also means building up a savings cushion without having to rely on a bank. In many parts of Africa, this cushion takes the form of a herd of small ruminants. Complementing crop production, it constitutes the savings of many families.


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However, expanding the range of crops produced – as well as adopting agricultural practices that are more drought-resistant – can be costly for farmers and require specific knowledge (the production of fonio, for example, demands a high level of technical expertise during processing).

Additionally, when real opportunities for diversification are limited, poor farmers tend to specialise in low-risk, low-yield activities, which do not allow them to significantly increase their incomes.


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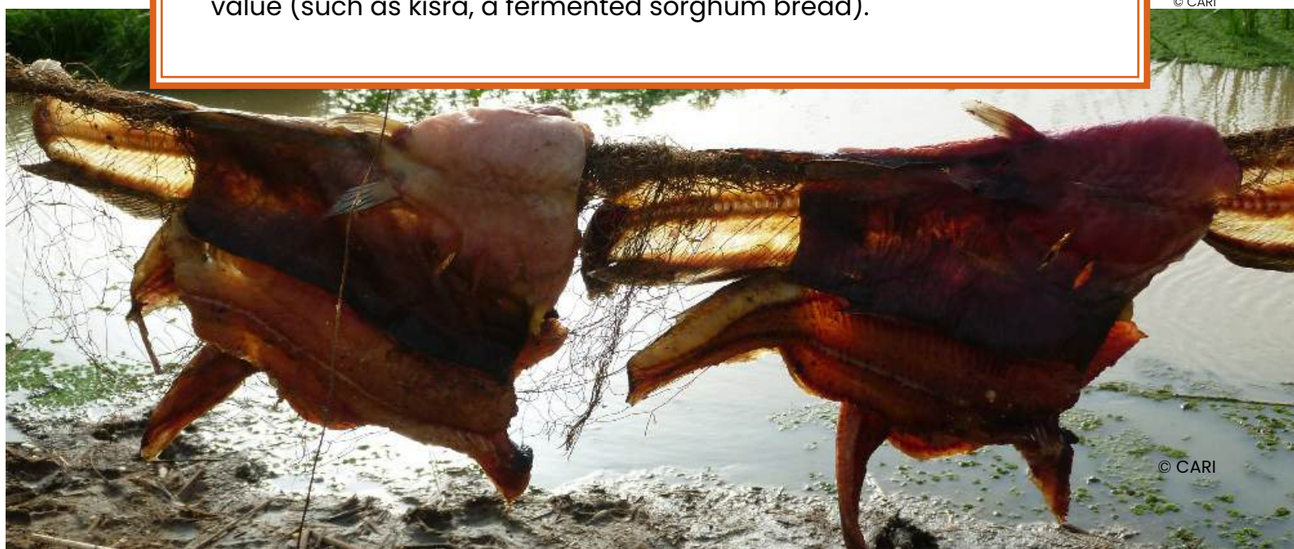
Local know-how for farm self-sufficiency

Thanks to local knowledge, it is possible to identify nearby natural resources (medicinal plants or edible species) that are better suited to drought. Often of high nutritional or medicinal value, they are particularly useful and contribute to the self-sufficiency and enrichment of farms. This utilisation of local resources can be greatly enhanced through scientific contributions: agricultural research is able to identify the wild varieties best suited to drought conditions or to facilitate their transport and storage.

Similarly, traditional preservation methods enhance farmers' self-sufficiency. Salting and smoking fish and meat, processing cereals and pulses into pasta or flour extend the shelf life of food and provide a source of protein during droughts. These low-cost traditional practices help to make use of surpluses from previous harvests in preparation for periods of scarcity, thereby preventing sudden food shortages. Another traditional method, the fermentation of cereals, vegetables or milk, preserves food whilst improving its nutritional value (such as kisra, a fermented sorghum bread).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Supporting farm resilience at the local level: six areas where agroecology can make a difference

This is the whole point of agroecology: to develop a systemic approach that avoids isolating the farm and instead considers its needs and development within its natural, economic and regional environment. By creating dynamics that support the farm, the region can play an important role in building its resilience to drought.

Biodiversity for improving agricultural production and resilience

For a long time, the performance of agricultural systems has been synonymous with genetic uniformity in varieties and breeds, with the aim of creating an environment that is as simplified and homogeneous as possible. The principles at the heart of agroecology are radically different. Agroecological practices optimise biological or ecological processes linked to biodiversity for the benefit of agricultural systems at different spatial scales – from the plant to the landscape – across successive crops, within a given context.

Designing an agricultural system using agroecology involves reintroducing and maintaining biodiversity in such a way as to promote the provision of ecosystem services[9]. This biodiversity, so useful to agricultural systems, is known as 'agrobiodiversity'. It includes both cultivated and wild species, the genetic variability of these species, the diversity of ecological habitats and their distribution across time and space. These habitats represent the range within which wild animal and plant species move.

In agroecology, the aim is to promote this agrobiodiversity not only at the farm level, of course, but also across the wider region. Various biological and ecological processes can therefore be optimised through practices designed for this broader scale. The presence of several plant species within a region, for example, hinders the spread of pests and diseases, which are often specific to one or a few species. Thanks to this functional biodiversity, agricultural systems benefit from natural controls against pests and diseases: balanced populations of predatory insects, pollinators and other species help to reduce pest populations, even during periods of water stress. In addition, research has shown that crop rotations or intercropping disrupt the habitats and life cycles of pests and diseases. Mixed grazing involving different species of ruminants also helps to limit health risks among animals.

[9] Ce sont les services produits par un écosystème donné, tels que la pollinisation, le contrôle biologique des pathogènes, l'enrichissement du sol en azote grâce à la présence de légumineuses…

At the regional level, agroecology creates a mosaic of landscapes by diversifying crops or introducing crop rotations, grasslands, hedgerows or agroforestry. This leads to an increase in biological diversity within agricultural production systems (agroforestry, intercropping, etc.) and the promotion of traditional breeds and varieties adapted to local conditions. This greater functional biodiversity helps to stabilise ecosystems, making them more resilient to climatic stresses such as drought.

The role of trees in pest management

Trees can play an important role in the agroecological management of pests, particularly in agroforestry systems but not only there. On the one hand, they alter the physical environment and pests, directly or indirectly, for example by creating physical barriers that restrict the movement of these pests. On the other hand, they alter the biological environment and encourage the natural enemies of these pests (birds, certain arthropods and microorganisms).

Managing water resources at the regional level

In agroecology, managing water at the regional level involves creating forums for dialogue, consultation and management where stakeholders can exchange views and negotiate, particularly regarding the distribution of the resource. This dialogue may, for example, lead to the creation of water banks and informal water collection groups that facilitate the temporary trade of water between farmers. Those with a surplus can transfer it to those in need, thereby optimising water use and supporting agricultural productivity in the region during periods of drought.

On a larger scale, when water management becomes a community effort, collective solutions can emerge: digging wells, shared maintenance of wells and reservoirs, and the establishment of community irrigation systems. Collective thinking can also encourage recycling practices, which allow nutrient-rich wastewater or agricultural drainage water to be reused to irrigate new crops. This not only conserves water but also makes use of the nutrients present in this water, thereby reducing the need for chemical fertilisers.

Water recycling also includes rainwater harvesting, which can be stored in cisterns or retention basins for use at strategic times. These alternative water sources for communities and agriculture reduce their dependence on freshwater resources and their vulnerability to hydrological droughts. Such water collection and reuse systems require collective organisation, which can be supported by local management bodies.

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Restoring water and soil at a regional level

In the Yatenga, a semi-arid region in northern Burkina Faso, water scarcity and soil degradation led communities to establish a collaborative approach to water and land management as early as the 1980s.

Through local governance involving traditional leaders and local councillors, the villages organised community projects to build half-moons, stone barriers and filter ditches. Designed as a network rather than on a plot-by-plot basis, these measures helped to slow down runoff, recharge groundwater and retain fine-grained soil. The reclaimed land was then put to good use through intercropping and the planting of woody species.

These integrated developments have transformed the landscape and improved water resilience: the rise in the water table sometimes exceeds one meter in the rehabilitated areas, and agricultural production has once again become viable there despite irregular rain.

Structuring value chains

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By broadening the scope of their economic activity beyond strictly agricultural production, farmers can secure diversified income streams, making them less vulnerable to crop losses caused by drought. In doing so, they improve the household's gross income and reduce its economic vulnerability. There are numerous avenues for development: converting agricultural waste into energy, crafts, agritourism, local gastronomy, processing raw materials, wage-earning activities, etc.

Such diversification generally requires the structuring of new value chains or the adaptation of existing ones. This may, for example, involve a certification process undertaken outside of a crisis, so as to promote certain products to consumers. Collective initiatives, such as the establishment of cooperatives, can also encourage the development of craft activities or non-agricultural community projects.

This range of activities forms part of a circular and solidarity-based economy, which lies at the heart of agroecological principles. The aim goes beyond simply generating additional income: **it is to reduce farms' dependence on long supply chains, which are often disrupted during periods of drought by constraints linked to transport or the scarcity of raw materials.** Generally associated with short supply chains, these diversification measures, which limit the number of intermediaries, support producers' incomes whilst maintaining fair prices for consumers and strengthening local economic development.

Relax product quality standards

During the 2018 drought, the UK retailers relaxed products quality standards and launched campaigns to encourage consumers to buy fruit and vegetables that did not meet strict size requirements. This flexible approach helped farmers generate income during this difficult period.

Fostering economic and social solidarity among peers

In a context of uncertainty linked to resource scarcity, individual competitive strategies are less viable than mutual aid strategies. Cooperation becomes advantageous as it allows for a more stable and sustainable use of environmental resources. Various forms are possible, such as the creation of solidarity networks, mutual aid groups or cooperatives among farmers or members of a community. Their benefit? **Facilitating the sharing of resources and knowledge (ideas, know-how, practices and experiences) and strengthening the capacity for collective anticipation ahead of a drought.**

The strong social cohesion fostered by agroecological practices makes communities better able to pool their resources in a variety of ways. For example, they can develop livestock and seed exchanges, collective water storage and irrigation systems, or pool production through agricultural cooperatives to better withstand resource shortages. Mutual aid networks such as local food banks, community funds to purchase water management equipment, or emergency food reserves may emerge. Solidarity-based economic systems such as social protection mechanisms or safety nets may also be established to support the most vulnerable households.

During a drought, these tools help farmers to continue production in spite of its decline. As well as being vital to the survival of farming households, these community projects also serve a social purpose: they strengthen a sense of belonging and help to alleviate loneliness. Outside of crises, they encourage reflection on collective sustainable practices (supplementary irrigation, soil improvement, etc.) with a view to reducing vulnerability to droughts.

More broadly, strengthening ties within a community enables it to be better equipped to make collective decisions on resource management in the event of drought. Strong social cohesion also helps prevent conflicts through the establishment of consultation mechanisms and resource-sharing policies, which promote peaceful and equitable redistribution solutions.

Among farmers, cooperation and solidarity also facilitate the exchange of experiences and skills. Networking, in whatever form, simplifies the dissemination of information on drought management solutions and strengthens the collective capacity to anticipate and manage drought-related risks. It helps to boost farmers' morale, enabling them to cope better with uncertainties, particularly those related to the climate.

Collaboration can extend beyond farming communities to include local businesses and government institutions, creating networks of cooperation. By forging links with different sectors (health, environment, etc.), farms can mobilise a variety of resources and expertise to anticipate and respond to drought.

Traditions that encourage mutual aid and solidarity

Traditional practices often foster solidarity and mutual support within the community (neighbours, family, communities, etc.). As a result, the most vulnerable members (the elderly, the poorest families, etc.) benefit from the redistribution of surplus food during periods of drought. Communal meals are also part of certain traditions. The social values and solidarity systems associated with traditional food cultures help communities collectively overcome crises caused by drought. This is the case, for example, with community grain banks, which serves as a means of storing surplus produce and distributing it when needed.

Providing tools for income security

Partially ensured by crop diversification (see p. 22), income security also relies on more conventional tools: savings, agricultural insurance, and formal or informal credit. The first two are put in place before the crisis, while credit is resorted to during the crisis, but they all mitigate the economic and social impacts of drought. Their benefits are manifold: **stabilising incomes and ensuring household food security, avoid detrimental survival strategies, encourage more resilient farming practices and support post-crisis economic recovery by limiting damage that could have significant long-term consequences.**

The use of savings, for example through the sale of assets such as livestock, helps farmers offset losses in agricultural production and income. Informal credit (loans between individuals, tontines [AS16.1], remittances from the diaspora, etc.) plays a crucial role in enabling families to cover immediate or emergency expenses, thereby reducing the need to resort to more extreme means of survival. It is often more flexible and accessible to low-income households than formal credit. In highly disadvantaged areas, or when drought affects a large area, these mechanisms, which rely on community solidarity, however, face limitations due to the limited resources of people living in these areas.

When provided by financial institutions (banks or credit unions), loans can be larger in scale. Beyond providing survival aid, they enable farmers to maintain their livelihoods during drought by financing needs such as the purchase of drought-resistant seeds, fodder for livestock or access to irrigation. However, such loans are only granted to farms provided they have a certain financial standing.

milarly, some farms can afford to take out agricultural insurance against climate risks (crop insurance, insurance indexed to yields or rainfall, etc.). In the event of a crisis, they can then have their losses partially or fully compensated. But in poor countries, these modern commercial insurance mechanisms are limited. They are virtually non-existent in rural areas due to contract enforcement failures and information asymmetry. When farmers are poor, they must essentially rely on self-insurance (such as the safety net often provided by their livestock, for example) and informal insurance mechanisms. These are not sustainable over time, especially if disasters recur. The droughts that struck the Sahel in 1973 and 1983 illustrate these limitations: many farmers sought to sell their livestock before it died, but with the flood of supply, prices collapsed. In most cases, they were unable to recoup any savings.

When drought reaches a certain level of severity across a region, loans at preferential rates or guaranteed by the state can step in and encourage producers to adapt their practices without risking excessive debt. Synergies with financial institutions make it possible to release emergency funds or access tailored loans to cover losses. The banking and insurance sectors can also set up ad hoc financial services, such as microloans. Farmers can then invest in infrastructure that proves useful in the event of a crisis.

The bulwark of village tontines

In the Kollo region, in south-western Niger, women organised into groups have since the 2010s set up a tontine scheme designed to build up a cash reserve for periods of drought. Each week, members contribute a small sum to a communal fund, which is redistributed on a rotating basis or in emergencies (such as when an active member fall sill). This community-based savings scheme, managed without a bank, has enabled them to finance the collective purchase of seeds and fodder during critical periods. Supported by local NGOs, these schemes reduce dependence on usurious loans and stabilise agricultural incomes during times of crisis. The strength of these tontines lies in local trust and solidarity: where formal insurance remains largely inaccessible, the community structures ensure financial autonomy and strengthen the ability to prepare to recurring droughts.

Encouraging cooperation between stakeholders

The sharing of knowledge and data between different sectors (agriculture, environment, meteorology, energy, research, etc.) helps to manage crises, particularly through the dissemination and sharing of crucial information, such as climate forecasts, water resource availability, or energy needs. More specifically, synergies with the meteorological sector and information services (technology, communication) provide farmers with access to climate forecasts and early warnings. Farmers can thus prepare adaptation measures – for example, by favouring low-water-use species and drought-resistant varieties or by delaying sowing – and reduce the vulnerability of their crops to periods of drought.


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More broadly, **multi-stakeholder and cross-sectoral networks help to strengthen farms' ability to adapt during droughts,** primarily by facilitating a rapid response to early warning signals issued to farmers. Through improved cross-sectoral coordination (agriculture, water, environment, economy), these networks also encourage concerted action to anticipate different needs and balance resource allocation according to local realities during the drought. Competition among farmers for scarce resources is thereby reduced. This is particularly true for water, where a negotiated and equitable management system is put in place, involving the sharing of water points, shared irrigation systems, etc. These tools help to anticipate and reduce conflicts over water use.

Overall, these cooperation network[AS18.1]s facilitate coordination among stakeholders on the ground (farmers, local authorities, NGOs, etc.) in the implementation of crisis management programmes and emergency responses where necessary (distribution of agricultural inputs, logistical or financial support, investment in rural infrastructure to ensure the supply of water and other resources, as well as food aid, distribution of drinking water, etc.). It also helps to avoid duplication of effort and maximises the impact of interventions.

Cooperation can also involve knowledge-sharing between farmers and researchers. This helps shape the future by facilitating the rapid dissemination of innovative techniques and scientific information on appropriate management practices and available resources. Thanks to partnerships with research centres or universities, farmers can adopt resilient agricultural techniques more quickly and, ultimately, increase their ability to respond rapidly to a crisis.

Action research projects are another form of collaboration between researchers and farmers. They produce practical solutions tailored to local needs that are easily adoptable. According to CIRAD, locally led participatory breeding programmes lead to greater uptake of the selected varieties, which are better suited to prevailing soil and climate conditions, intensification objectives and local dietary preferences.

Farmers' networks to keep local seeds alive

Aware of the constraints of their environment, farmers in arid zones have often, over generations, selected plant varieties that are more drought-resistant and well-adapted to local conditions. The same applies to animals. Local breeds are often better able than others to withstand the consequences of droughts, particularly sharp fluctuations in water and fodder availability.

But maintaining local genetic diversity is no easy task. By providing an effective means of accessing seeds, not only locally among farmers but also over long distances, farmers' seed networks are invaluable.

Over the centuries, this circulation has enabled farmers to reshape their crops – through selection, production and other exchanges – and to adapt them. Undoubtedly, these networks contribute to the conservation of biodiversity and the development of more sustainable agriculture in the face of climate change. But whilst 80 to 90 per cent of all seeds still circulate through these networks, their role is only just beginning to be recognised by researchers and policymakers.


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Improving resilience to hazards at the national level: three tools for better organisation

Whilst the resilience of farms is built at the local level, it also needs to be supported at national level by States and governments. This is particularly true in the case of droughts, the effects of which extend beyond the area directly affected. Agroecology also provides a framework for reflection at this level. Four tools are explored here: public policy in the broadest sense, early warning systems, decentralisation[10] of decision-making, and collaborative resource management.

Public policy: how to promote crisis prevention

Encouraging agricultural practices based on agroecological principles (crop diversification, conservation soil management, etc.) and the sustainable use of natural resources (water, land, biodiversity) to reduce the risk of drought impacts can be achieved through public policies. Traditional tools such as subsidies, loans, tax relief or training encourage farmers to adopt these practices and invest in techniques and equipment that strengthen their farms' resilience to extreme weather conditions.

More recently, payments for ecosystem services and public goods have been added to the public policy toolkit. This approach aligns financial incentives with environmental benefits by promoting sustainable agricultural practices. The aim is to create opportunities to provide financial support to farmers in implementing practices that improve their farms' resilience to drought. Whilst facilitating equitable and sustainable access to resources (particularly water and land), public policies also need to prevent their overexploitation, with a particular attention to water during periods of drought.

But agroecology is not limited to agriculture and resource use alone. With the aim of ensuring sustainable resilience in the face of future climate events, it also addresses the underlying factors (poverty, social inequalities, soil degradation, etc.) and the factors that exacerbate drought (demographics, institutional weakness, etc.). This requires, for example, anti-poverty policies to reduce vulnerabilities and take into account the needs of the groups most vulnerable to the impacts of droughts.

[10] The State transfers some of its powers to local authorities, thereby granting them a degree of autonomy

This also involves taking social and economic disparities into account. Several instruments contribute to this. The establishment of social safety nets to help vulnerable populations survive periods of drought, such as food subsidies or water distribution programmes, is one example. The promotion of insurance schemes to protect farmers and livestock breeders against losses due to droughts is another.

Finally, it involves implementing policies to protect vulnerable ecosystems. Here too, the tools are varied. They range from the conservation of wetlands (natural water reservoirs) to the restoration of catchment areas and degraded land to improve water retention in soils and ecosystems, as well as the establishment of environmental regulations to limit the overexploitation of natural resources (deforestation or the overuse of groundwater).

Social safety nets to prevent crises

In Niger, to prevent periods of drought from escalating into humanitarian crises, the government and its partners (notably the National Mechanism for the Prevention and Management of Food Crises, DNPGCA) haven since the 2000s established social safety nets that combine seasonal cash transfers, targeted food distribution and support for land restorative work. Activated at the first signs of a rainfall deficit, these mechanisms help to limit the forced sale of livestock or crops and prevent the depletion of household assets.

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A national vision for collaborative resource management

Inspired by agroecological principles, collaborative resource management involves organising the conservation of resources and maximising their efficiency as part of a collectively devised strategy, which is more effective than individual decisions taken without consultation. During periods of drought, certain choices are difficult to make at an individual level, particularly as they only have a real impact if adopted by a large number of farms. This is the case with reducing production to conserve water resources. It requires limiting the area under cultivation, abandoning water-intensive crops, and concentrating production on the most fertile and best-irrigated plots. It means leaving land fallow or planting cover crops on the remaining areas.

In livestock farming, reducing feed rations and water consumption in terms of both quantity and quality may be considered. However, it may be necessary to reduce herd size by selling or slaughtering animals, particularly the least productive or non-breeding ones. Only the best animals are then retained to ensure production resumes once the drought is over. Moving herds to less affected areas is another option, as is switching to different livestock species or diversifying within drought-prone areas. The Bedouins of the western desert coastal zone have adopted various strategies to cope with prolonged drought, including goat rearing, as goats are more resilient when resources are scarce.

These decisions have significant consequences for individual farms or herders and can be encouraged through public policy tools (grants, loans, tax relief, etc.). More generally, implementing collaborative management involves informing all stakeholders of the situation, the risks and potential solutions, and then involving them as much as possible in decision-making. Although longer, this process is ultimately more effective as it involves many more people. It is ideally designed for the medium and long term.

In the face of drought, effective collaborative resource management relies on preserving and improving soil health. Useful measures include: fertility management through the integration of crops and livestock, biodiversity maintenance through the preservation or the development of complex landscapes with multitudes of habitats.
The development of a national strategy makes it possible to maximise the area covered and to streamline its management.

Coordinated resource management also involves equitable and sustainable access to resources (particularly water and land) as well as the prevention of their overexploitation, which is generally ensured by regulations. Here too, a national-level approach will be more effective and will guarantee the provision of resources. Collective management measures, such as the creation of water reservoirs or the development of groundwater recharge areas that maintain a constant water supply for agriculture, are costly and must be considered on a large scale to be effective in the medium and long term.

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Defusing conflicts through shared land governance

In Niger, growing pressure on land and climate variability have led the government to adopt a participatory land policy based on consultation between stakeholders. The national framework, which is underpinned by decentralisation and the 1993 Rural Code, is based on the creation of Land Commissions (COFO) at various levels (village, commune, department). These bodies bring together farmers, herders, traditional leaders, local elected representatives and technical services to collectively negotiate usage rights and register land transactions. Strengthened in the 2010s with the support of the Food Security Support Programme (PASA), this mechanism has helped to anticipate and defuse numerous conflicts between farmers and pastoralists in the Maradi and Dosso regions, thanks in part to meditation regarding transhumance corridors and croplands.

Early warning signals to save time in an emergency

Installing early warning systems has several benefits. It provides a means of detecting signs of impending drought and taking both preventive and responsive measures. Based on the management of climate and hydrological information, this proactive planning provides governments with the information they need to better assess risks. **An early response helps minimise the impacts of the event** by activating emergency or contingency plans (water reserves, rationing, etc.) as well as relief mechanisms to support farmers and vulnerable populations before the crisis becomes too severe. It also helps to mobilise financial resources and international aid.

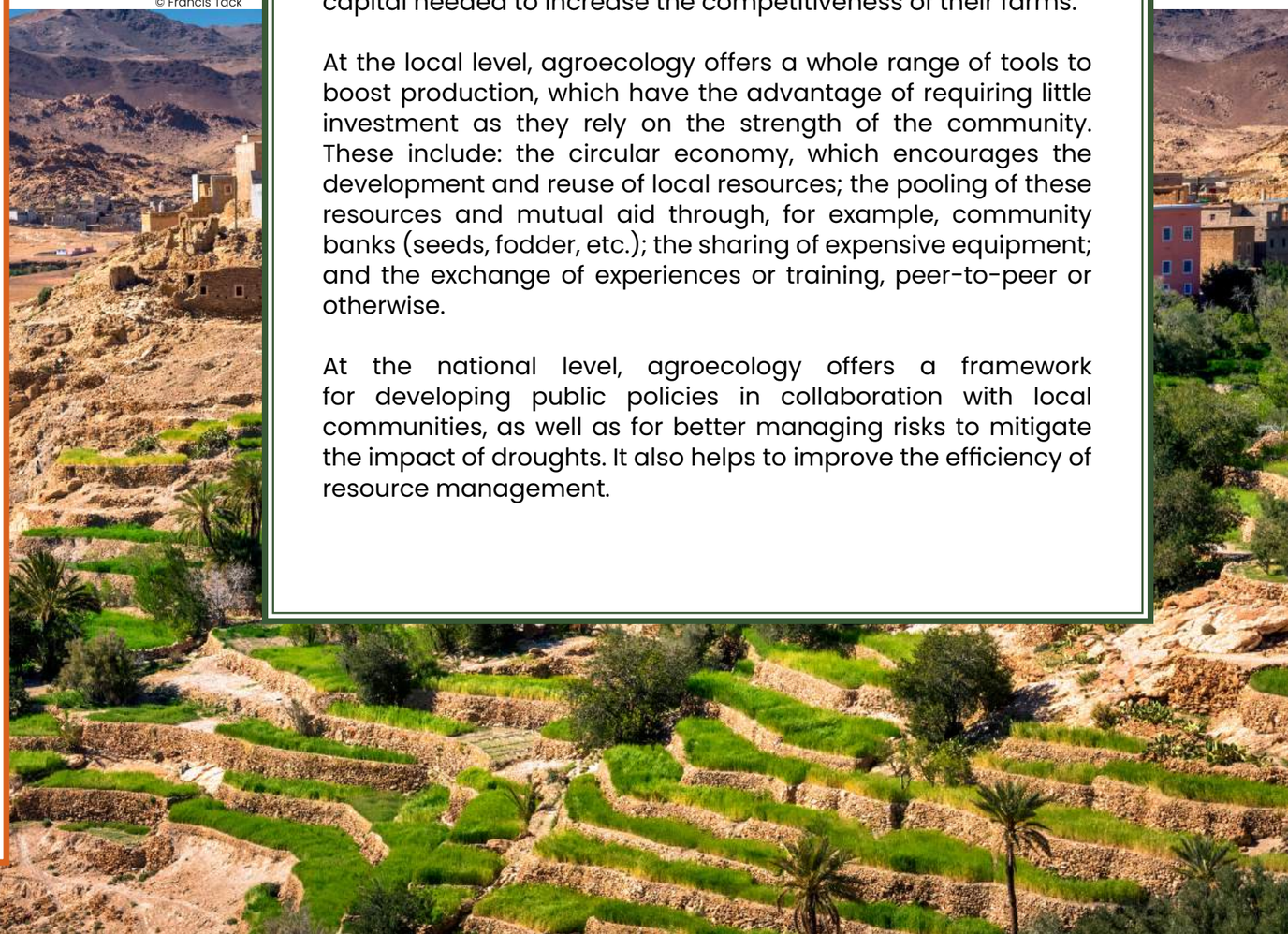
It is in the collection and sharing of these early warning signals that agroecology offers a different perspective. To monitor and assess the progression of drought and its short-term impacts, agroecological principles advocate for the integration of communities and their knowledge of local conditions within the monitoring system. Scientific tools, such as satellite imagery and climate models, must complement these to monitor droughts more broadly and at different scales.

Integrating this data clarifies the severity and progression of the drought, and improves the definition of the actions to be taken as well as their impact. As part of a horizontal dissemination of information, farms gain access, through synergies with meteorological services, to real-time information and forecasts regarding the location or extent of the drought. This enables them to adapt their practices more easily.

From a national signal to collective and local responses

In Burkina Faso and Niger, drought monitoring relies on Early Warning Systems (EWS) developed as early as the 1980s and strengthened since 2010 by national food security observatories and regional systems (CILSS[11], Agrhymet[12]). These systems combine agroclimatic indicators (rainfall, soil moisture, NDVI[13]) and socio-economic indicators (food prices, fodder availability, nutritional status). To be effective, they must be collected and analysed by local committees. Comprising technical staff and farmer representatives, these committees interpret the data in the context of their local area and trigger rapid action – such as the distribution of seeds or the opening of grain or livestock feed banks. In Niger, in the Maradi region, the reporting of information to technical services by farmer-observers enables local measurements to be cross-referenced with national indicators, providing a more detailed understanding of drought dynamics. This collaborative construction of the early warning signal shortens the time between observation and decision-making: precious weeks are gained. These experiences show that the **effectiveness of an early warning system depends not only on technology, but on the coordination between local knowledge and public instruments.**

[11] Inter-State Committee for Drought Control in the Sahel.
[12] Regional Climate Centre for West Africa and the Sahel.
[13] Normalised Difference Vegetation Index.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KEY TAKEAWAYS

By strengthening the resilience mechanisms of farms at the plot, regional and national levels, agroecology clearly emerges as a tool capable of mitigating the impacts of drought.

At farm level, agroecological practices often help to better harness ecosystem services, leading to more efficient and sustainable agricultural production. In particular, they help to restore soil fertility and carbon content, which are crucial for limiting the impact of droughts. By stabilising yields and diversifying income, these practices also improve the living conditions of a large proportion of the farming population, who are vulnerable and lack the technical, social and economic capital needed to increase the competitiveness of their farms.

At the local level, agroecology offers a whole range of tools to boost production, which have the advantage of requiring little investment as they rely on the strength of the community. These include: the circular economy, which encourages the development and reuse of local resources; the pooling of these resources and mutual aid through, for example, community banks (seeds, fodder, etc.); the sharing of expensive equipment; and the exchange of experiences or training, peer-to-peer or otherwise.

At the national level, agroecology offers a framework for developing public policies in collaboration with local communities, as well as for better managing risks to mitigate the impact of droughts. It also helps to improve the efficiency of resource management.

Managing a drought: the institutional framework currently in place

As we have seen, it is not possible for humans to intervene in the climatic causes of a drought. Drought management therefore encompasses two complementary approaches: on the one hand, risk management prior to the event and, on the other, crisis management during or after the event.

In the first phase, institutions focus primarily on reducing the vulnerability of human and environmental systems to the impacts of droughts. This is an ongoing and proactive process, which includes preventive and adaptive measures but does not address the causes of the phenomenon, only the risks of its impact.

Next comes the management of the crisis itself. This must be both effective and swift to minimise damage and restore a 'normal' situation as quickly as possible. It is a reactive process, which may reveal weaknesses in the risk management phase and lead to its improvement. Who is involved and how do they operate? What are their tools and objectives? We're diving into these questions in this section.

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What is the role of governments and institutions in combating drought?

Drought management involves a multitude of stakeholders from various sectors and levels of governance, from international to local. However, **it is the States that bear the overall responsibility for reducing disaster risks, through the establishment of policy and regulatory frameworks.**

Governments draw up plans and programmes aimed at reducing identified risks, coordinate emergency operations, mobilise resources and relief efforts, and so on. First and foremost, they ensure the economic stability of stakeholders in the area by preventing agricultural losses and water shortages that could affect the economy. This means guaranteeing food security for the population by maintaining sufficient agricultural production. It also means preventing social tensions and conflicts that may arise due to shortage of water and food (social and political stability), etc.

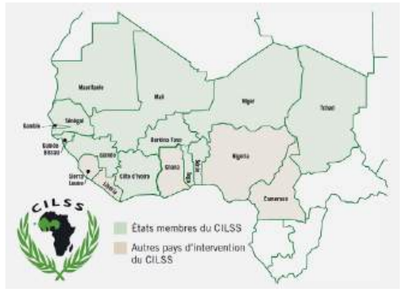
In implementing these plans and programmes, national governments rely on decentralised authorities[14] at the local level.

It is these bodies that ensure the implementation of resource management measures, the development of contingency plans and the coordination of social interventions. Specialised State agencies provide technical support for all these operations. Depending on their remit, they produce forecasts, monitor meteorological data and reservoir levels, but they may also conduct research into the impacts or develop methods and technologies to better manage drought.

[14] These are administrative authorities that represent the State in local administrative districts (regions, departments, towns, etc.). Devolution is a process distinct from decentralisation, which involves handing over decision-making powers to local authorities.

International organisations supporting States
A number of international institutions assist States in coordinating cooperation and support at a supranational level.

At the global level: the FAO, the UNCCD[15], the United Nations Development Programme (UNDP) and the World Bank…
These institutions provide a framework for international cooperation on drought management and/or technical and financial assistance to affected countries. They work on crisis prevention by proposing global programmes and initiatives for the sustainable management of water resources, food security, etc. They may also fund water management or drought-mitigation projects whilst providing technical expertise.



At the supra-regional level: the OSS[16] or the CILSS in the Sahel…
These institutions coordinate water resources and initiatives for collective and harmonised management. They fund research and development as well as capacity building. They collect and disseminate data, which helps inform policy decisions.

What tools do governments have to prevent and manage the impacts of drought on farmers and agricultural production?

States, governments and institutions have a wide range of instruments at their disposal, which vary depending on the stage of the crisis and the countries' capacity to implement them. In the run-up to a drought, to prevent the effects of crises, subsidies can, for example, facilitate access to crop or livestock insurance, which will compensate farmers in the event of a disaster. This type of scheme is in place in various countries in the Global North, such as those in the European Union or the United States.

During times of crisis, and where they have the means to do so, local and national authorities can implement policies to support farmers, helping them cope with the immediate impacts of drought. Tax relief (such as exemptions from agricultural land taxes) or reduced interest rates on agricultural loans provide relief to farmers. Some European governments offer interest-free loans or repayment deferrals to ease the financial pressure on affected farmers. When they take the form of distribution of replacement seeds or fodder, subsidies enable farms to continue operating. This prevents **the loss of capital** among livestock farmers and safeguard long-term livelihoods. Institutions can also subsidise training and technical support programmes.

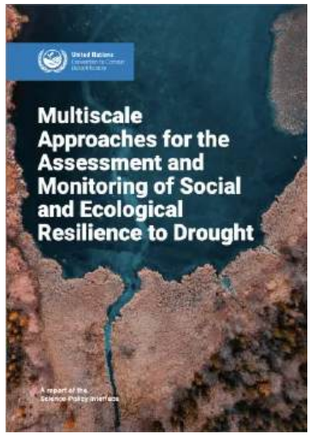
[15] United Nations Convention to Combat Desertification.
[16] The Sahara and Sahel Observatory.

Building strategic reserves
With a view to improving equitable access to resources – a crucial issue – the state can build up strategic reserves by purchasing surplus produce when world prices are low or when domestic production allows. It can then redistribute food supplies in the event of a crisis and prevent inflation. Appropriate governance bodies help to maintain social stability during periods of scarcity and reduce tensions that could exacerbate the effects of drought.

What approach does the United Nations take to reduce the risks of drought?

Reducing drought-related risks involves implementing specific plans aimed at preparing the population, increasing institutional adaptive capacity, providing forecasts, monitoring and early warnings, and ensuring a coordinated and effective response in crisis situations. To this end, the UNCCD established a framework for drought resilience, adaptation and management in 2019. It comprises six objectives: reducing exposure and vulnerability to drought, increasing resilience, transforming economies, transforming political and cultural institutions, developing comprehensive drought management plans, and sharing risks.

The actions to be taken are organised around three pillars: **threat monitoring and early warning, assessment of drought vulnerability and risks, and the implementation of measures to limit its impacts and improve responses.**



These three pillars are recommended as the basis for national drought policies and management plans. They are broken down into ten planning and implementation steps, all interconnected to build a holistic approach to drought management. These steps include: establishing a sub-national drought reference working group; monitoring key indicators across a range of parameters (rainfall, temperature, soil moisture, etc.), assessing the impacts on the economy or the pressure on local communities, and providing assistance or intervention during and after the crisis.

Several countries have drawn up drought preparedness plans as part of their national strategies. These need to be integrated into broader development frameworks, as poverty and socio-economic inequalities are factors that exacerbate the risks of drought-related impacts.

How does emergency humanitarian aid respond during a drought?

In times of crisis, humanitarian aid focuses on food aid, water supply, livestock support, cash transfers or health services. Support takes various forms: distribution of rations or food vouchers, but also cash transfers to buy food from local markets. Programmes can be set up to prevent malnutrition, either by screening for it or by providing nutritional supplements and training. Humanitarian organisations also work on access to water and sanitation (distribution of drinking water by water tankers, rehabilitation of wells, creation of new water points, provision of sanitation facilities to prevent disease, etc.). Support for agriculture involves the distribution of resources (drought-resistant seeds, livestock feed, veterinary care), the organisation of training to better manage the consequences of drought, or programmes to rehabilitate local infrastructure.

To maximise its impact and effectiveness, this emergency aid must be coordinated. Behind the donations and various forms of support, lies, amongst other things, logistical planning (coordination of relief efforts and communication systems), which is crucial for managing the distribution of supplies or delivering aid effectively. Emergency humanitarian aid also includes a component of monitoring and providing information to decision-makers and the public, which is essential for organising relief efforts and assessing needs. Organisations are therefore involved in monitoring, tracking and assessing drought conditions and impacts in real time. To collect data, NGOs use remote sensing tools but also rely on collaborative assessments developed with governments when dealing with more specific issues. It is difficult work with imperfect results.

Constrained by their limited resources, NGOs must prioritise based on an assessment of local needs, bearing in mind, for example, that drought can also lead to population displacement. Humanitarian aid then focuses on providing temporary shelter, creating safe spaces to protect vulnerable people (children, women, the elderly), but also the establishment of schools to ensure continuity of life.

In these fragile contexts, **organisations must demonstrate flexibility in balancing the satisfaction of immediate needs with long-term recovery efforts, as crises evolve.**

The increasing duration of crises complicates matters, in part because of the temporary nature of the aid provided. When delivered over too short a period, this aid does not, on its own, resolve the root causes underlying the scale of the impacts of droughts (poor governance, protracted conflicts, structural failures, etc.).

The concept of the 'triple nexus'

The growing complexity of humanitarian crises linked to natural disasters often requires a multidimensional response that integrates humanitarian, development and peacebuilding efforts, collectively referred to as the 'triple nexus'. This interconnection between humanitarian, development and peace actions aims to create a more coherent approach to better respond to complex and protracted crises, such as conflicts, natural disasters, and humanitarian challenges caused by climate change. This concept emerged in response to the limitations of[17], and aims to break down the silos between these sectors. In this respect, it is similar to agroecology. In practice, however, it proves complex to implement in terms of coordination, for example due to divergent priorities among actors and the need to adapt to the local specificities of crises.

[17] Notably the continuum between aid and reconstruction, as well as the link between humanitarian aid and development, which failed to adequately account for both the short and long term.

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How to assess needs following a drought?

There is an international framework, the PDNA (Post-Disaster Needs Assessment), for assessing needs following a disaster. This is the framework used in the case of droughts. This structured process addresses the impacts and identifies recovery and reconstruction needs. It enables governments, international organisations and development partners to better understand the extent of the damage caused by a disaster so as to define priorities for long-term reconstruction and recovery.

The impact assessment covers economic losses, material damage and social impacts across various sectors such as agriculture, infrastructure, health, education and livelihoods. Identifying needs then makes it possible to prioritise the actions required not only for reconstruction, but also for restoring basic services and resuming economic activities. The recovery strategy is then based on aligning risks and vulnerabilities, with a focus on improving resilience, reducing risks and preparing communities.

Once finalised, the PDNA can help to secure funding from international donors, humanitarian organisations and development partners. The first stage of the response involves implementing rehabilitation measures to restore essential infrastructure and services, particularly to bring agricultural production, water supply systems and livelihoods back to 'normal'. This is followed by medium-term recovery. This aims to stabilise economic and social conditions and prepare for reconstruction by promoting the recovery of the local economy and preparing for future crises. During this phase, communities must recover from the event and lay the foundations for better management of future risks. As a long-term phase, reconstruction seeks to transform infrastructure and systems, and to strengthen structural resilience in the face of future crises.

KEY TAKEAWAYS

Institutions and governments have developed an international framework designed to facilitate the management of droughts, both in terms of prevention and mitigation of their impacts.

This framework is based on cooperation between a wide range of actors from various sectors and backgrounds, including humanitarian aid organisations. These organisations are primarily involved in emergency response, but ideally within a structured process.

The establishment of strategies for anticipating and managing crises, developed by governments in consultation with institutions, forms the backbone of this framework, which remains highly flexible and depends on the resources of individual states. Whilst it offers a coherent set of best practices, the institutional framework for crisis management presented here is far from easy to implement on the ground. It requires a high level of expertise, the ability to anticipate, qualified staff, and human, financial and logistical resources. Not all countries have the same capacity to apply it, but it remains a guide on how to proceed.

Conclusion

Long regarded as an alternative approach, agroecology is now emerging as a key tool for addressing droughts. The evidence gathered in this review demonstrates this: by rehabilitating soils, diversifying cropping systems and optimising the management of water and local resources, agroecological practices reduce farms' vulnerability to climate-related risks. They reduce dependence on inputs, stabilise incomes and preserve the long-term productive potential of the land. Against a backdrop of more frequent and intense droughts, this ability to maintain production and the cohesion of rural communities is a major asset.

But agroecology goes beyond mere technical adaptation: it involves a systemic transformation of how we conceive of production, resource management and relationships between stakeholders. It is an eminently relevant approach for anticipating, mitigating and overcoming crises, whether agricultural, climatic, economic or social. It enables action at every stage of the crisis cycle: beforehand, by preserving ecosystems and livelihoods; during, by supporting solidarity and local autonomy; afterwards, by laying the foundations for sustainable reconstruction. In the face of droughts, this means acting before the crisis takes hold, by mobilising local resources rather than relying on external emergency responses.

Concrete examples from West Africa and the Mediterranean basin bear this out: farms practising agroecology have withstood recent droughts better, recording lower losses in yield and income than their conventional neighbours. This resilience does not stem from a single solution, but from a coherent set of practices: plant cover, agroforestry, composting, water harvesting, diversification and local solidarity. Agroecology thereby demonstrates its ability to turn drought into a driver of innovation, by stimulating new forms of organisation, markets and local governance.

Yet, scaling up remains limited. Agroecological transitions still suffer from a lack of financial resources, long-term policies and coordination between stakeholders. Many are hesitant, fearing a short-term drop in productivity or an increased workload. But studies confirm it: the ecological and economic benefits become more established over time, and the initial investment is offset by stable incomes, reduced inputs and the increased value-add of local products.

There is an urgent need to recognise agroecology as an integral part of national drought management strategies. This involves incorporating its principles into agricultural, water and climate policies; strengthening training and action research; and providing financial support to farms and communities that are committed to this approach. Only then can resilience become a reality, rather than just a buzzword.

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Les écosystèmes et agroécosystèmes du monde, selon leurs conditions pédoclimatiques, sont plus ou moins sensibles aux variabilités climatiques et aux événements extrêmes tels que les sécheresses. Les populations rurales et pastorales, fortement dépendantes de la bonne santé des sols et de la disponibilité des ressources naturelles, sont parmi les premières touchées par les effets des sécheresses. Elles voient leurs moyens de subsistance affectés et leurs conditions de vie se dégrader, entraînant des conséquences en cascade parmi lesquelles des déplacements forcés, l'augmentation de l'insécurité alimentaire et de la pauvreté.

Face à ce constat, l'agroécologie, qui connait un engouement majeur ces dernières années, semble apporter des pistes de solutions prometteuses. Mais qu'en est il exactement ? Quels sont les défis liés aux impacts des sécheresses que l'agroécologie peut relever ? Quelles sont ses limites ? Autant de questions auxquelles ce document de vulgarisation, basé sur une revue de la littérature scientifique, tente de répondre. Bonne lecture...