



TECHNICAL GUIDE

POSITIVE OUTCOME AREAS

- ☒  **SOIL**
- ☒  **CARBON**
- ☒  **WATER**
- ☒  **BIODIVERSITY**
- ☐  **ANIMAL HEALTH & WELFARE**
- ☐  **SOCIAL**

Rotations: Soil health and fertility

Why build fertility and soil health in rotations?

Building fertility through rotations means designing a planned sequence of crops that actively improves soil function.

Agroecological systems rely on rotations as the primary tool for maintaining soil fertility, structure, and biological activity rather than just using break crops to manage soil borne diseases. Integrating diverse plant species in well-designed rotations can supply nitrogen, improve nutrient cycling, enhance soil organic matter and disrupt pest, disease, and weed cycles, reducing reliance on external inputs and increasing system resilience.

Rotations that build fertility are central to reducing input costs and improving long-term productivity. They stabilise yields by improving soil structure, water-holding capacity, and biological activity—key factors under increasing climate variability.

Legumes can significantly reduce the need for nitrogen fertiliser, while diverse crop sequences reduce pest, disease, and weed pressure reduce reliance on pesticides, cutting costs and environmental risk. In organic systems, rotations are essential for maintaining fertility and crop health.

Improved soil organic matter enhances workability, extending working windows and reducing compaction risk. Diverse rooting patterns improve soil structure, water infiltration, and drought tolerance, while continuous soil cover reduces erosion risk.

In all systems, they offer a practical route to improved resilience, reduced financial risk, and better environmental performance. Over time, this approach builds a more stable and self-regulating system, where fertility is generated within the farm, supporting both productivity and environmental outcomes.

What the science says

Research shows that diverse rotations play a key role in building soil health and reducing reliance on external inputs. Cover crops protect and improve soil between cash crops. They can reduce soil erosion by up to 80% and keep valuable fertility in the field.

Legumes and mixed swards fix nitrogen naturally, reducing the need for fertiliser. In practice, this can typically supply 30 kg N/ha following pulse crops, but it can reach 120kg N/ha after grass-clover leys.

Diverse rotations also increase soil organic matter over time, leading to improved soil structure, drainage, and water-holding capacity - helping crops cope better in both wet and dry conditions.

The overall trend is clear: well-designed rotations reduce input costs, improve soil function, and increase resilience.

Making Rotations work on your farm

Whole farm system

Rotations are the structural backbone of a whole farm system, linking cropping, livestock, and nutrient management. Fertility-building phases such as grass-clover leys or cover crops provide opportunities to integrate grazing livestock, improving nutrient cycling and reducing reliance on imported fertilisers.

Crop residues and manures are key components of this system, returning nutrients and organic matter to the soil. Straw can be used for bedding or feed and later applied as manure, closing nutrient loops.

Deep-rooting crops and cover crops capture nutrients at risk of leaching and improve soil structure, while also supporting soil biology.

Planning rotations at the whole-farm level allows better alignment with labour, machinery, and market opportunities, while spreading workload and risk.

In organic systems, this integration is essential, but it also offers clear benefits in conventional systems aiming to reduce inputs and improve resilience.

Rotations supply fertility and control pests and weeds, without synthetic inputs, while improving soil health and resilience in the longer-term.

Measuring and monitoring

Monitoring is essential to understand whether your rotation is delivering the expected benefits. Key indicators include:

- **Soil organic matter** - track long-term trends
- **Soil structure** - assess aggregation, compaction, and rooting depth
- **Crop performance** - yields and consistency over time
- **Weed, pest and disease levels** - identify trends across the rotation

Simple field assessments, such as soil pits and visual structure evaluation, can provide valuable insights.

Record-keeping is critical - tracking inputs, yields, and field observations helps refine the rotation over time.

Biological indicators, such as earthworm counts, can also provide a useful measure of soil health improvements.

A well-functioning rotation should show gradual improvements in soil condition, reduced input requirements, and more stable crop performance

Timescales

Rotations deliver benefits over different timescales.

Short-term (1–3 years):

- Reduced pest and disease pressure
- Lower nitrogen requirements following legumes
- Improved weed control through crop diversity

Medium-term (3–7 years):

- Increased soil organic matter
- Improved soil structure and workability
- More consistent crop performance

Introducing new crops or extending rotations requires planning and may initially reduce flexibility. However, early gains - particularly from legumes and spring cropping - can offset this.

Patience is important; soil health improvements are cumulative and depend on consistent management over time.

Impact

Well-designed rotations deliver multiple benefits across the farm system:

- **Soil:** improved structure, organic matter, and biological activity
- **Water:** better infiltration, reduced runoff, and drought resilience
- **Carbon:** increased sequestration through organic matter build-up
- **Biodiversity:** more diverse habitats above and below ground

They also reduce reliance on external inputs, improving economic resilience and reducing environmental impact.

In organic systems, rotations are essential for maintaining productivity. In conventional systems, they provide a pathway to reduce inputs and improve sustainability.

Overall, rotations are one of the most effective tools for building a resilient and regenerative farming system.

How do I make sure Rotations will work for me?

Start with clear principles when designing your rotation:

Sequence crops:	Manage weeds:	Balance fertility
deep-rooting crops follow shallow-rooting	include competitive crops	alternate fertility-building and fertility-demanding crops
nitrogen-demanding crops follow legumes	Combine winter and spring cropping to reduce weed pressure	

Oats and Rye are good weed suppressors due to their allelopathic effects (chemicals they release which prevent other plants germinating), and their height and tillering which shades out other smaller plants

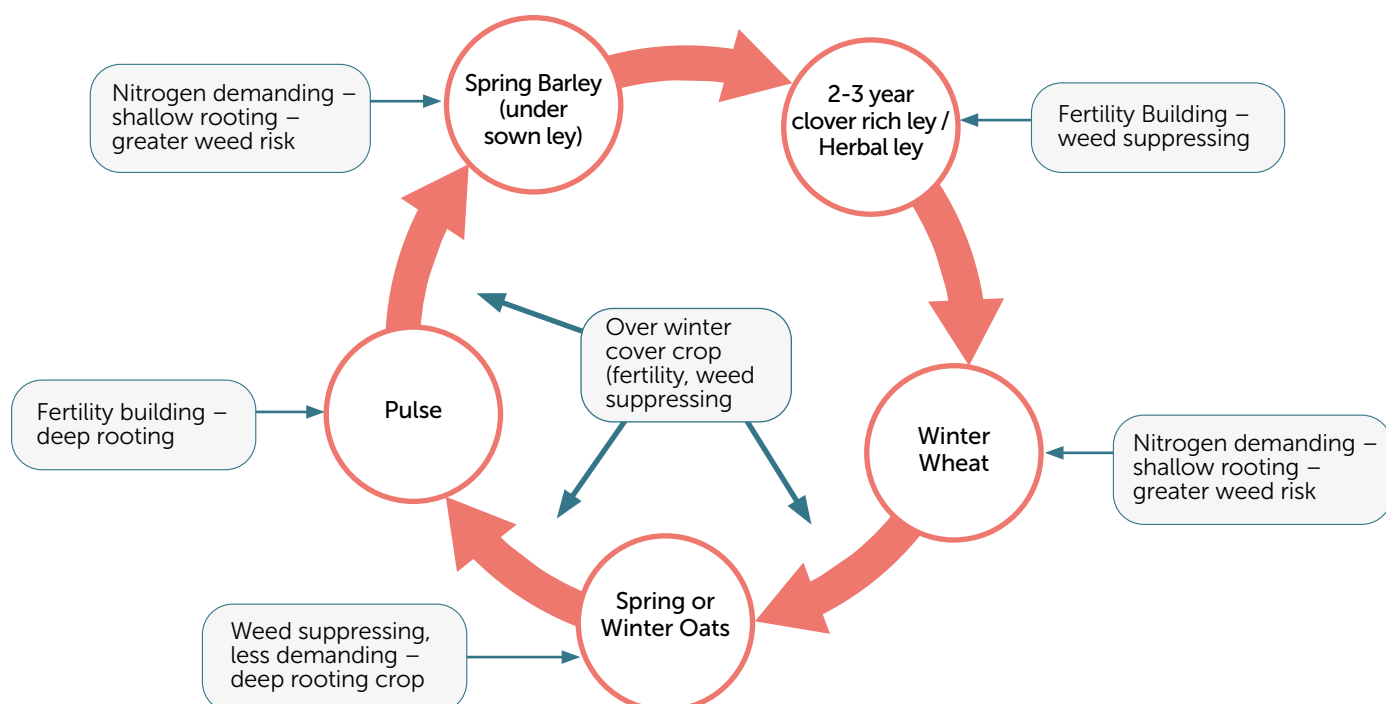
Crop selection should reflect soil type, climate, market opportunities, and farm infrastructure. Cover crops must be chosen carefully to avoid increasing pest or disease risks in subsequent crops.

Simple rotations, such as the Norfolk rotation (wheat, turnips, barley, clover/grass), provide a useful starting point. More complex systems may include pulses, oats for weed suppression, or vegetable crops.

Organic rotations typically include 2–3 year grass-clover leys followed by cereals and pulses. Undersowing cereals with clover is a common strategy to establish fertility-building phases efficiently.

Flexibility is key - rotations should evolve based on field performance, weather, and market conditions

Crop rotation example



Godminster Farm Case study

At Godminster Farm in Somerset, farm manager Peter Cheek has developed a rotation-led system that underpins soil health, livestock performance, and whole-farm resilience. The 1,200-acre organic dairy farm integrates multi-year herbal leys, cereals, and forage crops within a mixed rotation supporting a 300-dairy cow herd.

Herbal leys play a central role, improving soil structure, building organic matter, and cycling nutrients. Their deep-rooting species help access minerals and improve drought resilience, while also providing a diverse, high-quality diet for livestock.

Over more than 20 years of organic management, soil condition has improved significantly, with soils becoming more friable and better able to retain water and nutrients. Monitoring has also shown gains in biodiversity, carbon storage, and water management.

The rotation supports a low-input system, reducing reliance on bought-in feed and as an organic farm any chemical fertiliser while improving system stability. As Peter notes, working with diverse rotations and natural processes has “definitely add[ed] resilience without a shadow of a doubt.”



Costs, savings and improvements

Introducing or extending rotations will affect workload, cash flow, and crop planning. More diverse rotations often spread workload more evenly throughout the year, reducing pressure at peak times such as drilling and harvest.

There may be initial costs associated with new crops, including seed, machinery adaptation, or learning new management practices. Some crops may also have lower gross margins than high-value cereals.

However, these costs are often offset by significant savings elsewhere. Legume crops reduce or eliminate the need for nitrogen fertiliser, while improved pest and disease control reduces pesticide use. Over time, better soil structure can reduce cultivation intensity and associated fuel and labour costs.

Rotations also improve resilience to market and weather variability. A more diverse crop mix reduces reliance on a single commodity and spreads financial risk.

From a system perspective, profitability often improves due to lower input costs, more stable yields, and access to premium markets such as organic.

Environmental improvements - such as reduced nutrient losses, improved soil carbon, and enhanced biodiversity - may also align with environmental scheme payments, providing an additional income stream.

Overall, while rotations require planning and adaptation, they offer a practical route to a more resilient, lower-input, and economically sustainable farming system.

Contacts

Soil Association advice and support

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