Costs, savings and improvements

Upfront costs include:

- investment in tools if using mechanical weeding (e.g., interrow hoes, weed harrows or flame weeders)
- possible yield losses during the early years of learning weed management
- potential increases in labour requirements, particularly during peak times like spring weed flushes or when hand weeding is necessary in high-value crops or problem areas.

Labour can be a challenge, especially where capacity is already stretched. However, this is often balanced by reduced time spent sourcing, applying, and managing chemical inputs. Skills development, such as improving weed identification, understanding germination timing, adjusting cultivations, and honing observation, are key to making chemical-free systems work efficiently. These skills also support broader farm decision-making and can reduce interventions over time.

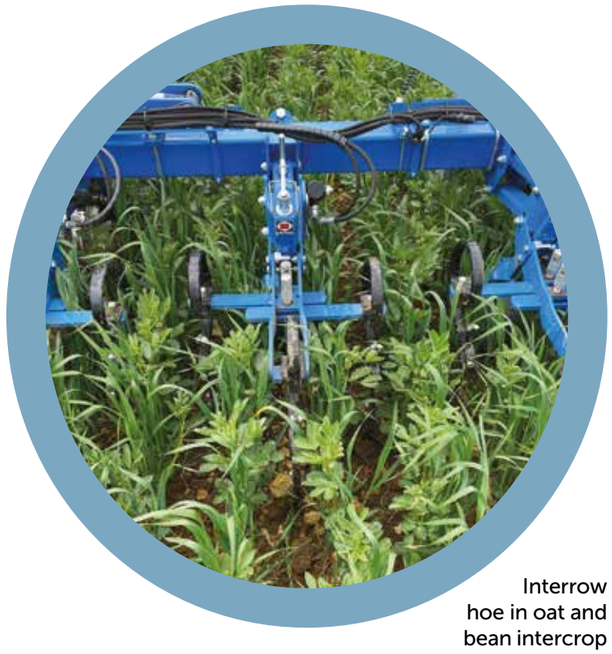
While these investments can feel front-loaded, significant savings accrue in several areas:

- No herbicide purchases
- Less reliance on contractor spraying services
- Better long-term soil health = fewer interventions needed
- Reduced soil erosion and nutrient runoff
- Compliance with organic standards without compromise

In organic systems, integrating control using timing, rotations and observation will significantly improve weed burden over time.

In organic farming, chemical-free weed control isn't a choice – it's a fundamental requirement of certification. However, it's also an opportunity to build more resilient systems. Rotations that include fertility-building leys, especially with clover or herbal mixes, tend to suppress weeds more effectively and improve overall system performance. These rotations can support better moisture retention, nutrient availability, and weed suppression, especially when combined with timely cultivation and crop choice.

Farmers report that over time, weed pressure can drop significantly - particularly for docks, fat hen, and blackgrass – if a consistent, system-wide strategy is in place. These changes are not only cost-effective in the long run but also contribute to the overall sustainability and regenerative potential of the farm.



Interrow hoe in oat and bean intercrop

Contacts

Advice and support from our Farming and Land Use team

Speak to a farming advisor: 0117 314 5100
General enquiries: 0300 330 0100
Email: producer.support@soilassociation.org

Resources:

Download a pdf of this and other guides at www.soilassociation.org/guides-for-whole-farm-planning/

For other practical resources and events, see www.soilassociation.org/farmers-growers

POSITIVE OUTCOME AREAS

- SOIL
- CARBON
- WATER
- BIODIVERSITY
- ANIMAL HEALTH & WELFARE
- SOCIAL

TECHNICAL GUIDE

What is chemical-free weed control?

Chemical-free weed control refers to non-synthetic approaches to managing weeds. In organic and whole farm systems, this practice integrates mechanical, manual, cultural and biological methods to prevent and suppress weed growth. In practice it can involve interrow hoeing, flame weeding, stale seedbeds and interplant competition to reduce weed pressure in crops. This means understanding the ecology of weeds, adapting rotations, sowing methods, and timing to reduce weed pressure, and using tools and machines where appropriate. There are periods when crop yield is not influenced by weeds, so 100% weed free crops are not essential, although some weeds will affect crop quality and harvesting. This critical weed-free period depends on crop type and expected yield.

In sown leys and arable systems, it supports soil health and biodiversity by eliminating the use of residual herbicides. Weeds are often indicators of underlying soil or system imbalances, so chemical-free control also means observing and learning from weed presence, for example are they telling you the soil is compacted, overworked, or nutrient-deficient? Effective weed control is therefore not just about removing weeds but improving the conditions that allow desirable crops to outcompete them.

This is an essential part of successful organic systems, where synthetic herbicides are prohibited. It is also one of the concepts of regenerative practices where reducing inputs is an objective. Instead, good weed management is achieved through planning, observation, and cultivation strategy.

Why should I be doing this?

Chemical-free weed control aligns directly with organic principles as well as the principles of agroecological farming, through preserving soil biology and reducing dependency on external inputs. In economic terms, while it can be more labour-intensive, it often offsets this through reduced input costs and better long-term soil health.

Weeds can reduce crop yields, particularly in cereal crops where early competition matters. But unnecessary or excessive cultivation in the wrong conditions can harm soil structure and organic matter too. So, this approach emphasises a balance – understanding how to reduce weed germination opportunities while over time building soil health, resilience and structure, reducing erosion and improving water retention – all key benefits in the face of climate change and volatile weather patterns. Additionally, a variable 'many little hammers approach' reduces the risk of weeds developing resistance or tolerance to a chemical or rigid weed control strategy.

Harrowing winter cereals

Whole farm system

Weed control must be considered across the entire rotation and land use plan. Incorporating grazed or mown leys in the rotation provides a weed cycle break, particularly for perennials like thistles or docks. Well-managed mixed species grass-clover-legume leys that could be grazed will also help build fertility and soil organic matter, supporting future arable phases.

Think about weed control as part of your soil health strategy. Are certain weeds indicating compaction (e.g. dandelions)? Poor drainage (e.g. dock)? Low nutrient availability (e.g. ragweed or thistles)? Enriched soil (e.g. nettle or knapweed)? Weed pressure often reveals management issues elsewhere.

Impact

With reduced weed pressure some farms have reported a 15-30% yield increase in organic cereals, with fewer harvest delays and better grain quality. All this benefit comes with lower long-term weed burdens, as the issues have been dealt with effectively as part of the whole farm plan.

Improved soil health and structure support better crops and resilience to future climate extremes. While the reduced reliance on synthetic herbicide not only saves money (by using less inputs), it also enhances biodiversity and soil microbial life. Therefore, more beneficial insects and pollinators will aid crop health and success, while more soil life will drive improved nutrient cycling and availability through a healthy alive soil.

How do I make sure it will work for me?

Start by mapping weed hot spots and identifying dominant species. Understanding weed germination windows – such as blackgrass in early autumn or chickweed in early spring – this lets you plan sowing dates and cultivations to avoid peak emergence.

Match control methods to your soil and system. Wet, heavy soils may not suit repeated mechanical hoeing, while lighter soils can accommodate more flexible shallow cultivations. Consider competitive crops like spring barley or oats, closer row spacing, and under-sown cover crops to limit light and space for weeds.

New technologies such as robotic weeders are now available for certain crops, offering precise mechanical removal with minimal soil disturbance. While the cost is currently high, these tools may become more accessible and reduce the burden of manual labour in time-critical periods.

Remember, no single method will be sufficient. The key is combining cultural, mechanical, and strategic planning for a cumulative effect; what's known as integrated weed management. Organic growers must rely on cultural and physical weed control methods. Herbicides are prohibited, so having a planned and implemented non-chemical weed strategy, based on timing, crop choice, and observation, is part of meeting compliance requirements. Weed control is also based around reducing weed seed return, with awareness of issues later in the rotation being an important part of the strategy in organic systems.

Be realistic and adaptive. Test approaches on small areas, observe results, and adjust as needed. Consistency matters.

Non-chemical weed control has three distinct phases, based around pre-drilling, seedbed and growing crop.

1. Start with a clean seedbed, often through ploughing or intense cultivation, to bury all weed plants.

2. This is followed by "false seedbeds" where weeds are allowed to germinate and are then destroyed by shallow (50mm) cultivation, which could be the drill pass. This is all aimed at reducing the weed seed bank and allowing seeds to germinate in a weed free environment. Deeper cultivations will bring more weed seeds to the germination zone.

3. Growing crops are then weeded using harrows (designed to pull out weakly rooted annual plants leaving the well rooted crop plant in place) or interrow hoeing (pulling out stronger rooted plants such as grasses) with a shallow cultivation later in the growing season (up to early stem extension stage, Growth Stage 32).

The Science of Chemical Free Weed Control

Chemical-free weed control requires what is called an Integrated Weed Management (IWM) approach, this moving from a single tactic and single growing season, towards a holistic IWM approach. (Riemens et al 2022)

Well-designed cropping systems, including sown leys, can reduce weed pressure significantly without herbicides (Sharma et al, 2021), with Rothamsted's long-term trials demonstrating reduced weed biomass in systems using diverse rotations, including the use of livestock. (Maclaren et al, 2019)

Soil management and well-timed establishment has also been shown to be important (see Weed control options and future opportunities for UK crops (research review) | AHDB) Approaches like early shallow-till soil disturbance being used to encourage early weed flushes, which can then be eliminated pre-crop sowing, can reduce up to 70% of weed emergence. And, increasingly more farms are benefitting from delayed drilling of autumn cereals to avoid early flushes of blackgrass.

Mechanical control, when timed well, has been found to be nearly as effective as herbicides for many broadleaf weeds in cereals. (Hussain, et al 2018)

Measuring and monitoring

Start with a baseline weed map: Walk fields and record dominant species and densities. Tools like the AHDB Weed Manager or digital platforms like FieldMargin can help track this over seasons.

Set thresholds: How many plants per square metre is economically acceptable, bearing in mind that 100% control may not be viable or necessary? Once decided, revisit after key interventions to check effectiveness.

Take notes: Did spring harrowing reduce weed load? Did ley break reduce docks in year 4? Monitoring gives you the evidence needed to make tweaks and build a robust weed control plan.

Observe changes in weed types: A shift from annuals to perennials might indicate changes in cultivation timing or depth. Learn to read these patterns.

Learn ways to manage weeds effectively, like this rhyme for thistles
Cut in May,
they're back next day.
Cut in June, they're back too soon.
Cut in July, they'll surely die!

CASE STUDY

Rob Atkin, Field Hall Farm, South Staffordshire

Field Hall Farm, a mixed arable and beef farm in Uttoxeter, has been transitioning towards using agroecological practices, including minimum tillage, to improve soil health.

The transition to min-till has largely been successful, though some fields have been easier to manage than others. A key challenge has been working out how to deal with grass weeds, such blackgrass.

Rob says, "I think it's one of the pitfalls. OK, so we're not moving a lot of soil, but we're also getting these weed pressures".

To combat grass weed build up, Rob has introduced a wider crop rotation that included spring cropping, allowing the land to rest over winter. However, he was keen not to leave the land bare, so he planted cover crops and stubble turnips as an additional phase of the rotation.

He says, "We trialled what worked well, how they acted as water pumps, and how well they broke up compaction", all keeping the soil alive and active, and helping keep the grass weeds at bay.

Timescales

Short term (Year 1–2): Expect to test several methods. Weed pressure may remain high initially, especially when reducing tillage. Consistency and patience are vital.

Medium term (Year 3–5): Benefits of rotations and cover crops emerge. Weed seedbanks reduce, soil biology improves, crop competitiveness increases. Monitor docks and thistles – early intervention is key.

Long term (Year 6+): A balanced system reduces reliance on interventions. You should see improved soil structure, higher yields in competitive crops, and fewer weed flushes.