Learning Series: Weed Management Beyond Tillage

What to Expect from this Resource

In the early months of 2025, the Regenerative Organic Oats (ROO) program hosted a series of virtual gatherings that created farmer-to-farmer learning opportunities focused on key topics in regenerative organic agriculture. This resource shares the experiences, insights, and advice of ROO farmers on weed management beyond tillage, highlighting their unique experiments that tested out certain regenerative organic practices. Explore this resource to gain first-hand insights into real-life scenarios and discover what might be a perfect fit for your own context.

Weed Management Strategies

It helps to think of weed management as something to build into the cropping system from the start, rather than something to add on later. Looking upstream at where strategies can be combined early can make a big difference. The most resilient systems tend to use layered approaches that are adaptive, cumulative, and work together over time.

Direct vs. Indirect Weed Management
Weed management can take both direct and indirect forms. Direct control includes tools like cultivation or, in conventional systems, herbicides. Indirect control includes crop genetics, seeding time, nutrient placement, and other cultural practices that shift the balance in favour of the crop.

Long-Term Weed Management
A key part of a long-term strategy is reducing weed propagules and limiting the spread of weed seeds. This can happen through crop rotation, cover crops, or managed tillage. For example, some producers have used winter rye to reduce seed set in Canadian fleabane.

Weed Prevention Methods

- Introducing more diversity into the landscape helps prevent weeds from dominating a particular niche.
- Limiting weed dispersal by cleaning crop seed and sanitizing equipment between fields. This helps prevent spreading weed seed from one area to another.

Crop Competitiveness as a Weed Management Strategy
Improving crop competitiveness is one way to shift how light and nutrients are distributed in the system. Higher seeding rates, narrow row spacing, and inter-seeding help direct more light to the

crop canopy and reduce what is available to weeds. Adjusting seeding dates and using shallow planting depth can give crops an advantage. Placing nutrients with the seed, instead of broadcasting, helps ensure that crops (not weeds) have early access to the resources they need.

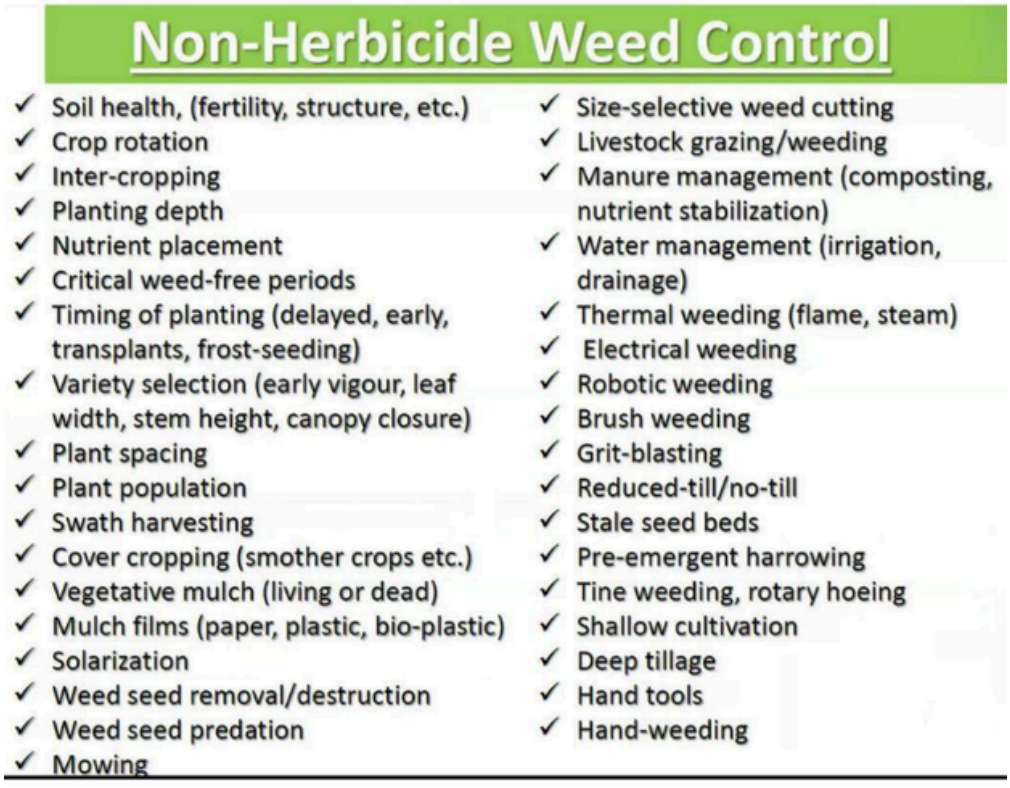
Crop Rotations as a Weed Management Strategy

Taking a whole-rotation approach can help reduce long-term weed pressure. Diverse crop rotations make it harder for weeds to adapt, especially when crop types, growth habits, and timing shift from season to season. Adding winter annuals or perennial phases into the rotation helps fill seasonal gaps and keeps weeds from settling in.

Monitoring Weed Populations

Scouting fields before and after planting and harvest helps identify which weeds are taking advantage of the system. If certain species are becoming more common, it may be worth targeting them directly, either through spot tillage or mowing, especially in patches like Canadian thistle. Some producers are also using harvest-time tools like seed destructors, which separate and crush weed seeds before they hit the ground.

List of Non-Herbicide Weed Control Methods



What Producers Are Doing in the Field

The material discussed in the following slides was compiled in a producer-centric gathering in Spring 2025. In these slides, we share the perspectives of ROO farmers regarding their experience with weed management beyond tillage and how they have adapted their farm management based on their learnings, successes, and challenges. Each farmer's context is completely unique and emphasizes the necessity to apply changes within your own management based on your own context.

Saskatoon, SK
A ROO participant from Saskatoon, SK is still relying on tillage to manage weeds. He practices fall spikes and spring sweeps[1] as well as guided row cultivation for narrow-row crops like cereals and forbs. The main weeds he faces are mustard, pigweed, lambsquarters, wild millet, and thistle. He is looking to shift toward cover crops over time. He is not using livestock manure currently, but past applications still show up in phosphorus and potassium levels.

Treherne, MB
A ROO participant from Treherne, MB is under-seeding red clover with cereal crops. When it works, it has been pretty successful. One batch of clover seed came with trefoil, and now that is getting hard to manage. He is still doing quite a bit of tillage; deep till in the fall, cultivation in early spring, and then seeding with a cultivator and disc drill, to a total of about three passes. The past couple of years have been too dry to get the clover established, and he is thinking about switching to a bigger-seeded cover crop.

Pigeon Lake, AB
A ROO participant from Pigeon Lake, AB started on land that had been in pasture and bush, so the weed pressure was low at first. There were mostly just small annuals like lambsquarters. After cutting back on tillage, perennials like thistle and quackgrass started showing up. He is now intending to use tillage intentionally and is planning to use fall spikes and spring sweeps, then seed right behind. Perennials have become the main challenge, and he is hoping a better fall tillage will help get them under control.

Birsay, SK
A ROO participant from Birsay, SK is dealing with green foxtail, millet on lighter soils, and perennial thistle. He was using a high-speed disc and cultivation and is still seeing issues with weed pressure, even with inter-row cultivation. He aims to start to move toward no-till.

Medicine Hat, AB
A ROO participant from Medicine Hat, AB had fleabane show up in 2024. The plan for 2025 was to

[1]Spikes and sweeps are tillage attachment tools that lift and cultivate soil (sweeps) as well as chisel and deeply break up soil (spikes).

cut the first growth early for silage to prevent seed set, then follow with a seed crop later in the season. Crop residue will be returned to the field after harvest.

Balcarres, SK
A ROO participant from Balcarres, SK is dealing with wild millet, foxtail, and some thistle, depending on the area. Most of the land was pasture or hay until 2024, so he is still waiting to see what comes up. He did some field cultivation and fall tillage to about 4 inches. He is thinking about trying a rod weeder or rotary hoe after seeding to catch a second flush. He also incorporated livestock to help with weed control.

Managing Perennial Weeds and Plant Mimicry

Tillage remains a primary strategy for managing weeds on many farms. However, integrating perennial crops into the rotation can also help reduce pressure from perennial weeds. This approach functions as a form of plant mimicry, where a crop resembles another species physically or chemically to occupy an ecological niche, which can fill the place of the target weed.

A Shift to a Perennial System
As tillage is reduced (especially in organic systems), the weed community often shifts toward perennials. This shift may indicate that the system is moving toward conditions that favour perennial species. Introducing a forage perennial can support that transition, but without livestock, managing or benefiting from that crop may not be the most practical or economically favourable option.

Chicory as a Thistle Manager
Chicory is being trialed as a strategy for managing thistle by competing in the same rooting zone. Its deep taproot allows it to access similar resources, making it more difficult for thistle to establish. To be most effective, chicory typically needs to remain in the field into its second year, which can be hard to justify economically, especially on smaller acreages where land availability is limited. To address this, current trials are using small amounts of chicory and red clover in annual cover crop mixes. Combined with fall and spring cultivation, and with growth extending into late fall, the goal is to suppress weeds while still keeping the field in cash crop production the following year.

Alfalfa as a Thistle Manager
Alfalfa may fill the ecological niche that thistles typically occupy, especially in compacted areas. Both are deep-rooted and compete in the same zone. Thistle often spreads more through root systems than seed, so weakening root reserves is key. In the field, this approach can be applied by seeding alfalfa into a thistle-infested patch. In the first year, both alfalfa and thistle may be

present in the field. But cutting for dry hay twice a year helps weaken the thistle roots. Over time, this can reduce the number of thistles, and in some cases, remove them completely.

Equipment-Based Alternatives to Tillage

Reducing tillage often begins with small, incremental changes to lessen intensity and frequency before removing it entirely from the system. It does not have to be eliminated all at once, rather the goal is to diversify approaches to weed management over time and become intentional about each use of tillage, its frequency, intensity, scale and timing (FIST).

Reducing Tillage with a Roller Crimper
Roller crimping[2] is a way to reduce tillage while managing weeds and maintaining productivity. One method starts with growing a cover crop like red clover and taking an early hay cut. The clover is then allowed to regrow through the summer. When it begins to flower again in late summer, the
regrowth (now smaller and softer) is easier to terminate with a roller crimper. After crimping, a fall crop (i.e., winter wheat, fall rye) is seeded directly into the residue. This approach allows for a hay crop early in the season, followed by a fall-seeded crop, offering two uses of the same field in one year while reducing soil disturbance and suppressing weeds.

Timing Roller Crimper Management
Timing is critical when using a roller crimper, especially under irrigation. If the cover crop is left too long, or not fully terminated, the residue can become matted and wet, creating conditions similar to a compost layer. This can lead to mold, especially with crops like alfalfa. Crimping at early bloom (around 10%) helps reduce this risk and improves the chances of a clean, effective termination.

Noble Blade as a Low-Disturbance Tillage Tool
The noble blade is a low-disturbance tillage tool used to manage weeds with minimal soil disruption. Its wide, shallow cutting action is effective for slicing through perennial roots and has been used to terminate crops like alfalfa.

Nutrient Relationships and Weed Pressure

Brassica weeds, such as wild mustard, tend to be less competitive when soil sulphur levels are adequate and active. Calcium availability may also influence weed dynamics. In one case, pelletized chicken manure (containing 11–12% calcium) was applied to a field. Areas that received less manure had more thistle, raising questions about calcium's role in thistle suppression.

[2]Roller crimping is the process of crimping the stems of cover crops at several points to terminate a crop while providing mulch across a field.

Building soil biology through manure applications may help reduce weed pressure over time. A crucial consideration is to figure out how to compost manure that may contain weed seeds so that you can prevent the creation of a new problem.

Reflections and Takeaways

Weed pressure is shaped by many moving pieces. Addressing weeds effectively often means looking at the whole system, not just the weeds themselves. What works one year may not work the next. Change in practice is about adaptation – reading the system and responding as it shifts. And remember, weeds are not out there to get you; they are just taking advantage of the conditions made available in your fields. By looking at weeds this way, they can tell you a lot about the condition of your soils and can empower you to take back your fields.