



# Weed Management in Organic Grain Systems

**Managing weeds is one of the toughest elements** of organic grain production to address, even among experienced organic farmers. Creating an effective weed management plan is essential for ensuring the productivity and profitability of an organic farm. A combination of the strategies described below can help an organic farmer plan for success during the transition to organic production and beyond.

## ***"Many Little Hammers"***

A **core concept of organic systems**, "many little hammers" embodies a plan for effective weed management in which multiple approaches are additively more effective than any single approach. When proactive strategies of crop rotation, cover cropping, and variety selection are combined with sound fertility and in-season cultivation approaches, weed pressure in organic fields can be successfully achieved.

"Hammers" include methods which directly uproot, cut, or disrupt the physical structure of weeds – in organic production, these include implements used for tillage and cultivation, and more recently, mowers, weed zappers, and flame weeders. Indirect hammers are equally as valuable as direct methods to achieve long-term weed control in organic systems. These indirect hammers include decisions regarding the selection of crop varieties, planting dates, row spacing, plant population, fertility management, and cover cropping.

Herbicides are available for use in certified organic systems. Although organic herbicides are used less frequently due to efficacy and cost, there may be a place for these products in certain situations. However, to date, they are rarely used in organic grain production. Before applying a product to a field that is certified organic or undergoing the transition to organic, it is best to speak with an organic certification agency to ensure that it will not affect the field's organic certification status.

## **Specific strategies for organic weed management**

### **1. Plan an integrated crop rotation**

Crop rotation is a foundational element for many aspects of organic production, including fertility management, insect and disease management, and weed management. A rotation of crops that differ in planting date, growth habit, row spacing, harvest date, tillage and cultivation intensity, and residue management is critically important to break up weed life cycles and prevent conditions that favor troublesome weeds adapted to a particular environment. Crop rotation should include alternating legumes (such as soybeans, lentils and peas) and grass crops (including corn and cereal grains); perennial and annual crops; row crops and drilled crops; spring-planted crops and fall-planted crops; summer-harvested crops and fall-harvested crops; and no/reduced till crops and those requiring more intense seedbed preparation. Rotations should also be planned in order to strategically prioritize planting cover crops – particularly those used as smother crops and with allelopathic properties (such as sorghum sudangrass and cereal rye). A successful organic rotation typically spans four or more years, the success of which depending upon agronomic knowledge, proper equipment, and proactive marketing for the crops in rotation.







## 2. Create the environment for a competitive crop

In organic systems, your cash crop always must have a jump on weeds. If the weeds become taller than the cash crop, management becomes much more difficult and less effective. Several agronomic practices can help boost the crop growth allowing a fast, uniform establishment. First, ensure adequate fertility in the field (including all macro and micronutrients) to promote healthy, vigorous growth that can outcompete weeds. Second, select a crop variety with good emergence, disease resistance, and canopy characteristics for soil cover. Third, create the ideal environment for the cash crop to emerge and establish quickly. This includes creating a good seedbed (whether through tillage, reduced tillage, or no-till practices), adjusting planting equipment to ensure good seed placement and depth, and delaying planting date to capture warmer soil temperatures. Later spring planting not only ensures quick germination and establishment of the crop, but also allows for the first flushes of weeds to be knocked down through shallow cultivation, a technique known as “false seedbedding”.

## 3. Have the *Right Steel* for the system

While organic farmers have few, if any, chemical means with which to directly manage weeds, physically eliminating weeds in the field through different implements can be very successful. The use of different steel “hammers” at strategic times in the growing season can effectively manage weeds, especially in combination with the strategies described above.

Seedbed preparation is typically the first use of an implement to manage weeds during the cash crop season. As mentioned previously, one way to lower weed pressure is to practice “false seedbedding”. An initial tillage pass that occurs a week to ten days prior to planting allows time for weed seeds to be stimulated to germinate while minimizing the time the soil remains uncovered. Then, just prior to planting, the seedbed is prepared; the shallow soil disturbance eliminates newly germinated weeds yet minimizes new seeds brought to the soil surface. Good seedbed preparation can facilitate seed placement and improve the seed environment, allowing for uniform germination of seed and the subsequent uniformity of the stand.

After the crop is planted, blind cultivation is the next opportunity to knock down germinated weeds. In this practice, a cultivating implement (typically a tine weeder, harrow, or rotary hoe) is used to cover the entire field including the rows in which the crop was planting. By disturbing the top 1 to 2 inches of soil, germinating weeds at the “white thread stage” are brought to the soil surface. Ideally, these activities are timed right before a period of dry weather, such that the newly emerged weed seedlings desiccate and die. These operations typically occur about 36 hours after planting, ensuring that the weeds will not get a chance to become taller than the crop.

Once the crop in the row has a sufficient canopy to slow weeds from emerging within the row, between-row cultivation becomes the focus. These operations should be considered more of a “clean-up” after the primary agronomic strategies and blind cultivation have occurred, not the primary weed management tool. Typically, 1 to 3 passes of between-row cultivation are needed, depending on the season and the weed seedbank. The use of GPS and RTK guidance has made the task of between-row cultivation easier; other guidance systems are also available to help the cultivators get as close to the crop as possible without causing damage.

All cultivation practices are a bit of an art, with adjustments needed to account for weed and crop size as well as soil condition. Tractor speed, angles and depths of tines and shovels, down pressure, and the types and distance between shovels can all be adjusted to make weed management more effective. The time spent making these adjustments in the field prior to cultivating pays off in terms of time and money over the course of the entire season, and for seasons to come by diminishing the weed seedbank. The key to effective timing of these practices is that the crop should remain taller than the weeds; this height differential is essential for these cultivation strategies to be successful.

Outside of cultivation, there are other types of equipment to aid weed management. Roller crimpers promote a thick cover crop mulch that can prevent weed seeds from germinating and greatly reduce, if not eliminate, the need for cultivation. Flame weeding can enhance in-row weed management, particularly in wet soil conditions in which cultivation may be prohibitive. Newer pieces of equipment that move above the crop canopy, such as weed zappers, weed pullers and cutters, and between-row mowers offer expanded options to manage weeds that escaped the cultivation.

## Take-home message:

Although chemical means for weed management are extremely limited in organic systems, there are still many tools and strategies that an organic farmer can use to ensure that weeds are managed in their fields to ensure a productive, healthy crop. To be effective with these tools, however, it is critical that one adopts the mindset of “many little hammers” -- no single tool will be a silver bullet, but by combining both proactive strategies of crop rotation, cover cropping, and variety selection with sound fertility and in-season cultivation approaches, weed pressure in organic fields can be successfully achieved. While some weed pressure might remain, it is critical to keep this pressure in perspective: Are the weeds negatively impacting the economics of that crop phase or future crop phases? Are they contributing to the weed seedbank? Are they contributing to insect and disease issues? Will lack of management this year make management more difficult in future years, as can be the case with perennial weeds? Lastly, it is important to recognize that the weed management practices used in organic production are continuing to advance with respect to science and technology. New strategies based on our understanding of ecology and weed biology (especially when partnered with innovations in equipment, including those allowing for no-till management) bring advanced options to organic farmers for meeting their weed management goals.

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