

Small Scale Cultivation in Diverse Crops

Focusing on sub 10 acre systems I've used on farms

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I started working on small organic farms in 1997. The farms I've worked for have ranged from very small, completely hand worked gardens, to 20 plus acre operations with dedicated cultivating tractors. They have all grown a wide variety of vegetables, and some have grown herbs, flowers, fruit and incorporated animals. I've worked in the dessert Southwest, the Northeast, California and Oregon. Over the years I've also had the opportunity to visit many, many farms all over the world, farms at every scale. Whenever I have that opportunity I take to time to learn as much as I can about their systems and the tools they use.

Whether they realize it or not, a lot of times particular tools or weed control practices on specific farms are strongly tied to other parts of the farm system: how beds are prepared and planted, climate and soil, target weed species, available tools and available labor, irrigation techniques, personalities, etc. If a farm is using a technique I'm not, I want to know why, what part of their system makes it a good practice for them, but not fit into my system. Or, should I modify my systems to incorporate their practice, because it's better?

This is the basic system for weed control that I've developed for myself over the past two decades, taking cues from farmers far more experienced than myself.

Rotation

When someone visits one of my farms, the least expensive and least obvious part of my approach is the use of rotation as a tool for dealing with weeds. I realized early on that some crops on the farms I was working on tended to leave the ground relatively weed free for the following crop, salad greens, or lettuce for example. Other crops tended to build up a little weed pressure for the following crop, usually because they were in the ground for a long time and were relatively weed tolerant themselves, leaving little incentive for late weeding, allowing late weeds to go to seed.

In the Northwest we have a very long growing season (nearly 12 months), and our early spring weeds are a completely different set than our summer weeds, which are different from our fall weeds (by Northeast standards we don't really have a winter). A crop that may have built up summer weeds might not be a problem for a subsequent crop planted in the early spring before the summer weed seeds are germinating.

By paying attention to these factors and setting up my crop rotation so that crops that are sensitive to weed pressure and difficult to cultivate go into as clean a field as possible (carrots and alliums, for example) I greatly reduce my weeding costs. Crops that are easy to cultivate, in particular ones that are easy for me to cultivate with the tractor like lettuce and broccoli, can be used to clean up fields that previously had crops like winter squash and sweet corn, crops that, for me, tend to build up some weed pressure.

Clean Bed Preparation

Spending time preparing a bed for planting that is clean of weeds and that will allow you to easily get in with cultivating tools when you need to is a good investment. For me that means giving the cover crop or prior crop residue enough time to decompose and germinating and killing as many weed seeds as possible before planting into the bed. It also means making the bed as straight, flat and even as possible.

In the Northwest it pretty consistently takes four weeks from incorporating flail mowed crop residue to planting time. Within that four weeks, depending on the conditions and weed pressure, I'll surface cultivate the soil at least one more time to kill any weeds that have germinated, and sometimes to speed decomposition of the crop residue. If I need to, I might increase that to two or three times, and this can also help to dry out wet soil, a problem we have only early in the spring.

Weed seeds only germinate from the top 2" of soil so disturbing the soil deeper than 2" will bring up new flushes of weed seeds. Sometimes that's ok, and it may also be necessary to deal with weeds growing back from deep roots (for us that's bind weed, burdock and Canada thistle).

I want the final bed to be flat, straight and weed free, with little to no crop residue or chunks in the top 2". This will make planting easier, and it makes the first passes with cultivating tools easier, allowing me to get as close as possible to the crop without disturbing them, digging up clods or chunks that expose roots, or bury plants, skipping over low spots, or dragging trash with the cultivating tool.

Plant In Even, Straight Rows with Tight Spacing

Choosing crop varieties with good canopies that fill in quickly can help control weeds, especially later weeds. These aren't always the best from a harvest perspective. For example, I choose zucchini varieties with more canopy, which can make it harder to find the fruit and move through the field but prevents weeds from continuing to germinate and thrive after the plant has filled out.

There are a number of factors in choosing good plant spacing. Taking those into account I choose a spacing that lets the crop canopy fill out the entire bed as quickly as possible. I make rows as straight and evenly spaced as possible to speed hoeing and to allow closer tractor cultivation. For weed control reasons I tend to favor closer in line spacing with fewer rows per bed because inter-row cultivation is so much easier than in row cultivation.

Cultivate Early and Often

Timing is key to success in weed management. Weeds are almost always easiest to kill when they have their first seed leaves. Most weeds germinate, or re-sprout in 3-6 days, depending on the time of year. They are typically getting their true leaves 3-6 days later. I think of quickly cultivating every week to keep weeds down but missing a week keeps me in the window. Loosening surface soil by cultivating regularly reduces weed seed germination by breaking soil to seed contact, improves water infiltration from rain and

irrigation, improves air movement to roots and soil and releases small doses of nitrogen by increasing biological activity (like turning compost).

Flame weeding can be done pre-emergent on slow germinating seeds after weed seed germination but before crop germination. It is also effective post germination on monocot crops (alliums and corn), but similarly it is not very effective on monocot weeds (grasses) or perennials.

Irrigate to Favor the Crop

In the Northwest we have dry summers so we mostly control when water goes on and where. Drip tape wets less surface and germinates fewer weeds, overhead and natural rainfall evenly wet the surface, but also can cause compaction and germinate more weeds.

Choose Flexible Tools

On small scale, diverse market farms it's hard to have tools dedicated to single crops. Basic sweeps and side knives on a tool bar are good starting tools, essentially basic hoes, and hoes can be used the same way, which is usually faster than the way they are typically used. Carrying a wrench on the tractor makes field adjustments relatively easy. Side knives can be used to move soil away from, or towards the row.

Spring tine rakes in some ways act like lots of little sweeps, with the ability to follow contours and move around hard obstacles like rocks. Individually adjustable tines like the ones on Lely rakes allow quick in the field adjustment for different crops. The small, and spring nature of the tines tend to clog less than knives in wet conditions.

Rolling cultivators tend to clog less in trash and to deal with clods and hard soil better. These are tools like disks, spiders, and baskets.

Limiting variations in rows per bed allows the same tools to work on more crops. Hand tools are most efficiently used in pretty much the same way tractor mounted tools are used and there are close corollaries for most tools.

Killing by Burying, Dragging and Slicing

The above are the three basic ways mechanical tools kill weeds. These tend to be most effective in hot, dry, windy conditions where the weeds will desiccate more quickly, preferably before they can re-establish, but even if they do they will be set back. The smaller the weed, the fewer reserves it has to re-establish.

Set up your beds keeping in mind how soil will move over the course of cultivating through the season. Raised beds may get knocked down, furrows will get filled in.

Know When to Stop

The big trick is judgment, judgment that can only really be learned from careful observation over years: what to do when it's wetter than ideal, how much weed pressure is acceptable, when the crop is established enough to quit weeding. Focus on the pathway and inter-row weeds first, they are easiest to control and will constitute the majority of the weeds in the field. In row weeds are less important than you think.

