

CULTIVATION EQUIPMENT FOR WEED CONTROL: PROS, CONS AND SOURCES

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Effective mechanical weed control requires compatibility among the crop, the soil, seedbed preparation technique and cultivation equipment. As you plant, so shall you cultivate: use row spacings that will accommodate your equipment with a minimum of adjustment. Cultivating in a timely fashion is important, but that can be a challenge because of weather or other farm management demands. When weeds get ahead of you, a 'rescue' strategy with aggressive cultivation tools and/or hand-hoeing may be needed.

Field Cultivators are used for pre-plant weed control as well as incorporating residues and preparing a seed bed. They have a rigid frame with several rows of S-tines or C-shanks attached in staggered fashion, fitted with sweeps or shovels. There may also be cutting discs, rollers, cultipackers, crop shields, leveling bars, spike harrows and/or gauge wheels attached to the frame. Field cultivators are good for keeping fields free of weeds, or 'bare fallowing', until crops are planted. They cannot be used for after planting, except in the case of narrow units pulled between wide rows. They are relatively heavy and not suited to small tractors. Several brands are available; they vary in size, tool configuration, available options, and cost.

The Perfecta II field cultivator is made by Unverferth Manufacturing. It comes in widths from 4 to 28 feet, with folding wings in wider models. The S-tines, spaced at 18 inches on 3 individual bars for 6 inch centers, are fitted with standard 2 3/4 inch sweeps. Heavy duty models have 7 inch sweeps and thicker S-tines. The latter lift more soil and require more horsepower to pull (60+ hp for 10 foot unit, depending on soil). The tooth leveling bar follows the tines; it comes with either diagonal spikes or straight spikes which are better with more trash or more clay. Then comes the crumbler roller which has 2 positions to vary aggressiveness. An 8 foot unit costs just over \$2,000 with gauge wheels; add about \$300 for heavy duty sweeps and tines.

Kongskilde, a Danish company and S-tine innovator makes a unit called an 'S cultivator' that is manufactured in Canada. It has more tines and is priced higher than the Perfecta.. It comes in 7 to 12 foot widths, with 2 to 6 inch tine spacing. Available with leveling bar, crumbler rollers and either 'trailer' hockey stick harrows for leveling or long 'finger' harrows for stoney land. Brillion makes 'S-tine basket harrows' in 12, 15 and 18 foot widths. Stalford also makes a field cultivator, 3 to 42 foot wide with a variety of options.

Flex-tine weeders are used primarily for 'blind' cultivation over the whole surface of a recently planted field. They can be also be used before planting for bare fallowing. They're good at uprooting very small weeds but to avoid uprooting the crop must be several inches tall or have several true leaves. Some growers plant a little deeper to minimize crop damage. Tine weeders do not provide control of perennial weeds or well-established annual weeds.

Flex tine weeders can be used in clay or sandy soils and they work around rocks better than other blind cultivators. They can be used at fast speed, so the wider units cover a lot of ground quickly. Most units are light weight and can be used with small tractors. Originally intended for cultivating weeds in grain crops, flex tine weeders are suitable for use in many vegetable crops.

The Lely Weeder is made in Holland. It comes in 7, 10, 14 and 19 foot sections for about \$1700 to

\$3300. The 6 mm tines are set 1½" apart in 4 rows across the entire width of the unit, so it 'floats' independently. Optional gauge wheels help control depth, avoid gouging of soil on rolling land, and act as parking stands. It can be used as a blind cultivator with all the tines down until the crop is 3 to 8 inches tall, then the tines over the row can be raised and the cultivator used as a between-row cultivator. The depth of each individual tine can be adjusted, although few growers do so, instead using the 3-point hitch to adjust the pressure.

The Einbock Tined Weeder is made in Germany. Unlike the Lely, it has a single quick-adjust lever that controls angle and tension of all the rows of 7 mm tines. It is sold in 5, 6 and 10 foot sections for about \$1600 to \$2300. The 3-section unit can be manually folded; units with 3 or more sections fold hydraulically.

Rotary hoes are a more aggressive blind cultivator than tine weeders. They consist of thin spider wheels 16 or 18 inches in diameter, set 3½ inches apart across the entire unit. The spiders turn independently and bear the weight of the unit; gauge wheels are available. Rotary hoes 6 feet wide cost about \$1800, 12 feet wide cost \$2600, available up to 24 feet. Originally intended for blind cultivation of grain crops, they can be used for control of small weeds in recently emerged corn or beans. They are good for breaking up crusted surface of soils. They work well in heavy soils but are not recommended for light soil because they are heavy and will work too deeply. Rocks can jam in the wheels, keeping them from turning properly, and possibly damaging the crop. Plastic mulch pieces in the field will also collect on wheels and require removal. Dull spider tips reduce the effectiveness of rotary hoeing. John Deere and Yetter are manufacturers.

Basket Weeders are metal cages that roll on top of and scuff the soil surface without moving soil sideways into the crop rows. This action makes them ideal for newly emerged crops or crops like lettuce that have to be kept free of soil and are not suited to hilling. Budding basket weeders are custom built for two to eight row beds. Angled baskets are available to work the sides of raised beds. Basket widths range from 3 to 14 inches depending on the space between rows. For wider widths, and for inner row widths that change as crops grow, overlapping baskets are available that "telescope" or expand in and out to adjust for the width.

The front row of baskets turn at ground speed and a chain drives the rear row of baskets a little bit faster, so these kick up soil, and dislodge weeds that survive the first baskets. Commonly used at speeds of 4 to 8 mph, straight rows and an experienced operator are helpful to avoid crop damage. At higher speeds, both baskets will provide hoeing action. This tool is usually belly-mounted to facilitate close cultivation. The baskets handle small stones but work best in fine soils free of crop residues, and are most effective when weeds are very small, although they can take out a thick stand of inch-high weeds as long as the soil is friable. Cost is about \$1400 for a 3-row unit on a 4-foot frame, depending on mounting hardware. Order well in advance.

Finger Weeders also known as Budding 'C' cultivators, are used to work around the stems of crop plants that are sturdy enough to handle some contact. Rubber-coated metal fingers provide some in-row weeding. These are connected to a lower set of metal fingers that work deeper in the ground and drive the unit at ground speed. These units are used at just a few miles per hour since they are in such close proximity to the plants. They require belly-mounting, and are ideal for a G-type tractor. Wet clayey soils can stick to fingers and require frequent removal. Cost is about \$1500 depending on mounting hardware.

Sweep and S-tine Cultivators are used between rows on established crops. The shanks can be moved side to side on the toolbar to adjust for different row spacing and crop size. Sweep cultivators have C-shaped spring shanks, usually attached to 2½ inch diamond toolbars, often with gauge wheels at the ends of one toolbar. Hilling disks or other tools can be mounted close to the row. Cost for a 6 foot wide

unit with 2 toolbars is about \$1200 for 4 rows. Fewer, wider rows add to the cost as sweeps are added to work the between-row area. The spring shanks release when rocks are hit, then re-set.

S-tine cultivators have gangs of 3 tines attached to a 4 by 4 inch toolbar. Each gang floats independently on its own gauge wheel. They can cultivate row spacings of 16 inches or wider. Prices start at \$850 for a 2-row unit or \$1,500 for a 4-row unit on a 6 foot toolbar. Rolling crop shields or disc hillers add about \$100 per row.

Sweeps, shovels and knives are tools that attach to the end of a shank. The type of tool, as well as the arrangement of shanks and toolbars determines the amount and direction of soil movement and the area that gets cultivated. Narrow shovels with sharp points uproot aggressive weeds like quackgrass. Half-sweeps work up close to the row or along the edge of plastic mulch. Tender hoes, beet hoes or side knives cut parallel to the soil surface, sideways under the crop canopy, allowing close cultivation. Crescent hoes work raised bed shoulders. Rusty tools they may not cultivate well and rusty clamps make adjustments difficult. Wasco Hardfacing Co. is one source of a wide variety of sweeps, knives, shovels, shanks and clamps.

Bezzeries Tools are spyders, torsion weeders and spring hoes, used alone or in combination for close between-row cultivation. The 12 inch spyder wheel has staggered curved teeth and is ground-driven, rotating on a ball-bearing hub. A pair spyders can be angled in or out to pull soil away from the row or throw it back. Aggressive and rapid cultivation of straight rows is possible, even on stony soils. Torsion weeders are square stock metal bars that minimally move soil next to emerging crops. They can lightly hill small crops or follow the spyders, leveling the soil and flexing around plants to clean up missed spots. Spring hoes are flat blades about 16 inches long. They are more aggressive than torsion weeders, traveling perpendicular to the surface and stirring soil just below ground alongside the root zone. Cost for all 3 tools is about \$380 per row.

Rolling Cultivators consist of gangs of heavy slicer tines that aggressively dig up weeds and pulverize soil between rows. The gangs are ground-driven, and can be turned to adjust how much soil is moved. Gangs can be angled one way to pull soil away from the row while the crop is small, then turned the other way to hill or throw soil into the row as crop gets larger, burying in-row weeds. The aggressive action can control rather large weeds. Rolling cultivators can be used to work a crop like corn for as much of the season as the tractor can clear. Rear-mount, multiple row units are rather heavy and are not suited to small tractors. Individual gang width ranges from 10 to 16 inches depending on number of tines or spyders. A pair of gangs can be belly mounted to cultivate single rows; rear-mounted units can cultivate up to 12 rows. Several brands are available, including Lilliston, which start at \$1,600 for a single row unit, up to \$2,900 for a 4-row unit. Options can be added such as sweeps, crop shields, or fertilizer attachments for side dressing while cultivating. BHC and Brush Hog also manufacture a line of rolling spyders.

Williams Cultivator has a frame to which 4 rows of Lely flex tines are attached. It has a standard diamond front tool bar that attaches to the tractor with 3-point hitch. A second toolbar can be added behind the front tool bar to make room for more hilling tools, which is especially helpful if using it on 3 row beds. The flexible tines can be raised up about 12 to 15 inches off the ground; all of them or just the tines over a crop row, as needed. By removing two U-bolts you can remove the tine weeder frame, leaving the toolbar hitched to the tractor. That can be helpful once the clearance over the crop is limited; if you add the second toolbar it remains attached to the front one even when the frame is removed.

The tine weeders are good for 'blind' raking of the soil before crop emergence, and again for controlling small weeds after emergence, without damaging most crops. As the crops, and weeds, get bigger, more aggressive hilling action can be obtained by adding disks, spyders, shovels, and/or sweeps to the tool bar

(s), customized to your needs. Since the tines are really effective only in the bed area, not in the wheel tracks, choose a frame size based on your tractor 'straddle'. The front bar length is usually designed to cover outside-to-outside of the tractor tires in order to allow tools to be mounted that will work the area behind the tires/ in between the beds. The tool system comes in 40, 50 and 60 inch frame sizes and the basic frame prices are \$1680, \$1800, and \$1920. A second toolbar is \$200, Gauge wheels are \$200, and hilling spiders are \$225. Available from Market Farm Implement.

Brush Hoes are made in Switzerland by Bartschi-Fobro. They are for close cultivation in narrow rows. Units are rather expensive, starting at \$6,000 per row. Shields protect plants from bristle wheels that rotate independently between the rows, "sweeping" small weeds out of the soil and creating a 'dust mulch' that can suppress subsequent weed germination. An operator sits behind the rotating wheels and steers the unit to allow for close cultivation.

Star Hoes, also made by Fobro, are for cultivation between rows at least 16 inches apart. They have gangs of ground-driven 'stars' that are much like the spiders on rolling cultivators, except the individual star 'teeth' are curved at the ends so as to lift soil more than other types of spiders. The gangs can be angled to pull soil away or push it into the rows. A second operator steers the unit as a whole over the rows, allowing very close cultivation. The unit is well suited to crops grown on beds in uniform row spacings, i.e. 17 inch triple rows, 34 inch double rows. Taller plants may not fit under the toolbar, and bushy plants may snag on the stars. These problems usually happen at the time a standard tractor has trouble clearing the crop. Price is about \$4,500 for a 4-row unit without the steering mechanism for a second operator; it costs about \$1,100 more. Stars can be added for additional rows, fertilizer units are optional.

Cultivating tractors are usually off-set for good visibility of the crop rows being cultivated. They may be lightweight and low to the ground for use on young or low-growing crops (the Allis Chalmers "G" tractor, no longer made, is the classic of this type) or high-clearance for taller crops (like Farmall Super A, Kubota, etc.). A 50 year-old cultivating tractor in good shape with implements may cost \$3,000 to \$4,000. High clearance cultivating tractors from the 1980's may cost \$10,000. A new Saulkville cultivating tractor costs about \$20,000.

Gauge wheels should be considered on rear-mounted cultivators so you can just drop the implement and watch where you are driving while cultivating. They help maintain uniform depth of cultivation and eliminate the need to set the tension with the 3 point hitch every time you set a cultivator down. They also make it quick and easy to park.

Some Sources of Cultivation Equipment

Bartschi-Fobro LLC
P.O. Box 651
Grand Haven, MI 49417
616-847-0300

Bezzarides Bros., Inc
P.O. Box 211
Orosi, CA 93647
559-528-3011

BDi Machinery Sales Co.
430 E. Main St.

Macunie, PA 18062
800-808-0454

Budding Weeder Co.
7015 Hammond Ave.
Dutton, MI 49316
616-698-8613

Chauncey Farm
119 Bridle Rd.
Antrim, NH 03440
603-588-2857

HWE Agricultural Technology (Einbock)
B.P. 1515
Embrun, ON K0A 1W0
613-443-3386

Market Farm Implement
257 Fawn Hollow Rd.
Friedens, PA 15541
814-443-1931

Lely Corp.
P.O. Box 1060
Wilson, NC 27894
252-291-7050

Unverferth Manufacturing
P.O. Box 357
Kalida, OH 45853
800-322-6301

Wasco Hardfacing Co.
P.O. Box 2476
Fresno, CA 93745
559-485-5860

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