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Ridge-Till Tips

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Ridge-till, a tillage system involving scalping and planting on ridges built during cultivation of the previous year's crop, usually involves spring-planted row crops grown with a combination of herbicides and at least one cultivation. Herbicide costs may be reduced by a band application over the row and depending on cultivation to control weeds in the middle of the row. Scalping (row cleaning) about 1 to 2 inches off the top of the ridge at planting time moves most of the residue and weed seeds to the middle of the row and leaves a clean, smooth area for the planter openers and depth gauge wheels to run on. In some cases (such as heavy, clay soils or with very low ridges), it may be better to eliminate the scalping operation (planting no-till on the top of the ridge).

Since the ridges are preserved and rows are planted in the same location each year, traffic may be controlled. Ideally, most row middles have no wheel tracks, so that these middles, plus the row area, become less compacted as time goes on. Some growers are convinced that production improves steadily the first five years using ridge-till (from improved soil tilth). Some research, especially in Ohio, has found similar results with no-till (including pronounced beneficial effects from earthworms).

For some typical Indiana soils, Purdue University lists the following yield coefficients for ridge-till (the yield coefficient is the ratio of expected yield from till-plant compared to the yield from fall plowing):

For continuous corn the range is from 0.91 to 1.03.

For first year corn after soybeans the range is from 1 to 1.1.

For first year soybeans after corn the range is from 0.98 to 1.1.

Cultivation

Cultivators used to build ridges must be heavy and strong (thus, they are costly, typically about $1,500 per row). Several companies now market ridge-till cultivators. These machines can also be used to "salvage" no-till row crops when chemical weed control is inadequate.

A typical ridge-till cultivator has a coulter to cut through the residue in each row middle followed by a disk hiller on each side of each row and a large sweep in each row middle. Ridging wings (furrowers) are often attached behind the sweeps to further aid in ridge building.

The usual mode of operation is to set the disk hillers close to the row and set to throw soil away from the row during the first cultivation. The sweep is usually set quite deep at the first cultivation when few roots have grown into the row middles. During the second cultivation, the hillers are set to throw soil toward the row and the ridging wings may be used, too.

The disk hillers tend to throw the soil and build a peaked ridge. In heavy, wet soil the disk hillers can throw slabs of soil long distances. Under most conditions, the ridging wings will build a more desirably shaped ridge (with a nearly flat or rounded top that is easier to hold the planter on than a peaked top).

Getting started with ridges

Ridges are usually built 6 to 8 inches high to allow for weathering and settling. By spring they will usually be 4 to 6 inches high. The initial ridges are usually built when the cultivated crop is either corn or grain sorghum (milo). Ridges are usually built when the crop is 12 to 18 inches high. If the initial ridges are built in a crop of soybeans, lower ridges (3-4 inches high) may be built to ensure that the yield is not reduced by covering the lower pods.

Since there is only a short time span when ridges may be formed before the crop is too large, cultivation may become the critical factor for large operators. Some farmers may need to increase cultivator (and planter) size when switching to ridge-till to better ensure capacity to get the ridges rebuilt.

Ridges are seldom used with rows narrower than 30 inches. Wider rows allow the ridges to be higher or less peaked. Ridges that are nearly flat, or slightly rounded, and fairly wide present less problems with holding planters on ridges. Wider rows also allow the use of the wide widths of combine tires more commonly used on the larger machines.

Ridges are sometimes built after harvest. This works best when there is very little residue on the surface, such as after removal of a silage crop. Heavy

residue, such as corn or milo stalks, should be shredded. Even then, planting next spring may be somewhat like planting into a bale of straw. Tillage to reduce the amount of residue placed in fall-built ridges might be considered. Soybean residue may not be sufficient to cause much trouble with planting and seedling emergence next spring and is much preferred over corn residue for fall-built ridges. It is important that the combine do a uniform job of spreading the crop residue.

Orienting fall-built ridges on the contour will help to reduce over-winter erosion in the residue-bare furrows.

Ridge-cleaning (scalping) devices

Three different types of scalping devices are commonly used. Originally, a wide, flat sweep was the most common device. The sweep is usually preceded by a coulter to cut through the residue. Trash guards mounted on the shank above the sweep help to move the residue toward the row middle (somewhat like a V-shaped snow plow but using rods instead of a solid vee).

A second device is a horizontal, unpowered disk that is free to rotate. By rotating, trash is less apt to accumulate on the disk and wear is equalized around the disk.

The third device consists of disk furrowers–two vertical disks mounted back-to-back and throwing soil and residue toward the row middles. The disks may be either smooth or notched. Notched disks will keep turning better in trash, especially when operated at shallow depths. One disk usually leads the other to present a narrower aspect to the residue for better cutting. To prevent planter side-draft, there should be an equal number of furrowers with the right and left disks leading.

Other means are sometimes used to clean the ridge, including rotary tillers, tandem disks and mulch treaders. These may be used in tandem with the planter or as a separate operation.

The row-cleaning device should not be operated too deeply. Less than 1 inch depth may be sufficient under some conditions; 1-2 inches is usually adequate under any condition. Usually, depth should be sufficient to remove dry soil and residue but not so deep as to plant in overly wet soil or to completely remove large root clumps.

The scalped row area should be well above the original furrow (preferably 3-5 inches above) and slightly rounded on top so that water will drain to the sides and not pond or run down the row. The smoothed area should be wide enough for the planter gauge wheels not to run on residue or clods, usually about 10 to 12 inches wide.

Removing root masses can cause problems with depth control, soil-to-seed contact and later crop cultivation. The removed root masses may be run over by the planter gauge wheels, causing uneven depth; a void may be created in the row where the root mass was removed so that the planter cannot properly place and cover the seeds that are dropped into these voids; and at cultivation, root masses may plug the cultivator or be pushed back into the row and interfere with crop growth or harvest.

Several methods of attaching the row-cleaning devices and controlling their depth may be used. Those that attach to the planter frame and control depth independent of the planter units usually provide more consistent depth control. Those that mount directly to the planter units and depend on the planter's gauge wheels usually have inconsistent depth control. Units that mount on the parallel linkage between the planter frame and the planter units provide a compromise between cost and performance.

Planter stabilizing attachments

The need for stabilizing devices on the planter usually increases as row width (and ridge width) decreases, as sideslope increases and as row curvature increases, especially with pulltype planters. Some devices are available, or in a state of development, to provide guidance for the planter to bring it back onto the ridge.

Coulters are probably the least-cost stabilizing device available. Coulters may be used as combination stabilizers and residue cutting devices or as a separate stabilizer. Coulters tend to make the cultivator run in a straight line and may tend to guide the planter off of a curved row, and to make it harder to bring the planter back onto the ridge once it gets off.

Other devices include tapered wheels that run in the furrows and angled wheels that run against the sides of the ridges. These devices are usually used in pairs. The angled wheels are sometimes used on each ridge, especially when they also serve as gauge wheels for the row-cleaning device. Any of these devices must carry a portion of the planter weight to work properly. Care must be taken to ensure that sufficient weight remains on the planter metering system drive wheels to keep the mechanism turning without slippage.

A combination scalper-stabilizer with a pair of angled wheels usually costs about $500 per row (requires one unit per planter row or about $3,000 to equip a 6-row planter).

Residue management and soil conservation

To provide erosion control, ridge tillage must provide residue at least in the furrow area. With adequate stable residue in the furrow and furrow slopes not over 5 percent with corn residue or over 3 percent with soybean residue, erosion will usually be controlled within

acceptable limits unless slope lengths are exceptionally long. Research has shown that the residue in the furrows will keep the velocity of the water flowing in the furrows below that required for detachment and transport. Thus, most of the soil removed from the ridges will be settled out in the furrows.

After planting, up to 30 to 50 percent of the original residue may remain on the surface, concentrated in the furrows. After corn, 20 to 30 percent of the soil surface is usually covered with residue. After soybeans, only 5 to 10 percent of the surface is usually covered with residue.

Stalk shredding may be desirable if corn or milo has yielded substantially more than 120 to 130 bushels per acre, or the excess residue may be reduced by grazing with cattle (cattle will usually remove about 1,000 pounds per acre per cow-month, equivalent to the residue production from about 17 bushels/acre). Cattle should not be allowed on ridges except when they are dry or frozen.

Shredding will help to remove residue from the ridges, resulting in earlier spring warmup. Research by Purdue University has shown that ridges are usually not more than 1 or 2 degrees F cooler than fall plowed fields on a spring afternoon. Ridges are usually 4 or 5 degrees warmer than no-till planted into corn residue.

Shredding may speed residue decomposition and aid incorporation to help water to get across the field better when furrow irrigation is used on highly permeable soils. Residue may aid furrow irrigation by slowing water flow on relatively impermeable soils.

Fertilizer application

Nitrogen. The timing and placement of nitrogen fertilizer depends on the form used. Anhydrous is probably the most economical form and can be applied preplant, side-dressed, or, in some cases, with nitrification inhibitors, in the fall. Anhydrous applicators usually require either smooth or narrow rippled coulters to cut the residue ahead of the knives, and two sealing wings on each knife to seal the ammonia in the slot. Sealing and residue problems with applicator knives are more of a problem following corn than soybeans.

Surface-applied N can be used, but higher losses may result. If surface applied, urea and liquid N are usually applied within two days of planting so that losses may be reduced by the incorporation effect of the row-cleaning operation.

Phosphorous and potassium. P and K are usually applied on the surface, preferably in the spring to reduce runoff losses. The planting and cultivation operations will usually incorporate these materials from 3 to 4 inches deep. If the P and K levels are low at the 4 to 8 inch depth, these nutrients should be brought up to at least a medium level and incorporated by chiseling (or plowing, if the soil is not subject to severe erosion). P and K may be knifed in any time of the year or applied as a side-dress with the planter or cultivator. If the P level is low, a planter application of this nutrient may be advantageous.

Knives and other openers for fertilizer application are usually operated in the middle of the row to prevent disturbing the ridge and seedbed.

Lime. If nitrogen is surface-applied with till-planting (or no-till), an acid layer will develop in the top 2 to 3 inches of soil, markedly decreasing the effectiveness of triazine herbicides. Under these conditions, the soil pH in the top 2 to 3 inches may need to be checked every two or three years and smaller than normal applications of lime may need to be applied every few years. If nitrogen is deep-placed, or if plowing is done periodically, lime may be applied according to normal soil test recommendations.

Weed control

Many ridge-tillers band-apply pre-emergence herbicides over the cleared row behind the planter, using perhaps 60 percent less herbicide than if broadcast. Some farmers band-apply a UAN solution and herbicide mix in a 10- to 14-inch band over the row. Since cultivation is necessary to rebuild the ridges, these operators usually cultivate twice for better weed control. The first cultivation is deep and early to kill weeds and to loosen the soil before root pruning becomes severe. The second cultivation builds the ridge.

If weeds are over 1 inch tall at planting, a preplant burndown with either contact or translocated herbicides is recommended. Perennial weeds should be brought under control before initiating a ridge-till system. For details on herbicides, see Weed Control Guide for Missouri Field Crops (MP 575). Ridging may concentrate some herbicides, such as Treflan, and be detrimental to corn the following year.

Combines and harvesting

Keeping the combine tires off the ridges to prevent deformation of the ridges or soil compaction may be the hardest problem to solve for those who use large combines. The widest tire recommended for 30-inch rows is a 20.8 and for 36-inch rows a 24.5 tire. Compaction of the ridges may result in a 10 percent decrease in the yield of the compacted rows.

For more flotation or load-carrying capacity, tall, narrow duals are recommended. Two tall, widely spaced duals may provide better flotation than one single wide tire. However, many combines are not warranted for the use of duals. Straddle dual attachments including spacers, new wheels and new tires for a John Deere 7700 series combine cost approximately $5,000. Attachments are available from Unverferth Mfg. Co., Inc., Kalida, Ohio 45853 (419) 532-3121, and Kirchner Wheel Inc., Dundee, MN (507-468-2451).*

*References to products and manufacturers are for descriptive purposes only and are not intended as endorsements.

Smaller combines may require axle extensions to straddle four rows. Be sure that extensions will not cause axle or bearing failures. Some ridge-tillers use offset corn heads or use three, five or seven-row corn heads to make wheel spacings usable on their ridges.

Trucks and grain carts should either be kept out of the field or have tread spacings and tire widths that will keep the truck, cart and tractor tires off the ridges.

The pros and cons of ridge-till

Advantages of ridge-till include:

- Reduced soil erosion (compared to fall primary tillage with the same percentage residue cover after planting), especially when rows are on the contour (each ridge acts as a miniature terrace).
- Reduced fuel, labor and machinery costs (compared to conventional tillage).
- Herbicide costs may be lower than for no-till and other conservation tillage systems that do not include cultivation. Scalping tends to move weed seeds and volunteer corn problems to the middle of the row where the cultivator provides control.
- May allow earlier planting on level, poorly drained land than with other high-residue tillage systems. The ridges warm up and dry out sooner than other high-residue systems (gravity tends to move water and residue from the ridges to the furrows). On cold, poorly drained soils, yields tend to equal that of fall-tillage systems and exceed no-till yields.
- Works well with furrow irrigation.

Complicating factors include:

- Limitations on rotation with drilled soybeans, wheat and other narrow row crops. (A few producers have successfully planted wheat on the ridges and furrows with no-till drills).
- Higher labor, fuel and equipment costs than no-till. Ridge-till requires a heavy, expensive cultivator to rebuild the ridges annually.
- Will cause drainage problems if furrows have reverse slopes where water ponds (land should be put to grade or outlets cut below the low spots in the furrows to provide drainage; these outlets may need to be seeded to permanent grass to prevent erosion).
- Difficult to hold the planter on the ridges on sharp curves and steep hillsides.
- Extra cost to convert planters to ridge-till by adding scalping attachments and devices to hold the planter on the ridges.
- All equipment, including combines, grain carts and fertilizer carts, should have wheels spaced to keep tires in the furrow and not compact the ridges. This may require narrow, wide-spaced dual tires on combines.
- Planting up and down long, steep slopes may increase erosion compared to other systems, especially no-till. Normally, furrows should not have slopes greater than three to four percent, depending on the length of slope and the amount and kind of residue (loose soybean residue can easily be washed down the furrow).
- High management is required to make the system work. Placement and incorporation of fertilizer, herbicides, and pesticides will usually change from previous procedures. Rows should be carefully laid out the year ridges are built. Make sure that the "guess rows" are not too narrow (some users extend the markers an extra 2-4 inches).
- End rows present a problem. They may be planted "flat" or the ends may be planted in grass. At the present time, it may be possible to grass a 66 foot wide strip at the ends and use as "set aside."
- Winter annuals may cause a problem with ridge-till. They usually are spotted over the field but may require control with preplant herbicides to prevent moisture loss. Even then, some growers observe stunted plants and slow growth, perhaps due to an allelopathic effect.

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