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G88-876 Ridge Plant Systems: Equipment

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NebGuide

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Ridge Plant Systems: Equipment

Ridge plant systems, ridge cleaning equipment, planter stabilizing attachments, cultivation and ridge management are discussed here.

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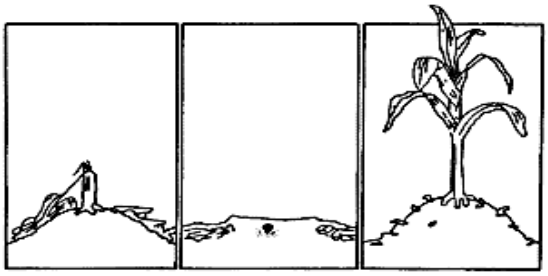
Ridge plant systems are methods of planting crops into a ridge formed during cultivation of the previous crop. Such systems combine tillage and herbicides to control weeds. Weed seed and residue lying on the soil surface are pushed from the ridge to the area between the rows by row-cleaning devices on the planter. Crop seed is planted into the old row in a cleanly tilled strip at an elevation slightly higher than the row middles. A band application of herbicide behind the planter typically is used in the row for weed control. Crop cultivation controls weeds between the rows and rebuilds ridges for the following year (*Figure 1*).



Before Planting After Planting After Cultivation

Figure 1. Cross-section of ridges at various times.

Level or gently sloping fields, especially those with poorly drained soils, are well suited for ridge plant systems. The elevated ridge tends to shed the residue to the row middles, allowing earlier soil warming in spring. This warming, combined with water drainage from the ridge, make the soil in the ridge drier than unridged soil at planting time. This makes ridge planting an excellent choice for soils that are often too wet for early spring tillage.

Ridge plant systems offer erosion control by leaving the soil covered with residue until planting. After planting, 30 to 50 percent of the initial residue may be left on the soil surface, but the residue is not

distributed uniformly. Residue-covered areas between the rows alternate with cleanly tilled strips in the rows. If planting is done correctly, the cleanly tilled strips will be higher than the residue-covered areas, so water drains from the row to the residue covered row middles.

On slopes greater than three to four percent, ridge plantings must be done around the hill for effective erosion control. Ridge planting up and down hill on sloping fields can increase erosion because water may run down the cleanly tilled strip, washing away soil, seed, fertilizer and pesticides. Ridge planting around the hill prevents water from running down the row. On the contour, ridges act as mini-terraces, slowing the rate of water flow down the hill.

On slopes greater than six to seven percent, ridge plant even on the contour begins to lose erosion control. A greater amount of uniformly distributed residue is needed for erosion control on these steeper slopes.

Ridge plant systems can be an excellent choice for furrow-irrigationd fields. The ditching or hilling operation required for irrigation makes suitable ridges for planting into the following year. Residue remaining on the ridges at planting is pushed into the row middles. If the furrow-irrigationd field has a low infiltration rate or excessive runoff before the crop is adequately irrigationd, the residue between rows can be advantageous.

Residue slows the rate that irrigation water advances across the field, allowing more time for infiltration. However, if the soil has a high infiltration rate and there is a problem of getting water across a field during irrigation, residue between the rows can be a disadvantage.

Crop rotation influences suitability of ridge plant systems. Ideally, the ridges are maintained year to year, making ridge planting well-suited to continuous row crops.

Rotations involving narrow-row soybeans, alfalfa or small grains may require tillage to destroy the ridges and level the field, and ridges for planting into next year cannot be easily rebuilt in these crops. A crop rotation having one year of narrow row soybeans, alfalfa or small grains generally results in two years without ridges.

Removing surface weed seed from the row, combined with mechanical and chemical weed control, gives ridge planting an advantage over some other tillage and planting systems. Conventional tillage operations incorporate or plant weed seeds while ridge plant systems leave weed seeds lying on an undisturbed soil surface. Continuous use of a ridge plant system offers an opportunity to reduce reliance on herbicides because of less weed pressure and the use of a band herbicide application rather than broadcast.

Two major types of ridge plant systems are used in Nebraska. One system does not include any pre-plant tillage operation and is most often called "ridge plant" or "till plant." The other system has some tillage prior to planting, generally limited to the row area, and is usually called "ridge till."

Ridge Plant

Ridge plant or till plant systems do not have tillage prior to planting. However, depending on the residue amount and fertility programs, shredding residue and knifing in fertilizer may occur prior to planting. In dryland situations or when the corn or grain sorghum yield is less than 120 to 130 bushels per acre, shredding will not be needed because residue will flow more easily through planters when it remains attached to the soil. Shredding residue on fields having higher yields aids in cultivating or ditching because the residue is cut into smaller pieces that can pass more easily through these implements without plugging. On furrow-irrigationd fields where residue may create problems with water advance, shredding early in the spring can speed the decomposition of residue. Livestock grazing reduces residue amounts

and minimizes the need for shredding, even in fields having high yields.

Ridge Cleaning Equipment

Ridge planting equipment uses row cleaning devices to push residue and weed seed to the row middles. A secondary function is to push residue away from the row to enhance soil warming. Ridge cleaning devices include disk furrowers, sweeps and horizontal disks (*Figure 2*).

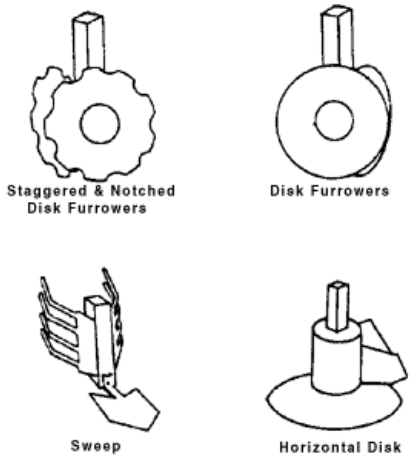


Figure 2. Types of ridge cleaning devices.

Smooth disk furrowers have been used when planting into conventionally tilled fields to remove dry soil and clods from the row area. These also can be used to move some of the surface residue and weed seed to the row middle.

In general, larger diameter disks will be more effective in moving residue and weed seed, and have less plugging problems than smaller diameter disks. Overlapping, notched-edge heavy-duty versions of these disk type furrowers are available for use in ridge plant to remove the ridge tops. The notched edges aid in keeping the disks rotating when operating at a shallow depth. The overlapping disks cut the residue without plugging, and cleans the row area behind the disks.

To minimize side draft, the leading disk should be on the right for one-half of the furrowers and on the left for the other half.

Early ridge planters used a wide sweep to clear the top of the ridges. The flat sweep allows operation at a shallow depth, sliding under the residue and moving residue, soil and weed seeds to the row middle. Often some type of deflector shields or "trash guards" are used to move the residue, soil and weed seeds off the ridge top as they slide over the sweep.

The rotating disk was recently developed to remove the ridge top. These disks, mounted horizontally on a vertical shaft, are designed to operate like a sweep, sliding under the residue and soil. Again, deflector shields are used to keep the row area clean. The rotating action makes the disks self-cleaning and distributes wear around the perimeter of the disk rather than only on the leading edge.

Regardless of the type of row-cleaning device selected, it needs to be operated very shallow. After planting, the top of the ridge should be three to five inches higher than the row middle. This reduces erosion potential in the cleanly tilled strips.

Even if the field is relatively flat and has little erosion potential, creating furrows by operating the row-cleaning device too deep can cause sediment from rainfall and runoff to be deposited in the row. When dry, these deposits can form a crust that a rotary hoe may not be capable of breaking. Operating row-cleaning devices too deep also places the crop seed in a cooler, wetter environment which can slow germination and emergence.

Operating row-cleaning devices too deep is a common problem with ridge plant systems. The operating depth only needs to be deep enough to keep residue and weed seeds flowing away from the row area. Very little soil needs to be moved, and it is not necessary to remove the previous crop root masses.

Removing the root masses can cause problems with depth control, seed to soil contact and crop cultivation as follows:

1. the removed root masses may be run over by planter gauge wheels causing non-uniform depth;
2. a void can be created in the soil where the root mass was removed and the planter may not be capable of placing and covering the seed properly when seeds are dropped into these voids;
3. at cultivation, root masses can plug the cultivator or be pushed back into the row, interfering with crop growth or harvest.

Several different methods are used to control the operating depth of the row-cleaning devices. Row-cleaning devices which operate independently of the planting unit provide the most uniform and consistent depth control. Those devices which mount directly to the planting unit and use the planter gauge wheels for depth control may have inconsistent operating depths.

Although not as good as independent depth control, mounting the row-cleaning device on the parallel linkage between the toolbar and the planting unit can be an effective compromise between performance and cost.

Planter Stabilizing attachments

Since ridge planting occurs on the old row, keeping the planter on the ridge is important. On properly formed, flat-topped ridges, planter stabilizing attachments or guidance systems generally are not needed. However, when planting on contours or around a hill, an attachment may be needed to help keep the planter on the old row.

Coulters often are added to the planter to cut residue in front of the ridge-cleaning attachment. These coulters act as stabilizing devices, similar to the stabilizing coulter added to row crop cultivars. Another option is the addition of large diameter coulters to the toolbar of the planter. Coulters guide the planter in a straight path, minimizing side-to-side movement rather than actually following the ridge. If the planter is off the ridge, coulters make it difficult to get the planter back on the ridge.

Tapered stabilizing wheels running in the furrow or angled guidance wheels running on the side of the ridge sometimes are used to help the planter follow the ridge. These devices, used in pairs, are mounted on the toolbar to keep the planter on the old row. In order for the wheels to work properly, they must carry some of the weight of the planter. Take care when mounting the wheels to keep enough weight on the seed-metering drive wheels to prevent slipping.

Some ridge planting attachments use small, angled guidance wheels on each row unit rather than the larger toolbar-mounted guidance wheels.

Currently guidance systems are being developed and marketed which use sensing devices combined with mechanical steering mechanisms to keep planters on the ridge.

Ridge Till

Unlike ridge plant, ridge till systems make use of some tillage prior to planting. The tillage is generally very shallow, tilling only the ridge tops but not completely destroying the old row. Depending on the tillage implement used, some incorporation of herbicide in the row area is possible. However, the tillage also incorporates some of the weed seed rather than removing it from the row.

Tillage prior to planting can be used to flatten or smooth peak-shaped ridges to aid in keeping the planter on the old row. When large amounts of residue are present, light tillage can be used rather than stalk shredding. Tillage prior to planting also can be used for controlling emerged weeds.

The most common ridge rill system uses a rotary tiller with planting units mounted behind the tiller. To maintain the old row and avoid excessive power requirements, the rotary tiller should be operated only in the top two or three inches of the ridge. Rotor tines should be limited to, or at least concentrated in, the row area to provide a strip till configuration. Some additional tines can be included between the rows if it is necessary to break up residue or to kill growing weeds.

The rotary tiller cuts and chops residue on the ridge, incorporating some residue while the remaining residue settles to the lower area between the ridges. Since the planter operates in tilled strips, there is no need for either coulters or row-cleaning devices.

The rotary tiller offers some incorporation of herbicides in the row area. However, some of the soil and thus herbicide is thrown away from the row because of the rotary action of the tines. This tillage action also moves some of the weed seed on the soil surface away from the row, but the remaining seed is incorporated into the row.

To avoid this problem, some farmers place row-cleaning devices in front of the rotary tiller and use a band herbicide application between the row cleaners and the rotor. This combination removes most residue and weed seed from the row area while providing tillage and herbicide incorporation in the row area.

Other types of ridge till systems include the use of mulch treaders, rolling stalk choppers, tandem disks or harrows. Rounding or flattening the ridge, removing some of the residue from the ridge, and killing emerged weeds are major reasons for using one of these implements. Regardless of the tillage implement used, the operating depth should be very shallow and chemical incorporation should not be a tillage goal. With shallow tillage the old row will be visible because of reduced residue amounts on the ridge.

Planting equipment needed for ridge till systems depends on how much residue remains on the ridge, and the height of the ridge after tillage. If the ridge is relatively flat and residue free, most conventional planting equipment can be used without modification.

Greater residue levels may require that a coulter be added to cut the residue.

Row-cleaning devices also can be used in ridge till systems, but care must be taken to avoid creating a furrow in the row area.

Other Equipment and Management Considerations

Fertilization

Several options are available for fertilizing crops planted in ridge systems. These include broadcasting either dry or liquid, knifing in preplant, applying with the planter, side dressing and applying with an irrigation system. Mechanical incorporation of surface-applied fertilizers is not available with ridge plant systems, and only minimum incorporation may be available with ridge till systems. Rainfall, irrigation or crop cultivation may be used to incorporate the fertilizers.

Fertilizer placement equipment on planters usually can be used without modification. However, preplant

knifing and side dressing of fertilizer into ridge plant fields require that the knives operate between the rows.

Operating a preplant knife directly in the old row destroys the ridge and the seedbed. A smooth or narrow rippled coulter in front of, each knife may be desirable to cut through large amounts of residue and minimize soil disturbance.

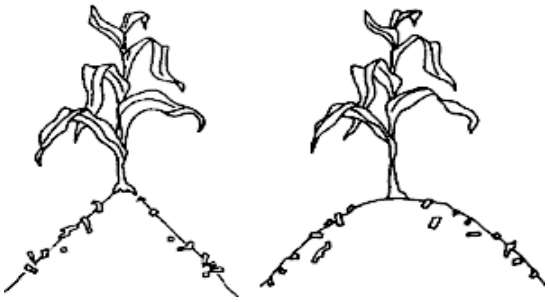
Cultivation

Cultivation is an integral part of ridge plant and ridge till systems. Two cultivations are generally used for weed control and rebuilding the ridge.

The first cultivation should be early and relatively deep, to kill weeds and loosen soil. A deep cultivation at early crop growth stages does not prune or damage crop roots and keeps the cultivator operating below residue in the bottom of the furrow.

The second cultivation or ditching operation when the crop is taller provides additional weed control and is used for rebuilding the ridge. In cases when most of the ridge remains after planting, a second cultivation may not be necessary to rebuild the ridge that year.

The shape of the ridge is critical. Ideally, the ridge should be rounded or flat topped (*Figure 3*). A peak-shaped ridge is easier to make, but more difficult to keep a planter on top of. To form a rounded or flat-topped ridge, soil should be pushed, rather than thrown, to the row. The height of the ridge should be six to eight inches after cultivation. Because of weathering and settling, these ridges may be only four to six inches tall the following spring.



Peaked is Undesirable **Rounded or flat topped is desirable**

Figure 3. Ridge shapes.

Cultivators for ridge plant systems must be capable of handling relatively large volumes of residue. Often these cultivars have coulters in each furrow to cut the residue. The coulters are followed with a sweep or horizontal rotating disk, wide enough such that only one is needed between each row.

Many ridge plant cultivars are equipped with barring off disks mounted adjacent to the row. During the first cultivation these disks are used to remove soil and any emerged weeds from the side of the ridge. On the second cultivation these disks are positioned to push some soil toward the row, covering small weeds in the row.

To protect the crop, shields can be used during the first cultivation. Open top shields can be used during the second cultivation to both protect the crop and help control the ridge shape.

Ridging or furrowing wings, attached behind the center sweep or horizontal disk, are used to build ridges. These wings push the soil from the sweep or disk to the row area. For furrow irrigation, a shovel-type ditcher, rather than a disk-hiller, should be used to build the ridge. Disk-hillers tend to form peak shaped ridges.

The number of rows on the cultivator or ditching implement and the planter must be the same. This ensures that all ridges within a single pass of the planter are parallel and equally spaced. If the planter

straddles a guess row from the previous season's ridging operation, it is difficult to stay on the ridges.

Ridge Maintenance

For ridge plant systems, a large portion of seedbed preparation occurs during the ridge-building operation. It is important that subsequent operations such as harvesting and fertilizing do not damage the ridge. Proper wheel spacing and tire size are factors which must be considered when using ridge plant systems.

Wheel traffic must be confined to the row middles, away from the ridge, to avoid compacting the seedbed. The wheel spacing of all equipment in the field must conform to the same row spacing. Common modifications include extending the axles on combines or repositioning the tires by reversing the rims. Grain carts, trucks, floaters and other implements which do not match the row spacing should be kept out of the field.

Tires that are too wide to fit between the ridges can damage the sides of the ridge, making it difficult to keep the planter on top of the ridge. Narrower tires may be a solution. However, if narrow tires will not carry the load safely, adding spacers and dual narrow tires which straddle the ridge will reduce damage to the ridge.

Keeping all implements the same width can result in controlled traffic where only specific row middles are driven on. If compaction occurs, it will be confined to these row middles. When necessary, confined compaction can be treated easily.

Ridge plant fields can be grazed, but care should be taken to protect the ridge. Grazing should occur only when the soil is dry or frozen; feeding or watering areas should not be in the ridged field. If the soil is wet, cattle should be kept off the field. Generally, cattle should be removed before the soil thaws in the spring. Random cattle tracks and trails through the field generally can be planted across with no problems, and the ridges rebuilt at cultivation time.

Closely related to ridge maintenance is residue management. For successful ridge plant systems, the residue needs to be uniformly distributed at harvest using either a spreader or chopper on the combine. Residue in windrows or in bunches will create problems with knifing in fertilizer, planting and cultivating and in irrigating furrow-irrigationd fields. Failure to uniformly distribute residue may require tillage to minimize these problems.

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