

# Consider the Possibility of Reduced Tillage after Biomass Harvest

Over the years, increasing corn grain yields have brought a new concern—what to do with increased cornstalk biomass. To manage this increased residue, famers have used both stalk chopping and more aggressive tillage, even though these options increase costs for time, fuel, and machinery.

Removal of harvested corn stover may reduce the need for some of these options. Assuming plants produce an equal amount of corn stover to grain, removing one ton of corn stover equates to handling residue from a crop yielding about 35 to 40 bushels per acre less than the actual yield. As an example, using this assumption after removing one ton of cornstalks, residue from a 210 bushel per acre yield is reduced to a mass of residue roughly equivalent to that from a 170 to 175 bushel per acre yield.

Several factors should be considered. Older tillage and planting equipment that may have had difficulty handling large amounts of corn residue has been replaced on many farms (figure 1). Difficulty in the past using a field cultivator or other implement with inadequate clearance between rows of shanks on the toolbars may no longer be a problem. Clearance by the planter is rarely a problem. However, planter performance may be hindered as the seed opener places the seed if the planter is of inadequate weight and the residue is significant. Moving up to a heavier planter manufactured within the last 20 years and using row cleaners have allowed successful operation into heavier residue by many growers.

It may seem daunting to acquire management skills for planting corn in a relatively high-residue system such as no-till (figure 2) or strip-till. For those preferring a full-width tillage system with a field cultivator, disk, chisel plow, and/or a subsoiler/ripper, it's worth noting that there may be a diminished rate of return for tillage beyond a certain point. Long-term side-by-side tillage trials at Iowa State University research farms generally have shown less than one bushel per acre of corn yield difference between chisel plow and deeper subsoiler or ripper tillage systems (figure 3). This is true at locations in central and north central Iowa on glacial-till soils as well as loess soils at other locations.

Figure 1. Increased clearance and ability to handle larger amounts of surface residue are common features in newer equipment.

Each tillage pass adds input costs to crop production and should be evaluated for its impact on yield potential. Machine costs vary, particularly with age of equipment. Secondary tillage, such as with a field cultivator or disk, often costs in the range of $12 to $17 per acre. Primary tillage can range from $15 to $22 per acre or more. Factors increasing cost can include higher-priced, newer equipment, and for primary tillage, increasing depth or aggressiveness of the equipment.

Figure 2. Corn production can be improved in significant residue with proper management techniques.

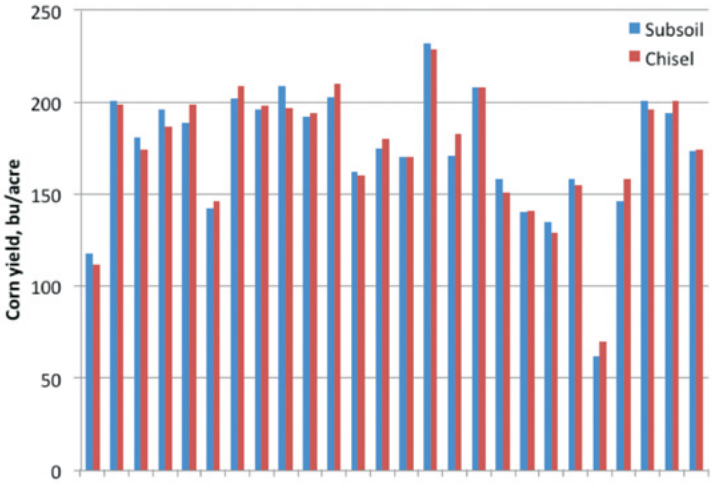


Figure 3. Corn after corn yields comparing deeper tillage with a subsoiler or ripper and shallower tillage with a chisel plow (25 site years, Al-Kaisi and Hanna). Last two bars are overall averages.

Farmers reluctant to reduce tillage may want to test one or more small trial areas with an eliminated or shallower tillage pass to ensure that yield differences are really present between tillage systems and justify tillage cost. Yield monitors now present on many combines make this a relatively easy method to make this comparison.

How much tillage is too much? Extra tillage is frequently done to "optimize" the seedbed prior to planter operation. Crop consultants sometimes observe "rootless" corn having difficulty establishing permanent roots. In some cases, it appears the soil surface may have subsided or dropped after planting because of loose soil and airborne permanent roots are having difficulty establishing. Soil at planting time may have been too mellow and loose from excessive tillage for early plant growth and development.

During wet springs with a delayed planting schedule, farmers are often pleasantly surprised by the crop produced from a simple field cultivate or disk and plant system or even a no-till system.

Management skills and approaches to pest management, fertility, timing of field operations, and setting of equipment are often somewhat different for no-till or strip-till systems. Simply operating tillage equipment less aggressively, or eliminating a secondary tillage pass that may be questionable rarely requires other significant changes to crop management. Removal of biomass may present an easy opportunity to cut back on tillage costs.

Considering environmental consequences of soil health and erosion, a certain amount of residue cover should be maintained (depending on steepness and length of slopes for water erosion). Longer term consequences of soil health, erosion, and water quality suggest not burying as much of the corn residue that remains after harvest.

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