Conservation Tillage Practices

- A key component of a sustainable agricultural production system is proper soil management.
- Maintaining an effective, adequate amount of residue is critical in a conservation tillage system.
- Managing soil erosion, maintaining adequate organic matter, nutrient supply, and soil moisture for crop production are major factors to consider in a conservative tillage practice.
- Depending on the field situation, conservation tillage systems have advantages and disadvantages that need to be assessed.

Advantages:
- Depending on tillage method, 60 to 90 percent residue remains on the soil surface to help reduce erosion. Residue can protect soil particles from rain and wind erosion.
- Conserves soil moisture by reducing evaporation at the soil surface.
- Improves soil health and reduces runoff by increasing organic matter, which helps to improve soil structure and increase water infiltration.
- Requires less labor and fuel and reduces soil compaction due to fewer tillage passes across the field.
- Firmer soil conditions during harvest.
- Potentially less air pollution from dust and diesel emissions.
- Residue provides food and cover for wildlife.

Disadvantages:
- Slow soil warming in the spring, especially on poorly drained soils.
- Requires planter modification or a no-till planter.
- Increased dependence on herbicides for weed management.
- Scouting is required because insect, disease, and weed problems may be different compared to pests that are found in conventional tillage systems.

The disadvantages of the system include dependency on herbicides for weed management, requires a no-till planter or planter modification, planting may be delayed due to wet, cool soil temperatures, and problems with different insect, disease, and weed species.

Strip-till, Usually used in fields that are poorly drained or fields with very little slope. This system is mostly beneficial in cold, wet spring conditions. Typically, strip-till is similar to no-till except that narrow strips are tilled while the rest of the field is left untilled. The system is implemented in fall in conjunction with anhydrous ammonium application. Strip-till can help warm up the seedbed earlier than a no-till system.

Ridge-till (ridge-plant or till-plant). Specialized planters and cultivators must be used to maintain the permanent ridges created for planting a row crop. The ridge tops are cleared of the previous crop residue at planting, to allow for the new crop to be planted on the ridges. After harvest, crop residue is left undisturbed on the soil surface until planting time. Maintenance of the ridges is essential and requires modified or specialized equipment for a successful ridge tillage system.

Mulch-till. Any conservation tillage system, except no-till and ridge-till, is called mulch-till. Deep tillage might be performed and crop residues are mixed with the soil. Different implements must be used to perform mulch-till. The tillage tools that are used must leave at least 30 percent of the residue on the soil surface.

Selecting the best tillage system for a specific situation requires the consideration of several factors:

Weed Management

Weed management in conservation tillage systems depends more on herbicides. Pre-emergence or post-emergence herbicides applied on the surface should be used to manage weeds in a no-till production system.
Nitrogen. Liquid N or anhydrous ammonia should be injected into the soil to prevent N volatilization losses, using coulters in front of the injector knives. The same rates of N for conventional tillage are recommended for a no-till system when injecting into four to eight inches below the soil surface. If surface application of N is needed in a conservation tillage system, utilize a nitrification inhibitor to reduce N loss. Research has shown that injecting resulted in higher corn yields in a no-till system than surface N applications, either broadcast or surface banding.¹

Phosphorus and Potassium. If soil test shows low P and K, injecting both nutrients with the planter or manure applicators is highly recommended.

Summary
- Conservation tillage is a system with a minimal amount of soil disturbance for a proper environment for seed germination and root growth.
- There is no one best system because of several variables, depending on the intensity of a tillage practice.
- Selecting one of the conservative tillage systems requires consideration of soil erosion and compaction prevention, fertilizer management and placement, weed management, organic matter retention, insect and disease control, and labor and energy cost.

Sources: