



CSP Job Sheet ESM

United States Department of Agriculture
Natural Resources Conservation Service

Soil Management Enhancement Activities

For 2005, the Conservation Security Program (CSP) offers two new enhancement activity opportunities to reward or encourage the improvement in soil quality by reducing soil compaction through the use of controlled traffic on cropland. These enhancements are available once the applicant qualifies for CSP by meeting the program's entry requirements for soil and water quality.

The following information will help landowners and managers determine if they are eligible for the offered payment(s) for these soil quality enhancement activities.

Reducing Soil Compaction by Controlling Areas of Traffic

Soil that is excessively compacted is limited in its ability to function. Soil compaction occurs when moist or wet soil particles are pressed together and the pore spaces between them are reduced. Adequate pore space is essential for the movement of water, air, and soil fauna through the soil. The mechanical strength and poor oxygen supply of compacted soil restricts root penetration. Soil moisture is unavailable if layers of compacted soil restrict root growth. Compaction restricts infiltration, resulting in excessive runoff, erosion, nutrient loss, and potential water-quality problems. Soil compaction can restrict nutrient cycling, resulting in reduced yields.

Compaction is caused primarily by wheel traffic, but it also can be caused by



Permanent beds in a no-till system allow for controlled traffic.

animal traffic or natural processes. Soil is especially susceptible to compaction when it is at field capacity or wetter, has a low content of organic matter, or has poor aggregate stability. Saturated soils lack adequate strength to resist the deformation caused by traffic. Moldboard plowing and excessive tillage break down soil aggregates. After the aggregates are broken down and the soil surface is bare, the soil is more likely to be compacted by the excessive vehicle passes common in conventional tillage systems.

A controlled traffic system separates traffic zones from cropping zones within a field. Yields normally improve when traffic is restricted to controlled zones between the rows because the soil directly beneath the rows can retain a loosened structure. A controlled traffic system works well with row crops. If drilled

crops are grown, a skip row is required. One component of controlled traffic systems is ensuring that all equipment covers the same width or multiples of the same width. A second component is minimizing the number of traffic lanes. The table below provides examples of traffic patterns. In the first scenario in the table, the tractor tire spacing is 60" and the combine tire spacing is 120". Thus, each set of six rows will have four tire paths and 44 percent of the ground will be trafficked. By increasing the tractor tire spacing to match the combine tire spacing (as in the second row of the table), the number of paths and area trafficked are cut in half. Permanent high-residue cropping systems, otherwise known as conservation tillage systems, generally work well with controlled traffic systems because previous crop rows are not tilled and thus traffic rows remain visible. Controlled traffic can be an integral part of ridge-till systems and no-till systems with permanent beds.

Examples of Traffic Patterns for Controlled Traffic Systems

Number of rows	Tractor (in)	Combine (in)	Number of paths	% Trafficked
-----30" row spacing-----				
6	60	120	4	44
6	120	120	2	22
8	120	120	2	17
8	60 & 120	120 & 180	6	50
12	60 & 120	120 (6-row)	4	22
16	60 & 120	120 & 180 (8-row)	8	33
24	60 & 120	120& 180 (12-row)	12	33
-----36" row spacing-----				
6	72	144	4	37
8	72	144	4	28
12	72	144	4	18

Using GPS, or Other Similar Guided Measure Technology, to Reduce Soil Compaction by Controlling Areas of Traffic

Mulch tillage systems (systems with tillage across the entire field) require auto-steer technology (Sandusky, 2003) using guidance from a Global Positioning System (GPS) to locate traffic lanes year after year. Auto-steer technology keeps all field operations in the same traffic lanes. Some systems are even capable of 1-inch accuracy. This technology allows controlled traffic with standard agricultural equipment and full-width tillage. Automatic steering and controlled

traffic reduce compaction beneath the row, thereby increasing infiltration and reducing the hazard of erosion and the need for sub-soiling.

Documentation Required: A description of the system of controlled traffic, including fields being applied to and equipment being used, and Soil Tillage Intensity Rating (STIR) provided by NRCS.