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Farm Update

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The Cost of Soil Erosion

Harvest is still underway, but it is already time to look ahead and plan for better soil management practices. Soil health has several important aspects, but first and foremost is soil erosion prevention. Soil loss means topsoil loss. Topsoil is where the largest portion of soil and plant biology occurs. Eroded soil is typically higher in the smaller mineral particles such as clay and lower in organic matter, sand, and silt – the ‘good things’ that contribute to water holding capacity/drainage, nutrient availability, and crop productivity.

In Kentucky, most soil erosion is caused by water/rainfall. Water erosion soil losses are driven by storm length and strength, and Kentucky is certainly receiving fewer, but stronger, storms. UK monitored soil loss for 2 years in a field with a 5-6% slope under a no-till corn and no-till season soybean rotation. Soil losses and rainfall occurred throughout the two year period but as you would expect soil losses were least during the growing season with dense crop canopy. A 7-inch July rain event resulted in 0.2 tons of soil lost per acre. A 2-inch rain event in February, after a winter of soil freeze/thaw resulted in a loss of 9.0 tons of soil per acre.

Crop residues are your soil’s friend. Leave them undisturbed in the fall. The crop residue remaining after harvest is the ‘frontline’ resource available to prevent/slow soil erosion between

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harvest and canopy closure of the next crop grown in the field. Residue protects soil aggregates from raindrop energy and impact, lessening soil particle detachment, the first step in the water erosion process. Avoid fall field operations that diminish residue's erosion control effectiveness. Don't 'size' residue with a rotary chopper, disc, or vertical tillage tool. Those small residue pieces are more likely to float/move downhill during strong storm events, leaving soil areas uncovered and unprotected. Bigger residue pieces are more likely to get hung together and dam water movement and soil particle transport, the second step in water erosion of soil. Don't enhance crop residue decomposition, biologically, chemically, or physically – soil erosion protection needs to last through the winter into early spring. Kentucky winters are relatively mild and residue breakdown continues slowly but steadily all winter long.

Soil structure, the product of soil aggregation, should be left undisturbed. Soil aggregates resist soil erosion. Strong, water stable aggregates enhance water infiltration rather than runoff. At the end of the season, soil aggregation is at a maximum. Aggregation is enhanced by fresh carbon additions, earthworm activity, and the seasonal growth of the crop which provides both root exudates and biomass. Soil biology including bacteria and earthworms work all growing season long on these new carbon sources, forming organic matter/humus and bringing organic and mineral particles of clay, silt, and sand together to form aggregates. Aggregate damage happens when aggregates are crushed by compaction or broken by tillage. Fall tillage of any kind or any depth of surface tillage at any soil moisture causes aggregate damage. The surface disruption that occurs with vertical/disc tillage breaks up aggregates near the surface, while the compaction of aggregates happens due to considerable weight/pressure at the blade tips.

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Consider using winter cover crops. Fall surface tillage and/or residue sizing, either chopping or cutting, means that additional resources might be needed to prevent/slow erosion. Full-season soybean residue levels often look adequate for erosion control in the fall but degrade quickly and leave these fields vulnerable to springtime erosion. In these instances, a cover crop, such as wheat or cereal rye, is needed to reduce erosion risk. The more dense, fibrous winter root system helps maintain aggregation as it holds soil in place. If the cover crop planting date is sufficiently early, the shoot biomass also provides some additional aboveground protection against raindrop detachment and further aggregate destruction.

Soil erosion remains a major threat to long-term productivity in grain crop farming. Most of our agricultural lands exhibit slope and most all our field soils are covered by silt loam topsoil. These conditions, combined with our rainfall patterns, make our fields vulnerable to soil erosion. No-till soil management does a lot to reduce soil erosion risk, but even no-tillage practices can be improved to reduce soil erosion risk.

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