Soil Erosion and the Case for Residue Conservation
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As many readers will know, erosion can be the single most important force to prevent as a producer. Wind and water can strip you of your topsoil quickly, and if not dealt with, can spiral out of control rather quickly. Ensuring that your soil is covered and less susceptible to erosion is critical and leaving residue behind after a harvest can be the easiest way to help combat erosion. Researchers have indicated that up to 30% of the residue from a corn crop can be harvested without increasing soil erosion (Johnson, 2008). However, removing more than 30% can be disastrous. The following text explains how residue can help alleviate soil erosion both directly and indirectly.

The presence of the corn residue material itself can reduce the negative impacts of erosive forces. The roots that are still in the soil in the fall hold the soil together over the winter and during spring thaws which prevents loose particles from eroding. Exposed soil is extremely subject to erosion forces (Fig. 1). Also, the stems of the plants can help filter soil out of runoff as it moves over a field. There are more indirect effects presented below.

Figure 1: Washout on bare sandy soil

Corn residue left on the surface acts as a buffer to wind erosion at the soil surface. The residue provides many functions to reduce wind damage. First of all, it slows down the wind velocity at the surface of the soil by leaving the surface rougher than a bare soil. Researchers have determined that wind speeds of 25 km/hr or higher are required to initiate soil movement and that a rough surface will reduce the extent of wind erosion (Brady and Weil, 2002). Standing

corn stalks help to slow gusts of wind that can sweep soil away. Even flat residue on the surface will prevent the soil from coming into contact with winds and reduce the erosive force.

Residue left on the surface of the soil reduces rainfall impact which prevents soil crusting and leads to better water infiltration. When raindrops hit bare soil they can compact the surface layer and eventually a crusting layer will develop. Crusting can prevent water from infiltrating through the soil and consequently leading to water erosion. Plant material on the surface can dampen the impact of raindrops which enhances water absorption. This is particularly important in corn fields which have wide row spacing and large amounts of bare soil. Inter-row corn stalks help keep the soil in place during the spring when it is particularly rainy and throughout the remainder of the growing season (Figure 2). In addition, if runoff is running over a field from a neighboring field, residue left on the surface will slow the rate of water movement. Slow-moving water is more likely to infiltrate.

Figure 2: Corn residue holding inter-row soil in place

Leaving residue on the soil surface can enhance soil biodiversity of microorganisms (Mann et al., 2002). Beneficial organisms such as earthworms clearly help to reduce soil runoff by creating burrows from the surface of the soil to deeper within the profile. In addition to burrowing in the soil, earthworms generate casts from digesting the soil. These casts are known to enhance aggregate stability (Brady and Weil, 2002). A stable soil is less vulnerable to erosion. Also, soil bacteria and fungi are responsible for soil stability. When bacteria and fungi break down plant material they produce polysaccharides and other organic glues. Many of these organic glues are resistant to dissolution by water which results in soil stability for a lengthy period of time.

Leaving residue on the soil surface clearly helps reduce soil erosion. Producers can remove up to 30% of their residue and still maintain the erosion control benefits in addition to the other beneficial effects of residue on soil fertility, yield etc. You cannot put a price on the value of controlling erosion and maintaining your topsoil, so be sure to consider how residue removal is affecting your soil's erosion potential.

Notes:

Brady, N.C and Weil, R.R. 2002. The Nature and Properties of Soils. Pearson Education Ltd.

Johnson, J.M F. 2008. Biomass removal: Effect on soil nutrients and productivity. North central extension - industry soil fertility conference; November 12-13, 2008; Des Moines, Iowa. 2301 Research Park Way, Suite 126: International Plant Nutrition Institute. Page 7 p.

Mann, L., Tolbert, V., Cushman, J. 2002. Potential environmental effects of corn stover removal with emphasis on soil organic matter and erosion. Agriculture, Ecosystems and Environment. 89: 149-166.