Management Of Crop Residues And Soil Compaction For Improved Soil Productivity And Profit

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Historically, crop residue has been perceived as a problem that has to be destroyed either by fire or tillage. However, crop residues are a valuable resource not only for improving soil organic matter, soil tilth and water infiltration, but also recycle valuable fertilizer nutrients. Removal of corn or grain sorghum crop residue for any reason, including hay or ethanol production, removes valuable fertilizer nutrients from the field. The nutrient removal in the crop residue is correlated to the grain production. Thus, corn stalks baled from corn producing 100 bu/acre grain yield would remove slightly more than 100 lb/acre of K20 and about 15 lb/acre P205. The replacement cost for P205 and K20 removed in the corn residue is currently equal to about $0.30 per bushel of grain yield. Grain sorghum residue stalks baled from a 100 bu/acre grain yield would remove about 150 lb/acre of K20 and about 20 lb/acre of P205. The replacement cost for P205 and K20 removed in the grain sorghum residue would be $0.42 per bushel of grain yield. Therefore, removal of the crop residue by baling for hay or ethanol purposes would not only require extra fertilizer, but also fail to improve soil organic matter, especially on the lighter textured soils which often have organic matter of 1% or less. Improved soil organic matter enhances the soil tilth, water infiltration and soil productivity.

Leaving crop residues on the soil surface where possible not only improves the organic matter and infiltration but also protects the soil from erosion caused by rain drop displacement of the soil particles. However, on land that is flat, raised beds are often necessary for seedling emergence and good early season growth. In this situation, without a soil compaction zone, a one-pass tillage-bedding implement operation would be all that is necessary. Basically, this implement is equipped with coulters or cutter blades and bedder sweeps that form a raised bed. The coulter/cutter blades cut the residue in front of the bedder sweep which allows the crop residue to flow through the implement without clogging and leaves some of the crop residue on the soil surface, helping minimize soil erosion. On soils that have a compaction zone, non-inversion under-the-row subsoiling (Terratill® Paratill®) may be required before bedding. These beds are often burned-down with a non-selective herbicide in the early spring and/or reshaped and harrowed prior to planting. With this production system, the row remains in place each year, which is known as a controlled traffic production system.

In a controlled traffic system, all equipment wheel traffic, including harvest equipment, passes between the rows. This system does not compact the soil in the root zone where the crop is being grown. Soil compaction is known to reduce yield by impeding root growth, nutrient and water uptake, and overall plant growth. Research has shown that a controlled traffic system reduces soil compaction from approximately 90% in a conventional tillage system to approximately 30%.

In summary, consider crop residues a valuable fertilizer nutrient and organic matter resource. Removal of crop residue will likely result in significant nutrient and soil organic matter losses. To minimize wheel track compaction effects, utilize implements with wheel tracks that run between the rows. For improved organic matter, soil tilth, water infiltration and reduced energy consumption utilize no-tillage or minimum one-pass reduced tillage stale seedbed production systems. Δ