The Effect Of Soil Compaction On The 2010 Crop

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The wet weather that delayed and frustrated harvest this fall raises questions by producers on the effect that ruts and compaction will have on the 2010 crop. Many fields exhibit telltale signs of a wet harvest with varying degrees of combine ruts and the accompanying compaction that occurred in getting the grain out of the field. Excessive compaction restricts root growth, impedes drainage and restricts nutrient uptake.

Those areas where ruts are the deepest probably do not have much damage to the soil that could be attributed to compaction. The "ideal" soil contains roughly 45 to 49 percent mineral, 1 to 5 percent organic matter, 25 percent air pore space and 25 percent water pore space. When the soil is saturated, the air pores are all filled with water. Simply put, if there is not any air pore space available in saturated soils to squeeze, you are not compacting it. When soil is compacted, soil density increases, reducing or eliminating air space. If there is not adequate pore space, the roots cannot grow easily. If the roots cannot grow, the plant could suffer (again, it depends upon how much root space is available for growth and available water and nutrients in that space).

Some compaction of fields is normal, especially with today's heavier equipment; but excessive compaction could have detrimental effects to succeeding crops, depending upon soil type and moisture during the growing season. If compaction limits the ability of the root to adequately draw soil moisture into the plant, then yields can be reduced. Plant nutrients also find their way into the plant via moisture flow.

So the greatest concern from compaction would be to those areas of the field that are not rutted. Those areas in which heavy wheel traffic occurred that may have "squeezed" the soil, eliminating the air pore space. The amount of compaction on a given field will vary widely, depending upon soil type, axle load, soil moisture and other factors (frozen soil, etc.). Tire size has a direct impact on depth of compaction. Combines with duals or with ultra wide tires simply distribute the weight over a wider area, thus spreading out the weight. So for those machines, compaction does not occur as deep but over a wider footprint. Which type of compaction is better? Well, it is much easier to eliminate shallow (8-10") compaction than deeper compaction.

Shallow surface (0-10") compaction can be eliminated with deep tillage, under more favorable and dryer soil conditions than we are experiencing now. However, deeper compaction (down to 18" or more) cannot be eliminated with tillage. Some will contend that cold winter temperatures can help to alleviate deeper compaction by freezing soils (expanding) followed by thawing (contracting). Unfortunately, we rarely get many episodes in which deep freezes are followed by warmer weather to allow the freeze/thaw cycle to repeat.

There is little we can do to alleviate deep compaction. What we can do to help the 2010 crop cope with it is to reduce any stresses in order to allow the plant to develop the most vigorous root system it is capable of producing.

Research conducted from 1986-1996 at the University of Illinois shows varying yield differences in corn due to compaction. Yield differences ranged from a decrease of 13 bushels per acre when the entire plot was compacted, to a decrease of 3 bushels when every other row was compacted. Research results vary widely on the effect of compaction, ranging from positive to negative yield reactions. The reason is because of what we mentioned earlier: even if the root system is compromised, if the plant can get all the moisture and nutrients it needs, in the limited amount of space they occupy, it will not matter. Soybean yields show less yield variation in these tests.

I think we will all notice the effects of compaction next year, especially at field entrances. When combines were used as the grain cart, as they were in many fields, those crops growing at field entrances will be hard pressed to find uncompacted soils. Δ