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Time to evaluate fall soil conditions

Mahdi Al-Kaisi
Iowa State University, malkaisi@iastate.edu

H. Mark Hanna
Iowa State University, hmhanna@iastate.edu

Michael Tidman
Iowa State University

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Abstract
This year, some producers have already started to harvest in very dry soils, and their risk of soil compaction is very low. But if the weather changes and it rains, producers will have to monitor soil conditions. When saturated, soil aggregates are 'lubricated' by water and readily reposition themselves through the air spaces, especially when heavy harvest equipment is used. In addition, farmers and equipment operators need to remember that compaction can occur during the application of manure or anhydrous when soil moisture exceeds field capacity (maximum amount of moisture retained by the soil).

Keywords
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Soil Compaction

This year, some producers have already started to harvest in very dry soils, and their risk of soil compaction is very low. But if the weather changes and it rains, producers will have to monitor soil conditions. When saturated, soil aggregates are 'lubricated' by water and readily reposition themselves through the air spaces, especially when heavy harvest equipment is used. In addition, farmers and equipment operators need to remember that compaction can occur during the application of manure or anhydrous when soil moisture exceeds field capacity (maximum amount of moisture retained by the soil). Under wet conditions, the use of heavy equipment such as tractors, auger wagons, and combines can significantly change soil structure and cause soil compaction. And, as the size of farms has increased, the size of the equipment has followed, increasing the risk. The best general rule -- if it rains this fall, let the fields dry before starting field operations.

Soil compaction causes changes in the soil's physical properties that will hamper the movement of water and air through the soil, upsetting the balanced percentages of air and water in the soil needed for plants to establish a healthy root system.

Moreover, because compaction reduces soil pore size by "crushing" soil particles together, it reduces surface water penetration downward through the soil profile. This will increase surface water run off, causing soil erosion, and carrying sediment to water bodies. Moving into these water bodies with the soil are sediments and nitrates, phosphorus, and other nutrients.

Auger Wagons, Combines, and Axle Loads

Compaction near the surface, within the top three to six inches of the soil, is generally associated with the amount of surface pressure. Compaction below that is primarily associated with axle weight. For example, if soil a foot below the surface is at field capacity and the tractor's axle load is 7 or 8 tons or greater, compaction can occur at this depth, despite lower surface pressures.

Harvest TIP: Preserve maximum residue possible

All crop residue - stalks, straw, chaff, even the finest materials - work by stopping rain splash, slowing and trapping runoff, and allowing for better water infiltration. In addition, plant residue is important in improving soil organic matter, which leads to enhancement of soil physical and chemical properties, such as soil tilth, aggregate stability, and cation exchange capacity (CEC).

Harvest TIP: Dry weather raises fire risks
To mitigate the risk of compaction, use controlled traffic lanes for harvest. Avoid driving loaded grain carts randomly through the field -- most damage occurs in the first pass of the implement. Grain tank extensions on combines also add to the load on soil. And check wheel and tire size and pressure, since larger wheels and tires allow better 'flotation' and lower tire pressure reduces the load on the soil.

**Harvest Residue Management**

To minimize over-winter soil erosion, work on getting even distributions of crop residue while harvesting. Doing so is critical in preventing soil erosion throughout most of the coming fall, winter, spring and well into 2004, until next year's crop establishes a canopy. Any residue down to the finest material -- straw, chaff-- can potentially reduce erosion by stopping rain splash, slowing and trapping runoff, and allowing for better water infiltration. But it has to be *in place* to do it.

Large combine heads tend to concentrate material, especially fine material, in a narrow swath behind the machine. Concentrated residues are not only less effective in stopping erosion throughout the field, they also insulate the soil surface from the sun, reduce seed to soil contact, and make it tougher to plant in the spring, inhibiting crop growth. Furthermore, doing a good job of straw and chaff spreading this year could eliminate tillage passes next spring.

Have combine operators set up and run equipment so that straw and chaff spreaders or choppers operate properly and the combine distributes residue evenly. Corn residue is usually heavier and most corn heads do a good job of chewing up the stalks and dropping them back in place. But the challenge is greater in soybeans, where essentially the whole plant goes through the combine and residue becomes fragile.

Combine operators also should pay attention to the height of the crop stubble left in the field. Crop stubble can protect the soil by limiting exposure to wind and water erosion and trapping snow through fall, winter, and early spring. Of course, soybeans need to be cut near the ground to avoid grain loss, but operating the corn head higher leaves stubble and fewer stalks are run through the machine.

Some areas of the state have been very dry -- and the crops range from poor to dead. If you are combining 'through' these areas, assuming these are isolated areas within the field, try to leave as much stalk as possible since there won't be much residue anyway.

Many producers see harvest as the end of a season's activities, but in reality, it's important to address the issues of compaction and residue going forward into 2004. For more information, call your local Iowa State University Extension office and request publication Pm-1901b, *Resource Conservation Practices: Understanding and managing soil compaction*.

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