Plan Ahead to Minimize Soil Compaction During Harvest

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Abstract
While there is significant uncertainty about this year’s harvest weather, the struggles with previous year soil compaction may still be lurking in corn and soybean fields across Iowa. This article will highlight challenges with wet conditions at harvest and opportunities to minimize the long-term consequences of harvesting fields with wet soils.

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While there is significant uncertainty about this year’s harvest weather, the struggles with previous year soil compaction may still be lurking in corn and soybean fields across Iowa. This article will highlight challenges with wet conditions at harvest and opportunities to minimize the long-term consequences of harvesting fields with wet soils.

One of the challenges harvest time brings is the impact of harvest on soil health, such as increased soil compaction and bulk density as well as reduction in water infiltration. Wet soils are susceptible to compaction during harvest operations. When soils are near saturated conditions, heavy equipment loads weaken soil structure where water works as lubricant, leading to the collapse of soil aggregates. This will cause significant surface compaction, rutting, and deep subsoil compaction.

Damage from soil compaction can significantly impact water infiltration, root development, and ultimately crop yields the following season. It is estimated that yield loss due to soil compaction caused by wheel traffic ranges between 10-20% depending on the extent of soil compaction. An axle load from a 12-row combine with full a grain tank is estimated at 26 tons/axle and a single-axle fully loaded grain cart is estimated at 22 tons/axle. The combination of such heavy equipment and wet soil can create significant soil compaction.

Wet field conditions make soil prone to compaction that is occasionally unavoidable in the fall, as farmers make an effort to get grain harvested without pre-harvest yield losses and worsening grain quality. Avoid wet and near saturated soil conditions. Ideally, field operations would be delayed until soil water is below field capacity, where soil retains
maximum amount of water. Tillage fuel and time cost could increase significantly to remediate excessively compacted soils during harvest operations.

![Figure 1. Ruts made when harvesting soybean under saturated soil conditions. (Mark Licht)](image)

**Tips to minimize soil compaction during and after harvest**

Prior to entering the field with equipment, check the soil moisture status with a simple in-field test. Most of Iowa’s soils have medium textures that the “Feel-Method” can be used to estimate moisture status. Push a ribbon of soil between the thumb and index finger. If it breaks off within one or two inches, the potential for creating compaction is low. However, if the ribbon stretches out to four or five inches, it is too wet. The chances are good that being in the field under these conditions may cause more problems than it will solve. Probing the top 12-18 inches with a hand soil probe to assess the field’s soil moisture conditions is time well spent.

Another soil consistency test is to roll soil against the palm of your hand to determine if it will clump and roll or if it is fragile and falls apart. Soil that clumps together is more prone to compaction. After checking your soil moisture conditions, the following tips are valuable to reduce or control soil compaction in the field:

1. **Dedicated travel lanes.** Many combine operators use “on-the-go” unloading into a grain cart to speed up harvest. In areas that have received excessive rainfall, farmers
may want to consider having dedicated travel lanes for the grain cart. It has been
documented that 60-80% of soil compaction occurs from the first wheel passes,
subsequent field operations account for a much smaller amount of compaction.

2. Don’t run at full capacity. Reduce the axle loads of both the combine and grain
carts by not loading them to full capacity. This may not be an attractive option in high-
yielding cornfields and where harvest has already been delayed. This is much easier to
implement in soybean where the grain volume is much less than corn. A compromise
may be to try and keep axle loads lower in the far reaches of fields and achieve the
highest axle loads (full capacity) near the end rows where grain will be transported out
of the field.

3. Tire size and inflation pressure. Use appropriate tire sizes for the conditions and
adjust tire air pressure to match the axle load being carried. Larger tires with lower air
pressure provide more surface area, allow for better flotation, and reduce pressure on
the soil surface.

4. Concentrate non-harvest field activates near the field exit. While it is
tempting to move semi-trailers and tractors with wagons along the field edge as
harvest continues, this practice increases compaction along the end rows. Also,
moving semi-trailers along the combine will spread soil compaction throughout the
field. Try to limit compaction to the smallest area possible.

5. Harvest around the wettest areas. The wettest areas are the most at risk for soil
compaction and are also an accident risk that could lead to longer harvest delays.
Additionally, buried equipment may come with large financial penalties. Weigh risk
versus benefits and come back to these areas later in the fall once the soil is drier or
frozen.

6. Avoid or minimize tillage. Tillage is not always the solution to soil compaction.
The reason we create compaction in the field is due to weak soil structure that is
caused by intensive tillage systems. Remember to hold off on tillage operations and if
it is needed for correcting deep cuts or rutting use minimum tillage (i.e., field
cultivation, light diskling, etc.) when soil conditions are drier than field capacity. It is
important to consider the soil moisture at the depth of tillage. Tillage in wet conditions
results in further compaction and smearing of soil instead of the intended fracturing of
the soil. If it is absolutely necessary to cosmetically fill in ruts, use a disk unless soil
conditions are dry enough for fracturing of the soil through use of more aggressive
implements.

In wet conditions, the best choice farmers can make is to stay out of the field to reduce soil
compaction, but the steps above can help minimize the damage from necessary fieldwork
in wet soil conditions. Remember that how you approach fieldwork after a heavy rain
event can impact your soil for future growing seasons. More consequences of soil
compaction can be found in Top 10 Reasons to Avoid Soil Compaction.
Friable soil less compactable condition

Soil near lower plastic state and in compactable condition

Figure 2. Testing soil moisture condition in the field.

Additional resources:

Top 10 reason to avoid soil compaction

Understanding and Managing Soil Compaction

Category: Crop Production  Equipment and Machinery  Soil Management

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Crops:
Corn  Soybean

Tags:  soil compaction  harvest  tillage  field compaction  Equipment  wet soils  tire inflation

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