Soil surface compaction can affect soybean plant height, root growth and development, pod set, and yield.

**Patience in the Spring**

Long-term no-till production with cover crops increases soil organic matter and improves soil structure. However, the increased water holding capacity combined with cover crop residue can prolong periods of wet soil in the spring. Planting when the soil moisture content is too high can create a significant compaction zone that ultimately impacts soybean root development and yield.

In the pictures below you can see the effects of the planter and tractor weight, causing compression just below the soil surface on this no-till field:

**OBSERVATIONS:**

1. The overall soil structure directly above and below the compressed zone looks very good. In fact, the volume of worm holes, root mass, organic matter, and soil structure in these fields was quite good with exception to the compaction.

2. The soybean taproot was able to penetrate through the compaction zone.

3. The bulk of the balance of the rooting system was unable to penetrate through the compaction zone.

4. Most of the nodules remained above the soil compaction zone.
Soil Compaction and Nodulation

In cases of extreme compaction, nodule formation is restricted to above the compressed zone, which may only be the top 2 to 3 in. of the soil. When that happens, the nodulated zone likely experiences prolonged saturation, which reduces the amount of oxygen available to the nodules and ultimately leads to poor nitrogen fixation. Challenges to nodulation result in less total available N to the soybean plants, increased pod abortion rate and reduced seed size.

How to Know When Soils are Fit to Plant:

Mark Hanna’s (Ag Engineer at Iowa State University) suggestions for how to determine if soils are “OK” or “too wet” to plant are to pick up some soil from the top 0 to 3 in. and form a ball in your hand. Throw it like you are gunning down a runner at first base from shortstop. If the ball is still intact when it hits the ground, it is too wet to plant. Another strategy is to make a ball and if you are able to get some moisture to come out on the squeeze, it is probably too wet to plant.

If you still aren’t sure, you can get behind the planter or drill after it has run through the soil a few hundred feet and check for soil build up at the closing wheels or seed delivery outlets and to check for actual surface or sidewall compaction itself. If it doesn’t look right to you, trust your gut and allow the soil to dry some more before planting too soon and costing yield.

Strategies to Manage Compaction in a No-Till Field

In many cases, you have to make a tillage pass to break it up. Often times, the zone is shallow and can likely be broken up with a shallow (vertical tillage) pass in the fall, leaving the balance of the soil structure (3 in. and deeper) intact. The key will be to make the pass while the soils are dry in the fall and not exacerbate the problem with a spring pass when soils are wetter and the chance of heavy rainfalls post-pass are much higher.

Without tillage, there is a longer process to loosen soil compaction. Planting cover crops, like tillage radishes, with prolific rooting systems will break up compaction over time. Soybean or any crop that has a good taproot, like alfalfa, can also help.