

Dealing with cold wet springs and soil compaction

With cold wet spring, farmers face delays in spring planting. Generally, farmers try to get corn planted by May 10th and soybeans by mid-May to maximize yields. However, it does not pay to plant too early if the weather conditions and the soil is not fit. Farmers with large acreage may be tempted to get started a little early, but “mudding in” crops may result in hard compacted soils that get replanted. Two years ago in 2011, crops yields were high even though crops were not planted until June, because it rained all summer. Waiting for the soil to be fit is generally the best bet in the long run.

Some soils (especially sandy soils or loamy soil) may tolerate planting when the soil is a little wet but clay soils are much more unforgiving. Plant growth may be hurt the entire season if the soil structure is damaged. Soil compaction reduces root growth which then results in reduced nutrient and water uptake. Seeds planted into compacted soils tend to have shallower roots and may be hurt by drought stress later in the summer. Drought stress increases on compacted soils due to less soil water storage and less root growth. Compacted soils have less water infiltration, resulting in more water runs off; causing nutrient loss and soil erosion.

Soils that are compacted also have less aeration or less oxygen needed to mineralize or release soil nutrients. Compacted soils tend to dry out, reducing the microbial activity needed for optimal plant fertility. Plants also tend to suffer from increased diseases in compacted soils due to a reduction in beneficial microbes. Most disease organisms (*Phytophthora*, *Rhizoctonia*, *Pythium*, *Fusarium*) flourish under wet poorly drained soil conditions enhanced by soil compaction.

Denitrification or the loss of nitrogen to the atmosphere is greatly enhanced when water ponds on the soil surface. Denitrifying bacteria thrive under wet saturated soils with a lack of soil oxygen. Nitrogen loss from denitrification may be as high as 40% to 60% of the available soil nitrogen in heavy clay soils. The result is less nitrogen for plant production, especially for grasses like corn which do not produce their own nitrogen like the legumes such as soybean or alfalfa.

The impact of soil compaction varies by soil type. Ideally, the bulk density of the soil should be between 1.10 to 1.40 grams per cubic centimeter (g/cm^3). When you measure the bulk density; you are measuring the mass (weight) of the soil in a certain volume of soil. Clay soils that are dense and have a high bulk density hold less water and air than soils that are less dense (loamy or sandy soils). On clay soils, once the bulk density gets above 1.65 g/cm^3 , the root growth is greatly restricted. On sandy soils, due to bigger soil particles, root growth is not restricted until the bulk density is above 1.8 g/cm^3 . Farmers may have their soils checked for bulk density when they send in a soil sample or use a simple soil penetrometer. Generally, soil penetrometer measure soil penetration in pounds per square inch (psi) and root growth is limited at 250 to 300 psi.

Farmers generally have a good feel for when it is time to plant. Avoid planting if you can take soil and make a ball with your hand. Especially avoid planting if the soil is damp and you can squeeze water from it. With larger farms, often hired help may not be as knowledgeable as the

older or established workers; so make sure you take the time to communicate this knowledge to younger or new help. Sometimes it may take only a day or two for the soil to dry out. All these factors may play a big part in getting higher yields. The yield loss from delayed planting may be small compared to the yield loss from planting too soon on wet soils that are damaged by soil compaction.

Soils that have high levels of soil organic matter tend to resist soil compaction. They tend to have higher soil productivity and soil fertility. Soil organic matter buffers the soil from water stress by holding more water during a drought. Practices that conserve crop residues like no-till, that add manure, and/or increase crop residues like growing cover crops will improve soil structure, reduce the impact of soil compaction, and improve planting condition over time.