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Plant Nutrition TODAY
Better Crops, Better Environment...through Science

From Scientific Staff of the
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SOIL COMPACTION—AGRONOMIC AND ENVIRONMENTAL FOE

After all the wet weather in much of the central U.S.A. this spring, when soils began to dry there was an urgency to get in the field as quickly as possible to prepare soils and to plant, as the optimum planting window narrowed. As a result, some soils may have been tilled at moisture levels that were prime for increased compaction at the bottom of the implement's depth of travel. Soil compaction may have also increased more than normal beneath the traffic tracks of tractors, and the tracks of heavy fertilizer, herbicide, and seed tender units.

Soil compaction is like a silent thief whose robbery is not discovered until the symptoms of damage are severe. It increases soil bulk density, decreases soil porosity (especially the large or macropores), lowers the total water holding capacity, lowers the plant-available water capacity, and causes significant resistance to root penetration and root elongation. It can severely limit soil infiltration of rainfall and irrigation water and contribute to increased runoff loses. A close examination of the root system early this summer may expose yield-robbing soil compaction problems. Look for "flat-bottomed" root patterns in monocots like corn and sorghum, or "J" or "L" shaped taproots in dicots like soybean and cotton. As summer heat becomes more intense, certain areas in fields may be seen where plants begin to wilt more quickly between rain showers than in other areas in fields. Crops like corn and sorghum may roll their leaves in response to drought stress and in crops like soybean and cotton - flowers, pods, and young bolls may abort excessively.

While it is too late to take any special action this summer, by knowing what to look for, a strategy can be developed to disrupt the soil compaction with deep chiseling or shallow subsoiling in portions of fields where it has been identified as a yield limiter. University and USDA research has shown that there is usually no benefit to tilling any deeper than an inch or two beneath the depth of the surface soil compaction. Those depths can vary, but often are no deeper than 6 to 9 in., depending on the specific tillage implement or equipment traffic pattern.

Besides limiting yields, soil compaction has also been identified as a key factor that aggravates or increases the soil emission of nitrous oxide (N_2O), a potent greenhouse gas. Because soil compaction results in a lower soil oxygen status, reduced root growth rates, and reduced nutrient absorption rates…any nitrate present in the surface soil under warm, wet to near-saturated conditions--which is not rapidly absorbed by roots–can be quickly converted by certain soil microorganisms to N_2O. Even mild compaction can increase N_2O emissions by more than 20%.

Keep a watchful eye on your crops this summer, both above-ground and below-ground. You may recognize soil compaction problems that: 1) limit crop yields, 2) decrease N and other nutrient use efficiency, and 3) which increase the risk of N_2O emissions. Once identified, a deep chisel tillage or shallow subsoiling strategy can be developed to disrupt the compaction in the fall, when soils are dry and most responsive to this tillage practice. Zone tillage or strip-tillage strategies may be developed, which may in the long term help prevent large areas of your fields from being damaged by soil compaction.

Consult your Extension agent, Certified Crop Adviser, or other agronomic professionals about ways to remedy and to limit soil compaction. Be ready this fall to eliminate this factor from the list of things that could hurt crop production, your profits, and the environment next season. Good soil management provides both agronomic and environmental benefits.

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Abbreviations: N = nitrogen.