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DID COMBINE TRAFFIC ON WET SOILS DAMAGE FIELDS LAST FALL?

Lloyd Murdock

Fields rutted by wheel tracks during harvest last fall are a common sight in the grain producing areas of Kentucky. And, foremost on many producer's minds now, is whether this damage will lower productivity from those fields during 1985 and beyond. This concern also exists among some leading agronomists in the United States who think that the amount of soil compaction due to machinery traffic is increasing. One of the reasons cited for this is the use of larger and heavier equipment. One such piece of equipment which has increased in size and weight is the combine. A combine with 28 inch tires and a 16 foot header will traffic 29% of the soil surface in a field. A large combine with a full load of grain can also approach a weight load of 20 tons.

Even though combines can compact soil, the physical condition of the soil must be right for compaction to be severe. In Kentucky soils this means that the soil must be moist. When soils are at least dry enough that they could be tilled properly, little compaction is likely to occur because shear strength of soil is great enough to withstand the pressure. But, as the soils become wetter, they become easier to compact because soil aggregates and individual particles become lubricated with water, which reduces shear strength. However, the soil can become so wet that compaction is negligible when pressure is applied. An uncompacted soil is made up of about half solid material and about half pore space. These pores are filled with either water or air. In soils not completely saturated with water, the larger of these pores are filled with air. But, when completely saturated with water, most of the pore space is filled with water and shear strength of the soil is reduced to near zero. Under such conditions, soil is difficult to compact. This mechanism was at work during the wet fall of 1984 when fields were combined wet. Although these fields look extremely rough with the large, deep ruts left in the fields, the amount of compaction in some of the fields as measured by a cone penetrometer was found to be less than anticipated. The fields, or part of fields, that were very wet when combined, showed little or no compaction in the ruts. Evidently, most of the soil pores were filled with water, thereby preventing compaction. The ruts were formed by the weight of the combine pushing the mud to the sides of the tires and although the soil was not compacted, it is probable that soil structure was partially destroyed, which will likely make surface crusting more of a
problem in the future. However, only one pass with a combine through saturated soil isn't likely to completely destroy soil structure.

On the fields or parts of fields that were wet but not saturated, some compaction was found. Evidently, the top layer of these soils had drained sufficiently before the combine traffic to allow some compaction. In these areas, the top of the compacted zone usually occurred about 1 to 2 inches below the bottom of the rut. The compacted zone was found to be 2 to 4 inches thick and the bottom of this zone was 6 to 10 inches below the original soil surface. This means that most or all of the compaction can be broken up with common primary tillage tools such as chisel plows or moldboard plows, and that use of a subsoiler will not be necessary on many fields. One place that compaction did appear to be severe was on the ends or edges of the fields where grain hauling was done. These areas will need special attention. The amount of damage done to an individual field can easily be checked by probing with a 1/2 to 3/4 inch steel rod, 2 1/2 to 3 feet long, sharpened on one end and with a T-handle welded to the other end. This can be pushed into the soil and the compaction can be easily felt by resistance as you push on the rod. By using this technique, you can determine if a field has been compacted and if so, the depth and thickness of the compacted zone. With that information, the most appropriate primary tillage tool can be selected to use in breaking up the compacted layer.

The most severe problem with compaction could still be facing us. Compaction caused by spring tillage of wet soil can be more severe than that caused by the combine at harvest. Any time soils are tilled wet, the potential for serious compaction problems exist. It is important that we don't get over anxious with the tillage problems facing us this spring and cause the same type of serious compaction problems that we had in the spring of 1984.