May 2014

CC342 Soil Compaction... Fact and Fiction Common Questions and their Answers

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Nebraska Cooperative Extension Service CC 342

Soil Compaction... Fact and Fiction

Common Questions and Their Answers

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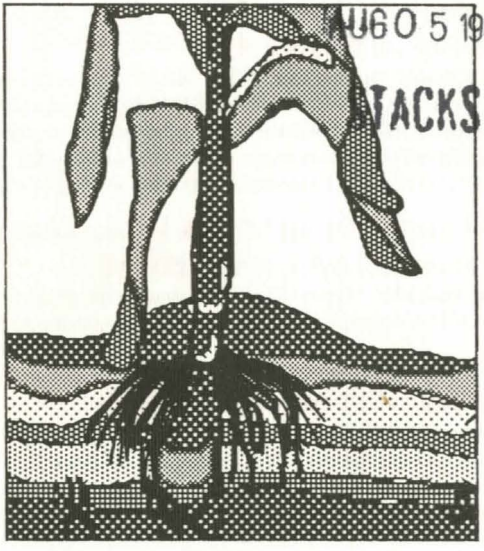

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Leo E. Lucas, Director of Cooperative Extension Service, University of Nebraska, Institute of Agriculture and Natural Resources.

1. What causes soil compaction?

Compaction occurs when soil particles move closer together because of external forces exerted by humans, animals, equipment and water droplets. It can be found on the soil surface and at almost any depth. Compacting soils leads to conditions that are less than optimum for crop growth, soil water management and efficient use of agricultural chemicals.

2. How does soil compaction develop?

Soil compaction can be influenced by several factors, but tillage of wet soils is the most common practice that causes compaction. The amount of water in the soil has more effect on compaction than any other factor. Research findings indicate that 80 percent of soil compaction from wheel traffic occurs on the **first** pass. This is why it is important to avoid any field operations when soil is wet.

3. How much compaction is there in Nebraska?

Compaction has been found from Falls City to Ainsworth and from McCook to Blair. In general, about 40 percent of the fields surveyed showed compaction in the top 12 inches of soil. Of the fields with compaction, about 10 percent would be expected to cause yield reductions.

4. I thought freezing over the winter got rid of compaction?

Freezing and thawing will help to reduce compaction in the surface soil. It will be most noticeable when there are several freeze-thaw cycles during the cold months. Below about 5 inches, the soil only freezes and thaws once during the year. This is not enough to break up deeper compaction.

5. My soils dry and crack in the summer. Does that help compaction?

Most definitely. Those cracks penetrate compacted layers and provide channels for roots and water movement into soil.

6. I farm some steep land. Will compaction promote erosion?

Erosion and runoff are likely to occur faster on compacted soils than on noncompacted soils. Water will infiltrate the compacted zone slower than the noncompacted area. As a result, the soil above the compacted zone will become saturated more rapidly and additional water will run off sooner. Erosion may be accelerated if crops are planted up and down the hill and water is channeled into compacted furrows.

7. Does compaction affect water quality?

Water quality may be affected indirectly by compaction. Compaction can increase runoff and erosion resulting in more sediment in our streams, lakes and drainage ditches. Moving into these waterways with the soil will be nitrates, phosphorus and other agricultural chemicals that lower our water quality.

8. Compaction doesn't affect my crop production on irrigated ground, does it?

You bet it can...an early symptom of compaction is slow infiltration of irrigation water. This might be seen as ponding of water on level ground or accelerated runoff on steep ground with sprinkler irrigation or extremely rapid movement of water along furrows with little infiltration. These two situations may lower irrigation efficiency and prevent the crop from receiving enough water to grow top yields. Also, if you schedule your irrigations with moisture blocks and the blocks are in or beneath a compacted zone you may get readings which are higher than the soil water environment seen by the crop.

9. My neighbor has duals on the tractor. Will that prevent compaction?

Dual wheels or large flotation tires help minimize surface compaction, but have little influence on subsoil compaction. Axle weight is the major factor in deep compaction. When adding duals, the tractor weight increases by at least 1/2 ton for tires and hubs...you're going in the wrong direction. By increasing the tire effective width you actually compact about twice the soil volume as compared to singles. The greatest danger with duals is the temptation to use the added flotation to work soil when it is wet.

10. When should I graze livestock to minimize compaction problems?

Livestock cause compaction when they traffic soil that is fairly wet and not frozen. One good management technique is to keep livestock off fields after fall rains and until the soil becomes frozen. In the spring, keep them off when the soil begins to thaw and until the surface soil is fairly dry.

11. How does compaction affect crop production?

Compaction can influence all stages of crop growth. Planting into compacted soils may decrease stand emergence which will affect yield potential. Root growth may be limited to the soil zone above the compacted layer. Water and nutrient uptake may be decreased and can result in nutrient deficiencies and moisture stress.

12. Can I have soil compaction without yield reductions?

Yes. If nutrients and water are in adequate supply yields may not be affected. In wet years, the compaction may not be noticed. When conditions are dry, compaction may reduce yields if roots are shallow and can not utilize subsoil water and nutrient.

13. Is all compaction bad?

No. Compaction occurs any time a force is exerted on the soil. Some level of compaction is needed to enable a tractor to travel across the field. Some degree of compaction is also needed around a seed for good soil-seed contact. In sandy soils, a small amount of compaction may actually improve the water-holding capacity of the soil and decrease irrigation water needs because of lower infiltration rates.

14. Does it affect all crops the same?

Crops have different rooting depths and root diameters so compaction does not affect all crops in the same manner. Perennial crop roots have more opportunity to explore the soil and to penetrate to depths below the compacted zone.

15. I soil test for nitrates to insure that I do not over fertilize. Can compaction affect nutrient availability?

Any problem that affects root growth may induce nutrient deficiencies even when soil nutrient levels are high. Compaction can prevent roots from reaching soil nitrogen that is below the compacted layer. Also, wet soil above the compacted layer may promote denitrification.

16. Does compaction affect water movement?

When compaction increases, the air space or pores in the soil are reduced in size. As a result, water will move downward through the soil more slowly. Greater amounts of water in the upper portion of the soil may result in water ponding on level fields and greater runoff on sloping land. Higher soil water content on compacted soils during the growing season may adversely affect crop growth.

17. My crop frequently looks like it has herbicide injury. Could this be related to compaction?

Any problem that affects root growth may affect the above-ground plant. Compaction may increase herbicide uptake if roots are concentrated in the zone where the herbicide is and injury may result. Herbicide carryover may also be extended because of soil conditions which do not promote breakdown.

18. How do I know if I have compaction?

Routine observation of soils and crops can provide clues as to where compaction may be present. Symptoms may include streaks of dark colored surface soil, increased power requirements, poor crop emergence and growth, yellowing of leaves, early wilting and reduced yields. Only by probing the soil and digging a few holes can abnormal root growth and compacted zones be identified. Information on this procedure is provided in NebGuide G87-831.

19. I believe that compaction is hurting my crop production. If I change my cultural practices, will I eliminate compaction?

You may not eliminate all compaction, but you can minimize it by using different management practices. Eliminating field operations on wet soil is one of the most important changes you can make to decrease compaction. Reduced tillage will minimize the number of trips across a field and the chances of making a trip when a field is too wet. Other practices which will help to reduce compaction are crop rotations which include perennials, returning organic matter to the soil, and confining wheel traffic to specific lanes or row middles in the field.

20. I have land in CRP. What can I expect in 10 years?

CRP land planted to perennial vegetation receives almost no traffic. You can expect no increase in compaction over the 10 year period and any compaction present when the land went into CRP will be largely eliminated.