Soil Compaction

A Limiting Factor in Production

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With the recent intensification of farm practices, soil compaction has become more prominent as a limiting factor in economical crop production. Means of greater production such as new fertilizer practices, new insecticide use, new crop varieties, irrigation and drainage combine to focus more and more attention on the need for correction of compaction in soils. Traffic over farm land not only is greater in amount but is heavier than ever before.

Efforts to prevent or correct soil compaction have been almost wholly disregarded in the intensified effort to increase crop yield. This neglect is due partly to the difficulty in detecting and measuring soil compaction and partly to the lack of knowledge of corrective methods that may be incorporated in existing farm practices.

A reduction in total pore space of as little as 10 percent adversely affects crop production. Still further reduction to 20 percent will eliminate growth of some crops altogether. Hard spots in alfalfa fields, for example, have been found to have 20 percent less pore space than the surrounding soil.

Limiting Factors

Compaction is responsible for limiting many conditions in the root environment that are essential for plant growth. Some of the adverse conditions in the soil associated with soil compaction are:

1. Reduction in pore space. (See photo.)
2. Reduction in water penetration.
3. Reduction in air movement; oxygen becomes limiting.
4. Reduction in size of soil aggregates or structures.
5. Reduction in root penetration.
6. Reduction in feeding area or root room. Root room is as important to a plant as pasture area is to cattle.
7. Reduction in microbiological activity. Microorganisms, like plants, must have air and water to live. Decay of crop residues such as straw is slow.

Corrective Measures

Some corrective or preventive measures for compaction of soil are listed as follows:

Tillage Practices

1. Eliminate as much traffic with heavy implements as possible.
2. Work the soil at a proper moisture content. Very wet soils compact more readily than dry soils.
3. Fine textured soils should not be subjected to pulverizing action by tillage implements when dry. Such treatment breaks the soil structure into a fine powdered condition which retards water intake. When such soil is wetted, it settles into a dense mass of a high degree of compaction.
4. Break up the soil below compacted layers when preparing a seed bed.
5. Deep plow when compacted layers are deep and when soils are layered in different textures.
6. Knifing or chiseling has been used to break up compact layers.

Organic Matter

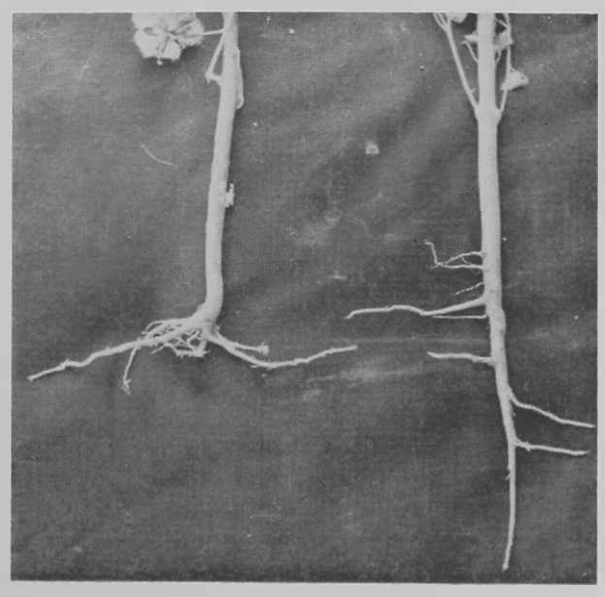
Return as much crop residue to the soil as possible providing it does not carry disease.

Crop Rotation

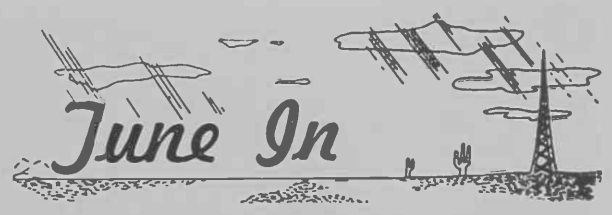
Certain deep rooted crops assist in getting air and water to a deeper depth than others. Rotate crops to prevent formation of pressure pans in the same spot each year. Hard spots often form in perennial crops. These should be broken up with a plow and rotated with crops such as the fiberous rooted grasses.

Pasturing Cattle

If it is necessary to pasture crop land, it is most desirable to have the soil dry. Animal hoofs compact soils.



Effect of soil compaction on cotton roots. Left, Compacted soil layer 4 to 6 inches below surface. Right, Normal root in soil where no campaction exists.



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