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Consequences of Soil Compaction

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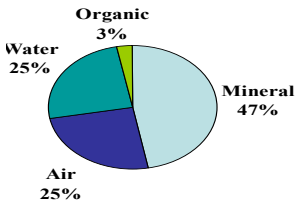
Will My Soils Compact?



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Soil "Composition"



- Soil structure in its natural state.
- Can temporarily increase air percentage with tillage.

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The diagram illustrates two soil cross-sections. The left one shows loose soil with large, irregular pore spaces. Above it, a box is divided into 'Air' (top) and 'Water' (bottom). The right one shows compacted soil where the pore spaces are significantly smaller and more uniform. Above it, a similar box is divided into 'Air' (top) and 'Water' (bottom).

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11 x 28 tires with pressure = 12psi and wheel load = 1,650lbs.

Soil depth in inches	Hard dry (psi)	Moist (psi)	Wet (psi)
0	15	15	15
4	12	12	12
8	9	9	9
12	6	6	6
16	3	3	3
20	3	3	3
24	3	3	3

Soil condition: Hard dry, Moist, Wet

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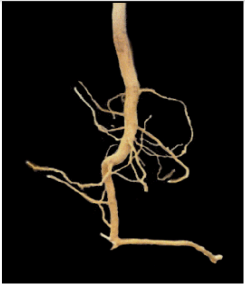
- Reduced soil drainage.
- Slow crop growth, root development.
- Deformed or flattened roots.
- Increased soil bulk density
- Poor soil structure.
- Increased plant injury from soil-applied herbicides.

The images show a penetrometer being used to test soil resistance, a hand holding a soil sample, and a root system that appears flattened and deformed due to compaction.

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- Decreased Infiltration
 - Decreased Water Storage
 - Increased Soil Erosion
- Decreased Root Growth
 - Reduced N Uptake



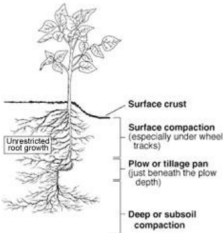
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Compaction Areas

- Surface from wheel traffic.
- Tillage pan.
- Deep/Subsoil.

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Relative Yield to Control

- One time compaction of 20 tons per axle.
- 12-year relative corn yields.
- Within 5 years yields back to normal during normal growing conditions.
- **1988 low precipitation**
- **1990 and 1993 high precipitation.**

Soil Compaction, University of Minnesota Extension, 3081 DeJong-Hughes, Extension Educator

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Kentucky No-Till

Relative Yield to Control

- Extreme compaction initially done in top 12 inches.
- First year yield only 2 percent of uncompact yield.
- 85 percent yield the second year.

Penn State, Effects of Soil Compaction Murdock, L.W. 2002. Personal communication

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Penn State Trial

Corn yield (bu/A)

- No-Till
- 30-ton manure truck, tires 100 psi.
- 2002 dry year.
- 2003 wet year.

Penn State, Effects of Soil Compaction

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Final Thoughts

- Soil compaction can affect crop yield, particularly in the first year after the compaction occurs.
- Soil compaction yield loss is greater in "**stressed**" cropping seasons.
- Soils have a resiliency to recover from soil compaction.

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