

This activity courtesy of No Till on the Plains & Twin Lakes Water Festival. Visit www.notill.org for additional resources.



Soil Tillage Activity

A delicious introduction to soil structure & compaction on agricultural lands

Background:

Soils that have been exposed to heavy equipment or a lot of human or animal foot traffic are usually more compacted. Compacted soils contain less air and/or water pore space than soils not subjected to a lot of weight. If a soil does not have sufficient pore space, it is limited in its ability to function. Adequate pore space is essential for the movement of water, air and soil organisms through soil. In addition, plant growth can be hindered because tender seedlings cannot grow through the soil very well. Roots cannot grow very well either; they become stunted and aren't able to absorb as much water and nutrients as a plant in soil with lots of pore spaces. Lack of sufficient pore space and the accompanying compaction also restricts water infiltration, resulting in excessive runoff, erosion, nutrient loss and potential water-quality problems. Using cereal to illustrate particles/aggregates of soil and milk to imitate rainwater, the following edible experiment shows how compaction affects the infiltration, storage and rate of water movement through soils.

Directions:

- * To demonstrate the varying sizes of soil particles, place balls of all different sizes into a clear jar or pitcher. Pour water into the jar to show where water sits between soil particles. Have students discuss how plants draw water from between soil particles, and ways in which particle size makes a difference.
- * Divide students into 2 teams (till farmers & no-till farmers) and discuss the positive and negative aspects of both practices.
- * Pour one cup of chocolate rice cereal into the clear container of the no-till farmers. Place the other cup of cereal in a closeable plastic bag and roll with a rolling pin until approximately half of the cereal is crushed. Pour the crushed/compacted cereal into the clear container of the till farmers.
- * Pour ½ cup of milk into each of two squirt bottles or measuring cups. Whole milk or cream is more desirable than skim or two percent milk because it is thicker and whiter, making it easier to see.
- * At exactly the same time and at the same rate, have one person pour a cup of milk over the compacted cereal and another person pour a cup of milk over the non-compacted cereal. Be sure to pour the milk into the center of the cereal so that the milk doesn't run down the sides of the container.
- * Compare the rate of milk flow through the two containers of cereal. How long does it take for the milk to reach the bottom of each container? Does the milk immediately infiltrate (enter) the cereal or does it "perch" on top or part way down?
- * Have students repeat the experiment on their own with the choice to crush (till), partially crush (partial till), or not crush (no till) their cereal/soil. Discuss and eat the results.



If this was water and soil instead of milk and cereal, how would this affect the growth of roots? Why do farmers till? Why might some farmers choose not to till? What would you do if you were a farmer? Which choice is better for the soil, the crops, the water, the farmer?

Materials:

- 2 cups chocolate sweetened rice cereal (cocoa puffs or rice krispies)
- clear container & spoon for each student (drinking glass or empty jam jar)
- Rolling pin
- 1 cup milk (preferably whole milk or cream)
- 2 squirt bottles or measuring cups with pour spout
- Tennis, golf, bouncy balls & marbles