

VALUE OF soil health

unlock the
SECRETS
IN THE
SOIL

What is the value of healthy soil?

Soil health is a combination of physical, chemical and biological properties impacting the function and productivity of the soil. Several of these properties directly affect your farm's net return.

Soil organic matter directly impacts water infiltration rates, soil aggregate stability and soil structure. It can also impact compaction, which can affect your farm's net return.

While it is difficult to place a monetary value on any one of these properties, it may be possible to provide an estimate of the economic value of two by-products of healthy soil: the availability of water and maintenance of soil nutrients.

More water for plant growth

Healthy soils impact the amount of water available for plant growth by improving infiltration of precipitation and the ability of

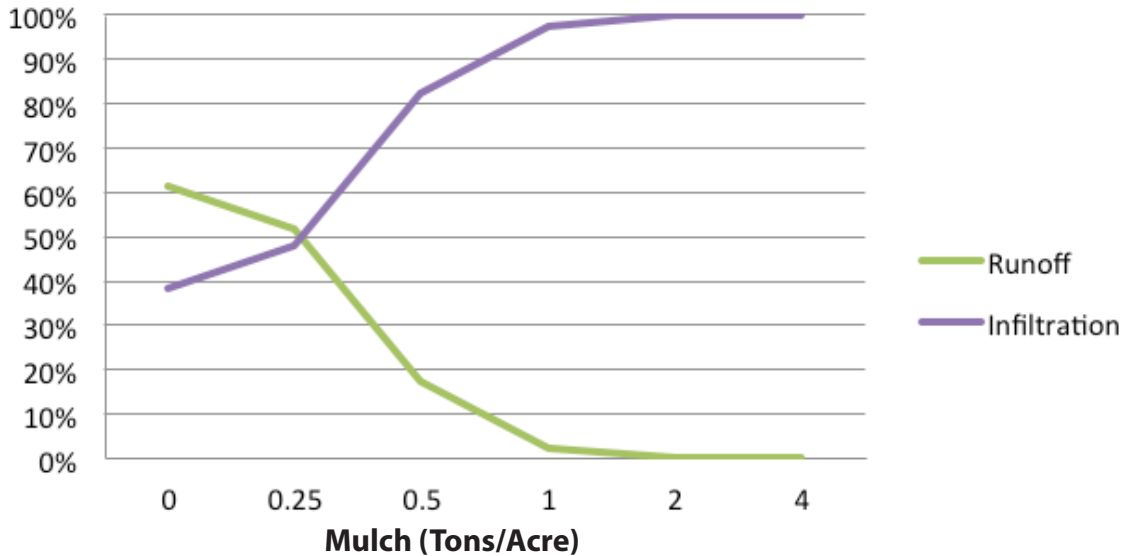


Conservation planning with NRCS can help you decide which adjustments are best for your operation to improve soil health .

the soil to store precipitation; in other words, the soil available water holding capacity. In the short-term, water infiltration (water entering the soil) can be effectively influenced by managing residue and reducing tillage. Studies have shown that the amount of water entering the soil can be increased up to 2.5 inches per hour by maintaining crop residues on the soil surface.

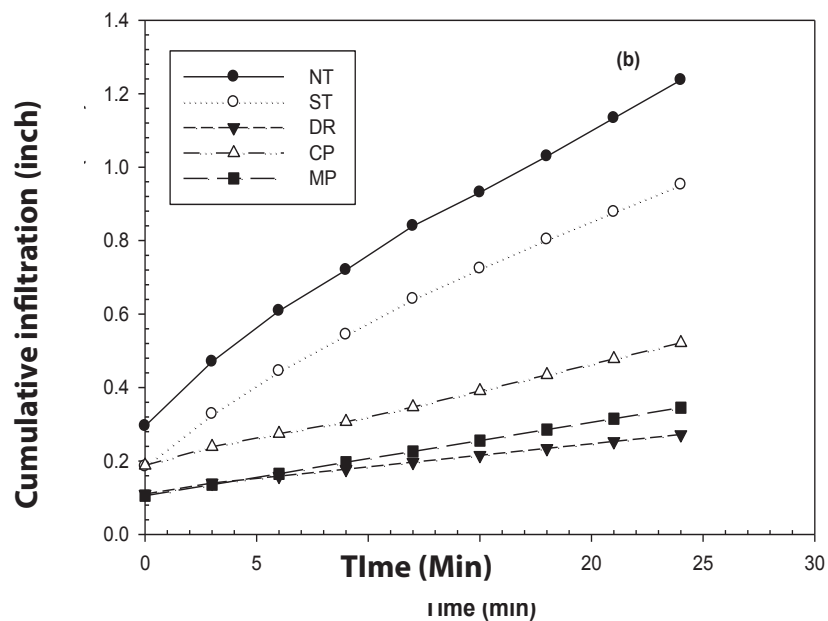
The residue shields the soil from rain drop impact which can seal the soil surface preventing infiltration. A majority of the benefit is gained by maintaining at least 1,000 pounds of residue on the soil surface at all times. This equates to approximately 30 percent ground cover of corn residue or 40 percent soybean residue.

Ground Cover Impacts on Infiltration



Tillage is disruptive to the soil structure and reduces water infiltration by breaking large pores and fills the small pores by dislocating the soil particles. Additionally, incorporating residue can cause a significant loss of soil moisture.

Tillage Impacts on Infiltration



Cumulative water infiltration under five tillage systems. NT=No-till, ST=Strip-tillage, DR=Deep Rip, CP=Chisel Plow and MP=Moldboard Plow. (Al-Kaisi, 2013). NT and ST increased water recharge by 50 to 70% over conventional tillage systems.

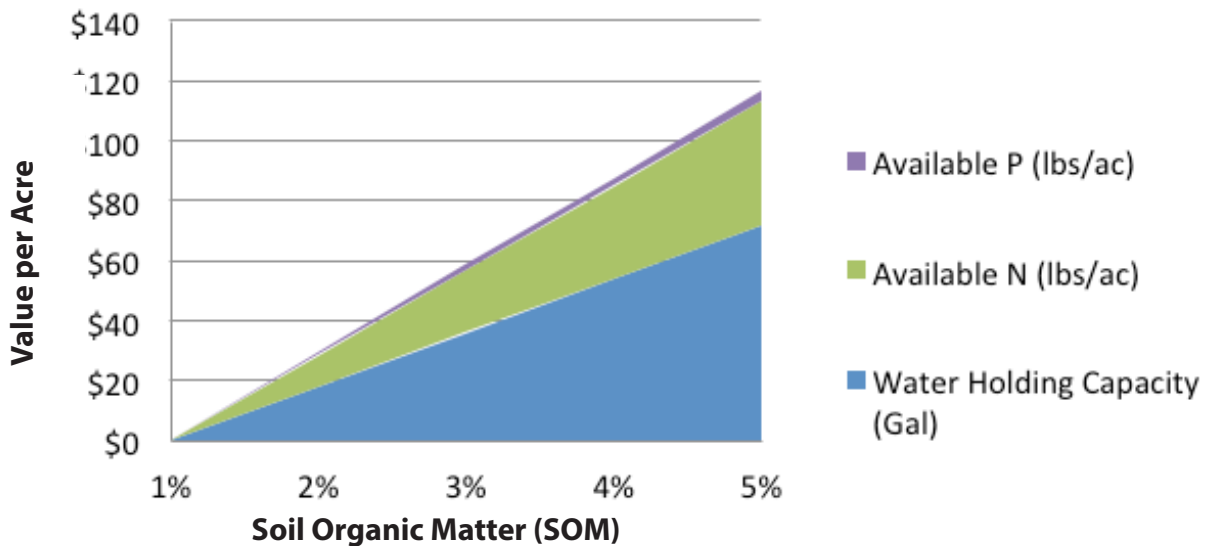
The exact economic return of improved water infiltration is determined by many factors including: precipitation, growing season conditions, yields and commodity prices. So the net return from each additional inch of available plant water will vary from year to year.

Value of soil organic matter

The long-term impacts of increasing soil organic matter (SOM) can be significant. A typical acre of soil, six inches in depth, weighs about 1,000 tons. One percent organic matter equates to 10 tons of organic material.

Since it takes at least 10 pounds of residue to decompose to 1 pound of organic material, SOM levels under the right management conditions will typically increase at a fairly slow rate. Studies have shown that for every percent increase in SOM, an additional 16,500 gallons of water is available in the soil. Using an average commodity price from 2009 through 2013 for corn and soybeans this would equate to \$18 per acre income, per 1 percent increase in organic matter.

Incremental Value of Soil Organic Matter



Maintenance of Soil Nutrients

Soil organic matter is also a significant source of nutrients. An acre of a medium textured soil profile, approximately six inches deep, will weigh approximately two million pounds. At an average mineralization rate of 1.5 percent, this could account for up to **17 pounds of nitrogen and 1.75 pounds of phosphorus per percent of organic matter**. At current prices of commercial fertilizer, this would amount to approximately **\$11 per percent of organic matter**. Using 1 percent SOM as a baseline level, the total long-term value of a 1 percent increase is an estimated \$29 per acre for the nutrient value and available water holding capacity. These estimates are based on Iowa's average of 34 inches of precipitation annually. Actual results will vary based on precipitation amounts and intensity, starting soil health conditions, crop rotation, and tillage methods selected.

How do you improve soil health and its value?

There are many things you can do to improve soil health and increase productivity and profitability.



No-till planting in between terraces in Southwest Iowa.

Manage More by Disturbing Soil Less

Eliminating or reducing tillage minimizes the loss of organic matter, reduces the impact of compaction, and protects the soil surface with plant residue.

More Crop Diversity

Increasing the diversity of a crop rotation and cover crops increases soil health and soil function, reduces input costs, and increases profitability.



A diverse cover crop mix including oats and radishes.

Keep a Living Root Growing Throughout the Year

Cover crops keep living roots throughout the year and provide a food source for soil microbes, which helps them cycle nutrients.

Add Livestock to Your Operation

Livestock will add nutrient rich manure to your soil, improve profitability of cover crops, increase soil organic matter and reduce input costs, as well as diversify your operation.

Keep the Soil Covered as Much as Possible

Residue management and cover crops provide a variety of benefits including erosion control, weed suppression, supplemental forage, reducing compaction, as well as fertility and other soil health benefits.

Questions?

For more information, conservation technical assistance, or to learn about Soil Health Management Systems, contact your local NRCS or conservation district staff or visit <http://soils.usda.gov/> or www.ia.nrcs.usda.gov.

References

Licht, Mark and Al-Kaisi, Mahdi, 2012. Less Tillage for More Water in 2013.

Mannering, J.V. and L.D. Meyer, 1963. The Effects of Various Rates of Surface Mulch on Infiltration and Erosion.

Hudson, B.E., 1994. Soil Organic Matter and Available Water Capacity. Journal of Soil and Water Conservation, Vol. 49, No. 2. p. 189-194

USDA-NRCS. Soil Organic Matter Soil Quality Kit — Guides for Educators.

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United States Department of Agriculture
Natural Resources Conservation Service