

A Strategy to Improve Soil Health in a Midwest Corn-Soybean Cropping System

Farmers, who use quality No-till systems to improve soil health, find that the integration of single cropping practices into a system, can consistently show that the benefits of the whole system exceeds the sum of the parts.

Managing for Soil Health is recognized as a regenerative approach for farmers to achieve resilience to the effects of extreme weather conditions and attain higher yield capacity on any soil in any year.

The following is an approach for a **Corn-Soybean (C-SB) Farmer**, interested in a no-till cropping system, that is low in risk, and will jump start nearly any soil type toward higher production capacity and function:

Step 1: No-till (NT) a cereal rye cover crop (CC) into corn stalks - It's easy to establish and easy to kill. Cereal rye is one of the most versatile cover crops: it is very cold tolerant, one of the most tolerant species to residual corn herbicides, and can be seeded aerial, incorporated with a vertical tillage tool or drilled with a high rate of success. It can be mixed with other species such as daikon radish or rape depending on the seeding date and resource concerns. This is your first No-till operation.

Step 2: NT a relatively early group soybean into the cereal rye and try to plant these beans early in the planting season...early group soybeans are more determinant, and benefit from early planting and this gives you a wider window to seed a cover crop mix next fall. This becomes your second No-till operation.

Soybean responds well to the cereal rye environment, even when planted into tall cereal rye. Soybean is not adversely affected by immobilized Nitrogen (N) which can be associated with a high Carbon: Nitrogen cereal grain like rye. In fact it responds favorably to a rye CC which has great benefits for weed control and late season water conservation. During most Midwest summers an extra ½" to 1" of water in August will have a major benefit to soybean yield.



Cereal Rye Drilled Into Corn Stalks



Soybean Planted Into 4-5' Cereal Rye



Soybean in Cereal Rye During Extreme Drought

Step 3: Plant a low Carbon: Nitrogen (C:N) CC mix after SB. Cover crops prior to corn should trap or produce N in the fall and early spring, but release N at the optimum time in the spring/summer. Corn into a mix such as: Oat/Daikon Radish that winter kills, or annual ryegrass/Crimson Clover mix will capture or produce organic N and release the N at time of greatest need. This becomes your third No-Till operation.

Cereal grain cover crops ahead of corn may have a high N immobilization, which can limit plant available nitrogen for the corn crop. If cereal grain cover crops are the only available option due to other resource concerns (such as erosion control), plan to terminate them in the vegetative stage, utilize them in a mix with lower C:N cover crops like Austrian Winter Pea and/or compensate with extra N in starter fertilizer.

Step 4: NT corn into the low C:N mix the following spring. This make the NT corn actually the 4th NT operation that has the advantage of a soil that already has many of the soil health qualities from a more mature system. By planting a cover crop mix with a low C:N ratio, N is released more timely and the corn crop also benefits from the timed release of the organic N. Remember that C:N is closely related to CC maturity, so plan to terminate the CC while it is in the vegetative stage.

By now, soil biological populations and processes are well on their way. Soil aggregates are stabilizing and pores are opening. Water infiltration and holding capacity are on the rise. Nutrients are cycling and accessible from alternate pathways.

Result... great production potential!

Soil health- “The continued capacity of soil as a vital living system, with balanced and complex biological communities, whereby carbon, nutrients and water are cycled efficiently assuring primary production and environmental quality are optimized.”

Acknowledgments: Thanks to the farmers who sent these pictures and Lucy (the dog) for modeling.



Oats and Daikon Radish Drilled after Soybean



Austrian Winter Pea Nitrogen Nodules



Corn Planted Into a Low C:N Cover Crop Mix