

### 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 provide benefits to the whole system that exceed 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 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 a Cereal Rye Cover Crop into corn stalks - It's easy to establish and easy to kill.** Cereal Rye is one of the most versatile cover crops because 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 rapeseed depending on the seeding date and resource concerns. This is your first no-till operation.

**Step 2: No-till 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.

Soybeans respond well to the cereal rye environment, even when planted into tall cereal rye. Soybeans are not adversely affected by immobilized Nitrogen (N) which can be associated with a more mature high Carbon:Nitrogen cereal grain such as rye. In fact it responds favorably to a rye cover crop which has great benefits for weed control, keeping soils cooler in summer and late season water conservation. During most Midwest summers an extra one half to one inch of water in August can have a major benefit to soybean yields.



Cereal Rye Drilled Into Corn Stalks



Soybeans Planted Into 4-5 foot Cereal Rye



Soybeans in Cereal Rye During Extreme Drought

Soil health is the continued capacity of soil as a vital, living system; whereby carbon, nutrients and water are cycled efficiently, assuring primary production and environmental quality are optimized.

**Step 3: Plant a low Carbon:Nitrogen (C:N) Cover Crop mix after soybeans.** 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 and summer. Corn into a mix such as: oat and 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 if allowed to mature, 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, use them in a mix with lower C:N cover crops like Austrian winter pea, and/or compensate with extra N applied at planting or in starter fertilizer.

**Step 4: No-till corn into the low C:N mix the following spring.** This makes the no-till corn the fourth no-till operation that has jump started the soil with 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, C:N ratio is closely related to cover crop maturity, so plan to terminate the cover crop 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.

## The result is great production potential!

**Indiana NRCS Soil Health website:**

[http://www.in.nrcs.usda.gov/technical/Soil%20Health/soil\\_health.html](http://www.in.nrcs.usda.gov/technical/Soil%20Health/soil_health.html)

**Indiana Conservation Cropping Systems Initiative website:**

<http://www.in.gov/isda/ccsi/>

**National NRCS Soil Health website:**

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/soils/health/>



Oats and daikon radish drilled after soybeans



Austrian winter pea nitrogen nodules



Corn planted into a low C:N cover crop mix

*Author: Barry Fisher, Soil Health Specialist, USDA Natural Resources Conservation Service, Indiana*

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