BEYOND THE BASICS

Advanced Cover Crop Series

UNDERSTANDING THE C:N RATIO



FEEDING THE SOIL ECOSYSTEM

Soil microbes are small but mighty when it comes to cycling nutrients and breaking down residue. Providing them with the right mix of carbon, nitrogen, and other nutrients fuels their ability to decompose residue, and is key to keeping needed nutrients available for crops.

Nitrogen Immobilization:
Residue nitrogen content is less than microbe demand. Microbes must use soil nitrogen instead of nitrogen from residue, limiting availability for crops.

Nitrogen Mineralization:
Residue nitrogen content is greater than microbe demand, and nitrogen is released for crop growth.

THE TURTLE AND THE HARE

How C:N Ratios of Different Cover Crops Impact Decomposition Rates

The carbon (C) to nitrogen (N) ratio of cover crop residue is an indicator of whether immobilization or mineralization will occur. The ideal microbe diet is 24 parts C to one part N (24:1). With higher C:N ratios, decomposition is slower and immobilization (also called “tie up”) occurs. With lower C:N ratios, decomposition is faster and mineralization can occur.

Slower decomposition ⟵ ⟶ **Faster decomposition**



These C:N values are approximate and vary based on plant developmental stage.



GRASSES

Grasses take up available N that is susceptible to loss, benefitting water quality. However, they tend to have higher C:N ratios, leading to immobilization. Small grain and other grass cover crops usually result in an initial, if not persistent, immobilization of nitrogen during the cash crop season.

AVOID THE DRAG

To avoid corn yield drag following high C:N cover crops:

- ☑ Terminate overwintering grass cover crops early, 7-10 days ahead of corn planting
- ☑ Apply starter fertilizer
- ☑ Avoid in-furrow applications to prevent salt injury to crop seedlings



LEGUMES

Legumes transform atmospheric N to plant-available forms in the process of N fixation, thanks to beneficial bacteria on their roots. The fixed N becomes available as soil microbes break down the terminated legumes. Due to low C:N ratios, legumes return N to the soil faster than grass cover crops.



Legume aboveground biomass contains 3.5-4% nitrogen (on a dry matter basis).

N accumulated in biomass is not the same as fertilizer replacement.



BRASSICAS, MUSTARDS, AND OTHER BROADLEAVES

These cover crops tend to winterkill and decompose quickly after termination. To retain valuable nutrients in the soil, frost-sensitive brassicas should not be seeded alone.

CONSIDERATIONS FOR TAKING A COVER CROP N CREDIT

- ☑ Typical corn and soybean rotations don't allow enough time to produce N credit
- ☑ Timing of N release is impacted by maturity of cover crop and tillage
- ☑ N release is dependent on climate and previous crop, and only half of the total N may be available this year

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