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Simple ways to predict a cover crop's carbon-to-nitrogen ratio

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Cereal cover crops being irrigated. Photo courtesy of Eric Brennan, USDA–ARS.

Nonlegume winter cover crops can help vegetable growers recycle leftover nitrogen from one season to the next and protect ground water from nitrate pollution. But growers need simple, field-based methods to know when to terminate a cover crop so that its nitrogen is released to best benefit the next vegetable crop. The carbon-to-nitrogen ratio of the crop can help determine if it is “juicy” and likely to release nitrogen quickly or “tough” and likely to break down more slowly. The “sweet spot” ratio is about 20:1—basically, a “tipping point” between nitrogen release (mineralization) and “tie up” (immobilization).

A study with rye and triticale winter cover crops planted biweekly from October 1 to November 30 at the USDA–ARS in America’s Salad Bowl (Salinas, CA) evaluated farmer-friendly methods to predict carbon-to-nitrogen ratio changes. The researchers found that, usually, the number of days after planting worked well to predict the ratio of 20:1 and that the ideal ratio occurred in October-planted cover crops when cereals were heading (Feekes 10.1, around 97–103 days after October plantings) or about 94–98 days after November plantings when the flag leaf was just visible (Feekes 8).

By maximizing the potential nitrogen source for next season’s crops while minimizing nitrogen losses, this optimization will help California vegetable farmers adhere to new state regulations that protect groundwater.

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Brennan, E. B., & Smith, R. F. (2026). Can simple metrics predict carbon to nitrogen ratio changes in rye and triticale cover crops? *Agronomy Journal*, *118*, e70375.

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