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Can Dual-Use Cover Crops & No-Till Make Dairy Farming More Sustainable?

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The short answer: Cover crops and no-till are excellent practices, but we can get even more from them. Customizing these practices for dairy farmers can address excessive soil-phosphorus accumulation, offer season-long erosion control, and grow extra forage.

Break it down: One reason we like cover crops is because they capture excess nutrients. “Excess” means:

1. Residual soil nutrients that a cash crop didn’t pick up, such as nitrogen and phosphorus.
2. Nutrients applied as fall manure when farmers empty out manure storage to make space for winter.
3. Nutrients that have moved too deep in the soil for cash crops to reach, such as nitrogen and calcium.

Cover crops hold extra nutrients like a temporary savings bank, returning nutrients to the soil when they die. For many farms, this is ideal. But dairy farmers are dealing with something that crop farmers are not: manure.

- **Nutrient ratio:** Dairy manure has a low nitrogen to phosphorus ratio, ranging from 2:1 – 4:1; most manure will be

closer to 2 than to 4. This should be quite convenient, because corn grain or silage requires a similar ratio of these nutrients.

- **Here's the rub:** Long histories of manure application have built up soil-phosphorus on dairy farms.
  - As a result, many farmers are subject to phosphorus-application restrictions.
  - Sure, manure is applied to corn that can take up a good amount of N & P and remove it from the field.
  - But manure is also applied in the fall when there is no cash crop to remove nutrients. To sum up, cover crops can capture – but do not remove — nutrients.
- **Extra plant-available nitrogen** is less prone to significant build up in soils.
  - Nitrogen is taken up by soil microbes and nitrogen leaves the field through leaching.
  - Phosphorus chemistry is different. Some phosphorus can leave through runoff or leaching, but most phosphorus will stick around for years.
  - This can lead to fields that need N fertility but have too much P to reasonably receive manure.
  - Traditional cover crop management prevents rapid N and P loss from manure applications, which is a very good thing. But cover crops do not remove extra nutrients from the field, just cycle them.
  - This leaves us with a built-up P problem in manured fields.

Back it up: What if we harvested the cover crop?

Rye, wheat, and triticale make great winter cover crops and haylage or bailage. Forage varieties of these plants are increasingly available and provide all the benefits of cover crops that we know and love.

When we harvest the cover crops, we physically remove nutrients from the field – around 20 lbs. of P per acre, depending on cover crop biomass yield.

- Feeding cover crops back to cows keeps nutrients actively cycling instead of accumulating in a field.
- When circumstances allow, the forage made from these crops can be sent off-farm entirely and reduce the total on-farm nutrient load. We get an economic benefit (extra feed) and an environmental benefit (better phosphorus management).

What about soil carbon? Some folks understandably wonder if this will result in less carbon building. However, we know that roots are the key to building soil carbon. Most carbon in surface residues is lost back to the atmosphere during decomposition. Regardless, as much as 50% of above ground cover crop biomass can be found in the 3-4" of dense residue left after harvest.

This strategy pairs well with no-till management. Cover crop residue can be terminated with herbicide before or after no-till planting corn. The standing cover crop residue is slow to decompose.

No-till benefits include:

1. Erosion control all summer without the challenges of establishing a living cover below the corn canopy.
2. Removal of some above ground biomass that could otherwise contribute to nitrogen tie-up during decomposition.
3. Preservation of soil carbon, facilitated by roots.

In short: Nothing in farming is one-size-fits-all. If you are a no or reduce-till farmer, you are not incorporating your cover crop anyway. If you are dealing with excess P, harvesting your cover crop for forage helps this sustainable practice pay for itself.

Photo by Sam Glaze-Corcoran.

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