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Cover crops have big impact on organic vegetables

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By Bob Johnson

A long-term organic vegetable study in Salinas shows that winter cover crops have a dramatic impact on vegetable yields the following spring, because they capture the large pool of nitrogen in the residue before it leaches out of the root zone and make it available to the next crop.

Eight years into a broccoli-lettuce rotation, the data showed that the nutrients captured by cover crops from broccoli residue helped take subsequent romaine lettuce yields to more than 1,000 cartons, even when no compost was applied.

"When you have a winter cover crop after the broccoli, the cover crop is able to capture the leftover nitrogen and recycle it back into the next spring lettuce crop," said Eric Brennan, U.S. Department of Agriculture research horticulturist who began the ongoing Salinas Organic Cropping Systems long-term vegetable crop study in 2003. "It is one of the few long-term systems experiments that is focused on high-value, high-input crops."

The study is documenting the impact that cover crops and compost have over the years in improving soil fertility, and the ability to cycle nutrients and suppress weeds.

"You may be wondering whether the nitrogen fixation in the legume portion in that cover crop mixture also helped to increase yields," Brennan said. "This may have helped a little bit, but I don't think it did much, because we also have high lettuce yields in other systems in the experiment where we grew only non-legume cover crops."

The study compares three different broccoli-lettuce systems—one with compost and cover crops every year, another with compost every year and a cover crop every fourth year, and a third with no compost and a cover crop every fourth year.

In all of these systems, lettuce yields went from 100 or even fewer caskets to around 1,000 caskets in the year

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also happened where we did not apply compost and only cover cropped every fourth year. This shows the remarkable power of a cover crop to boost yields."

This power of the cover crops comes from their ability to take up and hold the large amount of nitrogen in the residue of the previous crop.

"The nitrogen input from the fertilizer for the broccoli was usually about 145 pounds per acre each year," Brennan said. "When a crew harvests the broccoli, only about 25% of the total shoot biomass, just the top part that we eat, is removed from the field. Most of the nitrogen in the broccoli plant is left in the field in the nitrogen-rich leaves and shoots."

Without cover crops, this nitrogen in the residue, amounting to at least 100 pounds an acre, could leach out of the root zone before the next crop and eventually end up in the underground water.

"If the field is left in a bare winter fallow after the broccoli, all that leftover nitrogen can leach out of the root zone and down into the groundwater," Brennan said. "When you have a winter cover crop after the broccoli, the cover crop is able to capture the leftover nitrogen and recycle it back into the next spring lettuce crop."

Data collected after six years of the broccoli-lettuce rotations also showed that the annual compost and cover crop program had a dramatic effect on the soil microbial biomass carbon, which is one measure of soil health.

"The greatest improvement in soil health was in the system with compost and a cover crop every winter, which had an increase of soil microbial biomass carbon of 179% over six years," Brennan said.

In the plots that were cover cropped only once every six years, soil microbial biomass carbon declined or increased ever so slightly depending on whether compost was applied.

"There was some evidence of an actual decline in the system where we applied no compost and only cover cropped every four years, and just a slight improvement in the system that got compost every year but was only cover cropped every fourth year," Brennan said.

(Bob Johnson is a reporter in Sacramento. He may be contacted at bjohn11135@gmail.com.)

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