

Hot off the press:

Sign up to receive weekly alerts from the best Ag publication in California

 x

Welcome back eric.brennan@ars.usda.gov [Logout](#)



- [Home](#) |
- [Contact](#) |
- Welcome back

Visit Our Sites

- [CFBF](#)
- [California Bountiful](#)

- [Archives](#)
- [Subscribe](#)
- [Advertise](#)
- [Classifieds](#)
- [About Us](#)

Multi-year research guides growers on cover crops

Issue Date: [December 19, 2012](#)

By Bob Johnson

Hot off the press:

Sign up to receive weekly alerts from the best Ag publication in California

Enter your e-mail

×



Eric Brennan, USDA researcher in Salinas, is continuing his organic cool-season vegetable cover crop trial that began in 2003.
Photo/Bob Johnson

The most detailed long-term study ever conducted of the effect crops have on cool-season vegetable ground is yielding insights on how to build organic matter in the soil, suppress weeds and capture nitrogen before it leaches out of the soil.

The eight-year U.S. Department of Agriculture study in Salinas has shown that the best cover crop mix and seeding rate depend on a grower's priorities.

A combination of rye and mustard planted as a cover crop in the winter produces the most biomass, which should translate into the best weed control if that is the highest priority.

"The most cost-effective cover crops in terms of dry matter produced per seed costs were rye and mustard, because they produced approximately three times more dry matter per unit of seed cost than the legume-rye mixture, assuming 2010 seed costs," said Eric Brennan, USDA researcher in Salinas.

The production of dry matter, particularly early in the season, is important partly because it translates into better

Hot off the press:

Sign up to receive weekly alerts from the best Ag publication in California

Enter your e-mail



production. Minimizing weed seed production in winter cover crops in this region is extremely important, because many weeds occur year-round and seed produced at any time may increase weed management costs in subsequent vegetable crops," Brennan said.

Brennan started his Salinas Organic Cropping Systems trial in 2003, making it the longest organic cool-season vegetable cover crop trial anywhere in the country. Continuing the trial for many years, rather than just a couple, has made a world of difference in coming up with reliable information, he said.

"Had we taken just the first two years, we would have missed the conclusion about rye and mustard producing the most biomass. I'm convinced about the value of long-term trials because the trends are so clear," Brennan said.

It also took years for the benefits of adding compost to the soil to begin making a difference in the Salinas trial.

"A lot of organic growers are using both cover crops and compost. We saw an immediate benefit from cover crops, but we didn't see any benefit from composts the first four years," Brennan said.

The trial includes a rye, a legume-rye mixture and a mustard mixture cover crop, all three of them at both a typical seeding rate and at three times the typical rate. The cover crops were planted from mid-October to early November, and incorporated the next spring from mid-February to mid-March.

Higher seeding rates, all the way up to triple the typical rate, were important for biomass production of the legume-rye mixture, but not of the other cover crops.

Because they scavenge for nitrogen better early in the winter when storms are most likely to leach nitrates out of the soil, non-legume cover crops also worked best for the purpose of protecting against nitrate leaching.

"Non-legume cover crops are several times more effective at scavenging nitrogen and protecting groundwater quality than monoculture legume cover crops," Brennan said.

The mustard cover crop, in particular, was most effective in scavenging for nitrogen early in the season.

"Mustard would be the best cover crop to maximize nitrogen accumulation in the shortest period possible with the least amount of dry matter production, because nitrogen accumulation by mustard peaked in December with relatively low dry matter," Brennan said.

The results call into question the economic value of the common practice of planting nitrogen-fixing legume cover crops in order to add nitrogen to the soil for organic production.

"Mustard and rye grabbed nitrogen in the soil quicker than legume and rye. The legume and rye had more nitrogen by the end of the year, but a lot of that nitrogen was fixed by the legume. Is the 20 percent more nitrogen you get from the legume and rye mix worth the extra cost of the seeds?" Brennan asked.

The study provides growers with a way to calculate which cover crop to use, and at what rate, in much the same way as they calculate which cash crop to plant. Seed for the legume mix, for example, could cost 10 times as much if the higher rate is used in order to get maximum weed control.

The study has shown that growers can expect a payoff in weed control from investing in a much higher than usual seeding rate for their legume cover crops.

"Weed growth during the cover cropping phase of the trial, and weed densities in the subsequent vegetable

Hot off the press:

Sign up to receive weekly alerts from the best Ag publication in California

no increased labor and tractor costs for planting and incorporating the higher-density cover crop.

"Increasing the cover crop seeding rate by threefold increases the cost of cover cropping, but it would not triple the cost because cover crop seed typically accounts for only 20 to 30 percent of total cover cropping costs compared with labor costs to plant, irrigate and terminate the cover crop in high-value vegetable systems in California," Brennan said.

But the highest cost for cover cropping—and it can be a prohibitive cost—is the lost opportunity to plant a cash crop.

"The opportunity costs of forgone cash-crop income are one of the largest costs of cover cropping and a major obstacle to increased adoption. However, cover crop use on irrigated cropland in California will likely increase due to the Irrigated Lands Regulatory Program that regulates discharges such as winter runoff from agricultural lands," Brennan said.

This opportunity cost can encourage even organic farmers to look for off-farm sources of organic matter, which are available, but only at a long-term cost in terms of sustainability.

"Compost from off-farm sources is a more convenient way than cover cropping to add soil organic matter because fields are always available for cash cropping. However, cover cropping is a more sustainable approach because it reduces a farm's reliance on off-farm inputs and also provides essential ecosystem services such as nutrient scavenging," Brennan said.

Composts can add organic matter to the soil, but they cannot prevent nitrogen from leaching out of the soil and into the underground water.

"Deep-rooted winter cover crops add soil-building carbon that is critical to soil quality and function, and can reduce the 'leaks' in agro-ecosystems by scavenging nitrogen at risk of leaching," Brennan said.

The goals and methods of this long-term study were developed in close collaboration with Salinas Valley organic farmers.

"In 2002, an advisory group of 10 organic farmers from the Central Coast of California indicated that weed and soil fertility management and cover crops were major areas of common research needs across a diversity of high-value cropping systems and scales," Brennan said.

The numbers are still being crunched on the role of cover crops in adding organic matter to the soil, improving water holding capacity, and increasing yields of lettuce, broccoli and strawberries.

"There is a lot more to come and this is just the tip of the iceberg," Brennan said.

While the numbers on the long-term benefits of cover crops in increasing yields are still being looked over, Brennan indicated the preliminary soil organic matter results are impressive.

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

Permission for use is granted, however, credit must be made to the California Farm Bureau Federation when reprinting this item.

Hot off the press:

Sign up to receive weekly alerts from the best Ag publication in California

Enter your e-mail ×