



What does each individual cover crop do? by Daniel Olson

The benefits of annual cover crops, such as increased organic matter, soil porosity, and nitrogen creation, are well known. Over the past few years, innovators in this field have championed "cocktail" mixes of a wide range of species and plant types, and they have achieved amazing results.

Maybe it's my inner researcher here, but something about cocktails has always bothered me. I think it's the idea that it seems too easy. We plant a bunch of different things with the knowledge that something will grow and quite possibly thrive.

My question has been this: What does each species bring to the table, and is there actual science we can use in formulating our cocktail blends?

We attempted to start answering this question by planting 10 species of annual cover crops in 20-by-10-foot blocs. The planting was done August 1, 2014 following a crop of triticale, so there was very little residual nitrogen in the plots at the time of the cover crop seeding. We applied 50 units of nitrogen at planting and had great fall growth on all the plots.

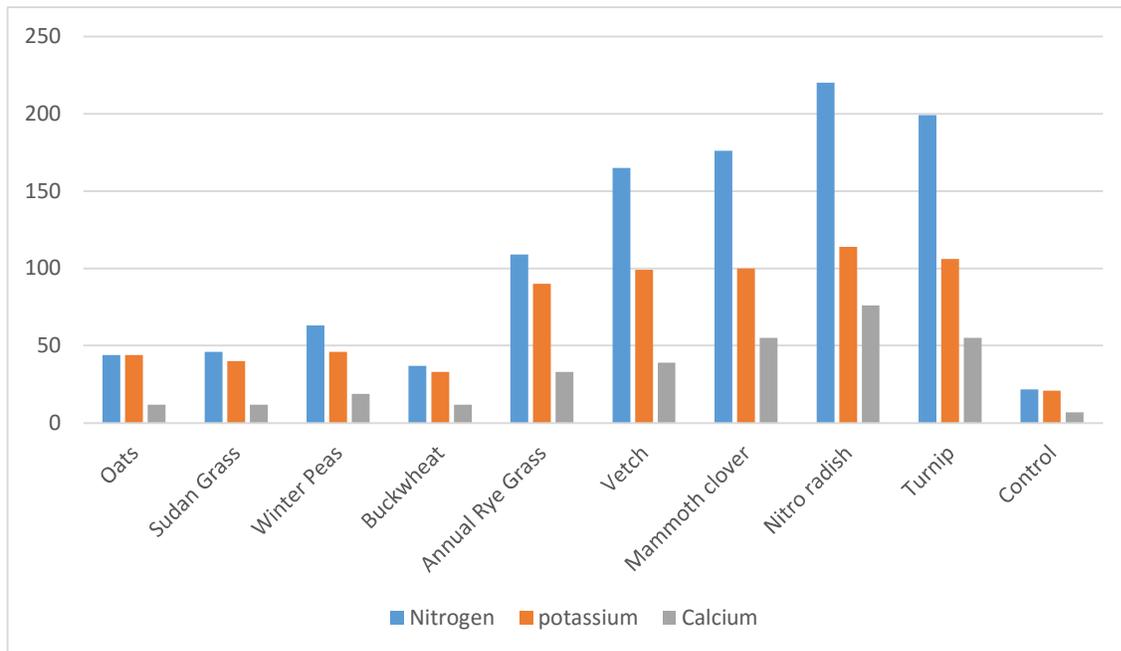
In the spring of 2015 we tilled up the plots with a Howard rotavator and planted the same variety of corn across all of the plots. We used another 20 units of nitrogen as a starter, but no other fertility was added. The goal was to keep the corn in a nutrient-deficient state to see how many nutrients were created or mobilized by the preceding cover crop.

In August we collected tissue samples and measured the dry matter production from the corn grown. The dry matter per acre varied greatly from #1600 on the control plot that had no cover crop last year to 8000# on the Nitro Radishes. By taking a nutrient percentage from the tissue samples and multiplying it by the pounds of dry matter we were able to determine how many pounds of nutrients were provided by each of the cover crops. The results are shown in the accompanying chart.



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Table 1. Selected Nutrients Derived from Individual Cover Crops in Succeeding Year's Corn



At first blush my response was, "Why would I plant anything on the left side of this chart?" But after thinking about it, I realized the data should not be unexpected, and that it defines the two things that cover crops do best: nutrient mobilization and nutrient stabilization.

Low-fiber species such as brassicas are amazing nutrient mobilizers. As the nutrients they scavenge or in the case of the legumes the nitrogen they capture from the atmosphere, break down in the soil they quickly release their nutrients, in effect sending the soil's metabolism into overdrive. In this study, the brassicas amazingly outperformed the legumes in providing nitrogen in the corn plants. If these nutrients aren't quickly captured by the next crop, these gain of harvested nutrients would be all for naught

Which brings us to the negative side of of cover crops like Daikon Radish. This huge flush of nutrients is that it is not sustainable — especially when the corn is being mechanically harvested. We put only 70 lbs. of nitrogen and no P and K on these plots in the previous 12 months, yet we harvested hundreds of pounds per acre of these nutrients in the previous crop, triticale and the next crop corn.. If



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we were grazing this forage, the nutrients are largely recycled, but if the corn is harvested as grain or silage the benefits may be very short term.

At the opposite end of the spectrum are high-fiber (carbon) crops such as sorghum, oats and sunflowers. If radishes act like urea, then these plants are like pen-pack manure. They are nutrient stabilizers, and if our long-term goals are conservation along with increased soil organic matter and water-holding capacity, they need to be part of what we do.

The reasons their benefits were not realized in this trial is that it was a short-term (one-year) study and each species was planted as a monoculture, which is discouraged by most experts.

Given all of this, what should we plant this year?

1. I think there are real benefits to planting cocktails. They should include at least one brassica (nutrient mobilizer), one nutrient stabilizer such as oats, and one legume like vetch or clover (nutrient mobilizer or creator). Other research has indicated that variety diversity within those categories could also be beneficial. Just as we need to balance carbon-to-nitrogen ratios to make compost, we need to balance our cover crop species for their contribution to overall soil health.
2. What is your cash flow situation? If you are concerned about just surviving the next year, the mix should favor nutrient mobilizers/creators and have a limited amount of stabilizers. Use a heavier ratio of stabilizers if you are in a position to invest in long-term productivity.
3. What is your soil type/condition? Water and water-holding capacity are also a benefits that cover crops can help stabilize in your soil. If you are farming drought-prone soils, high-fiber crops will help you do that.
4. If we are also grazing these mixes, we also have to think about palatability, fiber digestibility and protein content. We can still get high fiber [carbon] crops while maintaining quality. That is why I prefer BMR Gene 6 Sorghum Sudan to Millet, Oats to Sunflowers and I prefer Triticale over Cereal Rye. Also, for the extra two dollars an acre, it is well worth planting improved brassica varieties.

Daniel Olson