Nitrogen from Cover Crops for Vegetable Crop Uptake

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Goals:
1. Vegetable farmers in Massachusetts didn’t know how much nitrogen they had in fields where cover crops were planted or when that nitrogen would become available to their cash crops. Our first goal was to measure when nitrogen is being released by cover crops in relation to cash crop growth stages on different farms.
2. These farmers were also interested in finding ways to provide nitrogen to their crops in cost effective ways and without additional phosphorus. Our second goal was to reduce fertilizer use.

Methods:
Three Treatments
1. No Cover Crop
2. Rye (70 lbs/A) and Vetch (20 lbs/A)
3. Farmer Choice
With and w/out 60 lbsN/A after incorporation
Six Vegetable Farms in Massachusetts
Randomized Complete Block Design

Timeline:
May 2017: Collect biomass and incorporate cover crops.
May – July: Collect soil nitrate every 2 weeks for 8 weeks.
Two weeks after incorporation: Apply 60lbsN/ac to split plots.
Four weeks after incorporation: Plant a cash crop.
End of season 2017: Collect yield data.

Conclusions:
• There were statistically greater amounts of nitrites in plots with additional fertilizer on all farms and in most cases there were statistically greater amounts of nitrites in plots with cover crops than those without.
• Well managed cover crops with or without additional nitrogen resulted in Good to Excellent yields without any additional phosphorus in 2 out of 3 locations in this trial.
• It is possible to exceed sufficiency ranges for cash crop N requirements with only the use of cover crops and prior amendments (compost in the fall of 2016 at Langwater and poultry fertilizer in spring 2017 at Tangerini).

Farmer Adoptions as a Result of this Trial:
• Transplant 4 weeks after incorporating a cover crop.
• Direct seed 2 weeks after incorporating a cover crop.
• Experiment with less nitrogen fertilizer.
• Take a soil nitrate test 4-6 weeks after incorporating cover crops in the spring to measure peak N release.
• Take more Soil Nitrate Tests.
• Plant Tillage Radish at 10lbs/A for weed control.
• Start growing crimson clover in Massachusetts.

Farms and Farmer Choices

<table>
<thead>
<tr>
<th>Farm</th>
<th>Fall 2016 % SOM and ppm NO3</th>
<th>Soil Nitrate</th>
<th>Observations</th>
<th>Sweetcorn and Cabbage Yields</th>
</tr>
</thead>
<tbody>
<tr>
<td>UMass</td>
<td>May 22, 2017</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twin Oaks</td>
<td>April 24, 2017</td>
<td>1.7%</td>
<td>20 ppm NO3</td>
<td></td>
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<tr>
<td>Many Hands</td>
<td>May 23, 2017</td>
<td>6.2%</td>
<td>5 ppm NO3</td>
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<tr>
<td>Lyonsville</td>
<td>April 12, 2017</td>
<td>2.9%</td>
<td>25 ppm NO3</td>
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<tr>
<td>Langwater</td>
<td>May 26, 2017</td>
<td>6.8%</td>
<td>105 ppm NO3</td>
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</tr>
<tr>
<td>Tangerini</td>
<td>May 26, 2017</td>
<td>3.4%</td>
<td>30 ppm NO3</td>
<td></td>
</tr>
</tbody>
</table>

FC = Farmer Choice, RV = Rye and vetch, NC = No cover crop, NC+N = No cover crop + nitrogen fertilizer, RV+N = Rye and vetch + nitrogen fertilizer, FC+N = Farmer Choice + nitrogen fertilizer