Objective: Determine if a reduced N fertilizer rate is among the improvements to crop production resulting from repeated use of cereal rye cover crops in a corn-soybean system.

Hypothesis: N fertilizer rate for corn can be reduced by 60 lb N/ac in a field with a 7-year history of cereal rye cover crops in a corn-soybean system.

Farmer-Cooperator will:
- Follow Research Protocols in accordance with Project Design, Data to Collect and Timeline detailed below.
- Take photos throughout the project. Try to capture photos that depict the differences you observe among the treatments.
- Keep in contact with PFI with updates and questions.
- Turn in data and complete post-project survey by November 2020.

Practical Farmers of Iowa will:
- Help set up research protocol, monitor progress of project and provide support when needed.
- Publish results in a PFI research report, on PFI website and potentially other outlets.
- Provide $550 research honorarium to cooperator upon receipt of data.

Project Design:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>170 lb N/ac</td>
<td>Typical N rate. 90 lb N/ac applied prior to corn planting; 30 lb N/ac applied at planting; 50 lb N/ac applied at sidedress in early June.</td>
</tr>
<tr>
<td>110 lb N/ac</td>
<td>Reduced N rate. 80 lb N/ac applied prior to corn planting; 30 lb N/ac applied at planting.</td>
</tr>
</tbody>
</table>

- Apply these three treatments in a randomized, replicated trial: at least four replications of randomized paired strips. 2 treatments x 4 replications = 8 strips total.
- Strips must be at least as wide as one combine pass and should run the length of the field.
  - Example layout:
Data to Collect (cooperator):
- Corn grain yield
  - Harvest and record grain yield and moisture from each strip.
- Costs
  - Fertilizer application passes and amount of N fertilizer applied.
- Optional: Late-spring soil nitrate test (LSNT)
  - When the corn is 6-12 in. tall, collect soil cores to a depth of 12 in. from each strip.
    - One sample per strip.
    - Collect samples in sets of 8 cores.
      - The first core is collected in a corn row.
      - The second is collected 1/8 of the distance between any two rows after moving to another part of the sampling area.
      - The third is collected 1/4 of the distance between any two corn rows after moving to another part of the sampling area.
      - The process is continued until the eighth core is collected 7/8 of the distance between any two corn rows.
    - At least three sets (24 cores) should be collected to comprise one sample.
- Optional: Cornstalk nitrate test
  - In late summer, after corn has reached physiological maturity, collect stalk samples from each strip.
  - Sample collection protocols from ISU:
    - https://store.extension.iastate.edu/product/End-of-Season-Cornstalk-Nitrate-Testing-Video

Project Timeline:

<table>
<thead>
<tr>
<th>Fall 2019</th>
<th>Spring 2020</th>
<th>Summer 2020</th>
<th>Fall 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Seed entire field with cereal rye cover crop.</td>
<td>• Terminate cereal rye cover crop before planting corn.</td>
<td>• Collect LSNT soil samples.</td>
<td>• Harvest corn from all strips.</td>
</tr>
<tr>
<td></td>
<td>• Apply pre-plant N fertilizer.</td>
<td>• Sidedress N fertilizer to ‘typical rate’ strips.</td>
<td>• Turn in data and photos.</td>
</tr>
<tr>
<td></td>
<td>• Plant corn. Apply N with planting.</td>
<td>• Collect cornstalk samples.</td>
<td>• Take post-project survey.</td>
</tr>
<tr>
<td></td>
<td>• Take photos.</td>
<td>• Take photos.</td>
<td></td>
</tr>
</tbody>
</table>

Contact: Stefan Gailans, Research and Field Crops Director, (515) 232-5661; stefan@practicalfarmers.org