



## RESEARCH PROTOCOLS

### Green Manure Cover Crops In a Cereal Rye-Corn System

**Objectives:** Determine 1) biomass production of green manures: red clover and balansa clover intercropped with cereal rye and a mix seeded after cereal rye harvest; 2) grazing value of green manures; 3) corn yield responses to green manures; 4) potential for green manures to reduce N fertilizer rate.

**Hypotheses:** Provided timely summer rainfall, the summer mix will produce the most biomass and grazing value. The clovers will provide more atmospherically-fixed N to the succeeding corn crop. Under ideal growing conditions, the grazing value of the summer mix will offset its greater cost of establishment as well as its lower N value. Under stressed or average growing conditions, one or both of the clovers will provide more value through fall forage harvest and reduced N requirements of the succeeding corn.

#### 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 2021.

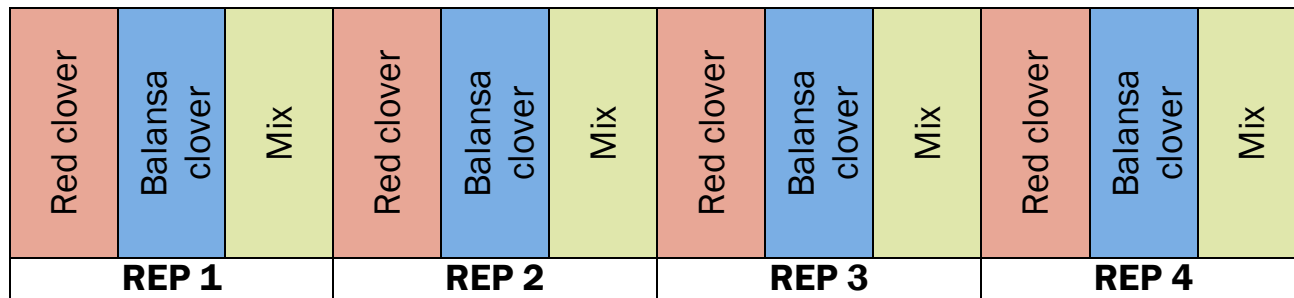
#### Practical Farmers of Iowa will:

- 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:

Treatment	Description
Red clover	Frost-seed red clover to existing cereal rye crop in late winter/early spring.
Balansa clover	Frost-seed balansa clover to existing cereal rye crop in late winter/early spring.
Mix	Drill-seed mix following cereal rye harvest in July.

- Apply these three treatments in a replicated trial: at least four replications of strips.
  - 3 treatments x 4 replications = 12 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):**

- Green manure cover crop biomass
  - In fall, sample aboveground biomass from each strip.
    - Randomly place 1'x1' PVC square in strip
    - Use shears to clip all aboveground plant material from within the square
    - Place all samples from a single strip into one paper bag
      - (e.g., one paper bag per strip)
    - Label paper bags accordingly
      - Cover crop: red clover, balansa clover or mix
      - Number of squares sampled from (e.g., 3 squares = 3 ft<sup>2</sup>)
      - Date of collection
    - Send paper bags to PFI office
      - Samples will be dried and weighed
      - Grazing value will be estimated:  
<https://www.extension.iastate.edu/agdm/crops/html/a1-91.html>
- Corn grain yield
  - Harvest and record grain yield and moisture from each strip.
- 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.
    - Sample collection protocols from ISU:
    - <https://store.extension.iastate.edu/Product/Use-of-the-Late-Spring-Soil-Nitrate-Test-in-Iowa-Corn-Production>

**Project Timeline:**

<b>Fall 2019</b>	<b>Spring 2020</b>	<b>Summer 2020</b>	<b>Fall 2020</b>
<ul style="list-style-type: none"> <li>• Seed entire field with cereal rye cover crop.</li> </ul>	<ul style="list-style-type: none"> <li>• Frost-seed red and balansa clovers to rye crop.</li> <li>• Take photos.</li> </ul>	<ul style="list-style-type: none"> <li>• Harvest rye crop.</li> <li>• Drill-seed mix.</li> <li>• Take photos.</li> </ul>	<ul style="list-style-type: none"> <li>• Collect green manure biomass.</li> <li>• Graze cattle.</li> <li>• Take photos.</li> </ul>

<b>Spring 2021</b>	<b>Summer 2021</b>	<b>Fall 2021</b>
<ul style="list-style-type: none"> <li>• Terminate green manure cover crops.</li> <li>• Plant corn.</li> <li>• Take photos.</li> </ul>	<ul style="list-style-type: none"> <li>• Optional: collect LSNT soil samples.</li> <li>• Optional: split strips               <ul style="list-style-type: none"> <li>○ Typical N rate</li> <li>○ LSNT recommended N rate</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Harvest corn from all strips.</li> <li>• Turn in data and photos.</li> <li>• Take post-project survey</li> </ul>

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