PRACTICAL FARMERS OF IOWA
COOPERATORS' PROGRAM Farmer-Led Research

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.

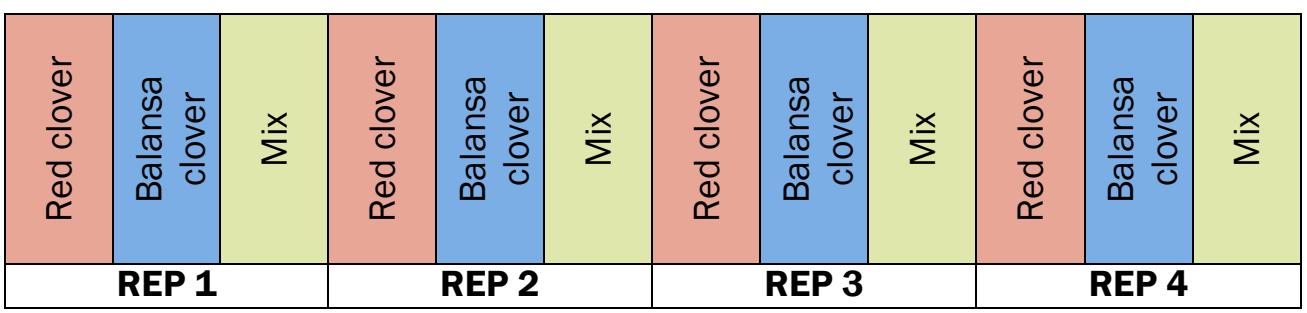
Practical Farmers of Iowa will:

- 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^2)
            - 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:

Fall 2019	Spring 2020	Summer 2020	Fall 2020
• Seed entire field with cereal rye cover crop.	• Frost-seed red and balansa clovers to rye crop. • Take photos.	• Harvest rye crop. • Drill-seed mix. • Take photos.	• Collect green manure biomass. • Graze cattle. • Take photos.

Spring 2021	Summer 2021	Fall 2021
• Terminate green manure cover crops. • Plant corn. • Take photos.	• Optional: collect LSNT soil samples. • Optional: split strips ○ Typical N rate ○ LSNT recommended N rate	• Harvest corn from all strips. • Turn in data and photos. • Take post-project survey

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