



**RESEARCH  
 PROTOCOLS**

**Green Manure Cover Crop Seeding Date and  
 Termination Date In Winter Wheat-Corn System**

**Objectives:** Determine the effects on cover crop biomass production, cover crop biomass N production and yield of the succeeding corn crop of clover that is interseeded to a winter wheat crop in spring and terminated in the fall; clover that is interseeded to a winter wheat crop and terminated the following spring; and a cover crop mix that is seeded after winter wheat harvest in the summer that winterkills. **Hypothesis:** Regardless of termination date, interseeded clover will produce the most biomass and biomass N and result in greatest corn yields.

**Farmer-Cooperator will:**

- Take photos throughout the project and keep in contact with PFI with updates and questions.

**Establish Treatments**

- **Spring 2019**, establish at least 3 replications of treatments as shown in the diagram below.
  - Interseed clover in spring to existing winter wheat and terminate Fall 2019 (Clover – fall kill)
  - Interseed clover in spring to existing winter wheat and terminate Spring 2020 (Clover – spring kill)
  - Summer-seed mix in summer after winter wheat harvest; mix winterkills in 2019 (Mix – winter kill)
- Strips will be as wide as at least one combine pass and run the length of the field.

- **Spring 2020**, plant corn to all strips.

**Measurements**

- **Summer 2019**, take photos of trial progress.
  - Harvest wheat.
- **Fall 2019**, collect aboveground biomass samples of cover crop from strips just prior to fall kill of clover and onset of hard frost (see next page for more detail).
- **Spring 2020**, collect aboveground biomass samples of clover allowed to overwinter just prior to termination (see next page for more detail).
- **Summer 2020**, take photos of trial progress; collect soil and plant samples (see next page for more detail).
  - June: collect soil samples from each strip for late spring soil nitrate test.
  - September (physiological maturity of corn): collect cornstalk samples from each strip in corn field for nitrate analysis.
- **Fall 2020**, harvest corn from each strip individually.
- Turn in all info and data pertinent to this trial to Practical Farmers of Iowa by the end of the project.

Clover – fall kill	Clover – spring kill	Mix – winter kill	Mix – winter kill	Clover – spring kill	Clover – fall kill	Clover – fall kill	Clover – spring kill	Mix – winter kill
REP 1			REP 2			REP 3		

**Practical Farmers of Iowa will:**

- Help set up monitoring 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 honorarium when all data is submitted by the conclusion of the project in 2020.

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## Data Collection Details

*Fall 2019/Spring 2020: Collect aboveground biomass samples of cover crops prior to winter 2019 (all treatments) and planting corn in spring 2020 (clover – spring kill only).*

- Collect at least one sample 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
    - Green manure cover crop:
      - Clover – fall kill
      - Clover – spring kill
      - Mix –winter kill
    - 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, weighed and sent to lab for N analysis.

*June: Late-Spring Soil Nitrate Test soil sampling (corn is 6-12 in. tall)*

- Collect soil cores to a depth of 12 in.
- 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.
- For more info, consult ISU Extension and Outreach publication “Use of the Late-Spring Soil Nitrate Test in Iowa Corn Production” (CROP 3140).
  - <https://store.extension.iastate.edu/Product/5259>

*September: Cornstalk nitrate testing (after physiological maturity of corn)*

- Consult these resources from Iowa State University for sample collection protocols
  - <https://store.extension.iastate.edu/product/Use-of-the-End-of-Season-Corn-Stalk-Nitrate-Test-in-Iowa-Corn-Production>
  - <https://store.extension.iastate.edu/product/End-of-Season-Cornstalk-Nitrate-Testing-Video>