**Objective:** What is the optimal time to remove row covers from butternut squash to minimize pest pressure and achieve optimum yield?

**Hypothesis:** The improved plant vigor of plants covered longer will result in decreased pest pressure and increased yield.

**Farmer-Cooperator will:**
- Follow Research Protocols for study
- Take photos throughout the project
- Keep in contact with PFI with updates and questions
- Turn in all data 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 cooperator payment at conclusion of project year.

**Project Design:**
- Randomized, replicated trial of butternut squash with three row cover treatments.
  - Treatment 1: Row cover removed at first female flower.
  - Treatment 2: Row cover removed 2 weeks following treatment 1.
  - Treatment 3: Row cover removed 2 weeks following treatment 2.
- The trial will run for two successions, with four replications of each treatment (12 plots total) per succession.
- Agribon-19 will be used as row cover.
- Farmers can use other management strategies to control pests once plants are uncovered, but should be consistent across treatments (like spraying Surround, for example).
- Remove plants with bacterial wilt as needed.

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Layout example of four replications of three treatments.
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Photo List:
- early-season field-shot of trial
- removing row cover (farmer in photo!)
- pests or disease (include treatment info and date in photo)
- mid-season field-shot of trial
- groups of fruit during harvest, in bins, etc.
- harvest-time with farmer in the photo
- bonus for photo of farmer entering data in the field!

Data Collected:
- Dates of: seeding (and row covers applied), emergence, first true leaf (and thinning), first flower (T1 row cover removal), T2 row cover removal, T3 row cover removal.
- Weekly scouting information for squash bug, cucumber beetle and bacterial wilt beginning when first row cover is removed.
- Harvest data by plot: marketable fruit count, weight, number of surviving plants/plot.

Project Timeline

- Review research protocol
- Complete MOU and pre-project survey

<table>
<thead>
<tr>
<th>May</th>
<th>Succession 1</th>
<th>Succession 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 10: Prepare field</td>
<td></td>
<td>June 10: prepare field</td>
</tr>
<tr>
<td>June</td>
<td>First true leaf: thin squash plants, add direct-seed to any holes w/o germ.</td>
<td>July</td>
</tr>
<tr>
<td>Uncover T1 plots at first flower. Scout for cucumber beetle and squash bugs – record data.</td>
<td></td>
<td>First true leaf: thin squash plants, add direct-seed to any holes w/no germ.</td>
</tr>
<tr>
<td>Continue scouting for pests weekly; record data.</td>
<td></td>
<td>Uncover T1 plots at first flower. Scout for cucumber beetle and squash bugs – record data.</td>
</tr>
<tr>
<td>July</td>
<td>Uncover T2 plots (two weeks after T1).</td>
<td>Augst</td>
</tr>
<tr>
<td>Continue weekly scouting and data recording.</td>
<td></td>
<td>Uncover T2 plots (two weeks after T1).</td>
</tr>
<tr>
<td>Uncover T3 plots (two weeks after T2).</td>
<td></td>
<td>Continue weekly scouting and data recording.</td>
</tr>
<tr>
<td>Continue weekly scouting and data recording.</td>
<td></td>
<td>Uncover T3 plots (two weeks after T1).</td>
</tr>
<tr>
<td>August – November</td>
<td>Manage crop normally, scouting each week for squash bugs, cucumber beetle and bacterial wilt.</td>
<td>September – November</td>
</tr>
<tr>
<td>Harvest squash; record data in accordance with data collection sheet.</td>
<td></td>
<td>Manage crop normally, scouting each week for squash bugs, cucumber beetle and bacterial wilt.</td>
</tr>
<tr>
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<td></td>
<td>Harvest squash; record data in accordance with data collection sheet.</td>
</tr>
</tbody>
</table>

Enter data and photos (see photo shot list, above), to PFI's google site: https://sites.google.com/practicalfarmers.org/research/home.

Complete post-project survey.

Contact: Liz Kolbe, Horticulture and Habitat Programs Manager, (515) 232-5661; liz@practicalfarmers.org
Early Season Spinach Variety Trial

Adult squash bug. (photo credit: Jeffrey Hahn, Univ. of Minnesota)

Squash bug egg mass on underside of leaf. (photo credit: Photo by Gerald Holmes, California Polytechnic State University at San Luis Obispo Bugwood.org)
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Squash bug nymphs (and eggs) on squash leaf. (Photo credit: UMass Extension, Vegetable Program)

Striped cucumber beetle (Photo credit: Utah State University)
Early Season Spinach Variety Trial

Spotted cucumber beetle (Photo credit: Utah State University)

Cucumber beetle egg mass, yellow to orange. (Photo credit: Gerald Holmes, California Polytechnic State University at San Luis Obispo, Bugwood.org)
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Bacterial wilt. Can look similar to vine borer damage (except no stem entry of vine borer!). When stem is cut will ooze bacterial exudate. (Photo credit: Howard F. Schwartz, Colorado State University, Bugwood.org)

Infected stem in water (Photo credit: American Phytopathological Society).