



PRACTICAL FARMERS OF IOWA  
**COOPERATORS'  
PROGRAM**

FARMER-LED RESEARCH

2022 Cooperators'  
Program Report







“Community and cover crops. It took conversation with three PFI staff (Sarah Carlson, Hayley Nelson, Stefan Gailans) and many farmers (Susan Jutz, Margaret Smith, Doug Alert, Carmen Black and others) and my crew to do this trial. I feel that the incorporation of cover crops on our farm leads to a greater sense of community.”

– Kate Edwards



# Reliable Results From the Efforts of Many

“Where do you go for answers to your questions?” This question appeared under the headline ON-FARM RESEARCH at the back of the very first Practical Farmers newsletter published in spring 1986. The article went on: “Farmers are finding some answers by setting up trials in their own fields and barns . . . As a regional and state organization, Practical Farmers of Iowa may one day decide to coordinate on-farm research of some kind. If a subject were of interest to enough people, this would be a way to generate more reliable information about it, with less work for any one person.”

Those words proved prophetic. It’s been 35 years since the first research trials on fertilizer, manure, tillage, reducing inputs and crop rotations were coordinated and conducted by PFI farmers. In the years since, PFI’s Cooperators’ Program has helped farmers looking for answers to over 1,500 different questions. In 2022, 45 cooperators tested their ideas in 75 on-farm research trials. That’s nearly two trials per cooperator (curiosity is a hallmark of PFI farmers).

What ideas did the 2022 cohort of cooperators want to test? The questions are diverse, span enterprises and reflect a desire to steward land, refine techniques and improve their operations:

- Do healthy soils need less nitrogen fertilizer?
- How do cover crops affect squash and peppers?
- Can a roller-crimper convert a robust cereal rye cover crop into a thick mulch that suppresses weeds and eliminates the need for herbicide in soybeans?
- Should heirloom tomatoes grown in a high tunnel be pruned and trellised or left bushy and caged?

You’ll find cooperators’ answers to these questions, and others, in the summaries of research projects that follow. To dive deeper and learn more about the projects, we encourage you to explore the full research reports on our website at [practicalfarmers.org/research](https://practicalfarmers.org/research).

Why do PFI cooperators commit the extra time and effort to conduct research? The answer is twofold: a drive to continually learn and a desire to “give back” to the greater PFI community. In our most recent member survey, PFI research reports are ranked among the top educational resources PFI produces. Many cooperators tell us at the start of a project that they wish to “help show others about \_\_\_\_\_.” Fill in that blank with the topics above, and those in the pages that follow, and you’ll get a sense of the diverse interests of the more than 6,300 members that make up PFI’s network.

These cooperators are also fulfilling that earliest vision of what would become PFI’s Cooperators’ Program – to generate reliable information through the combined efforts of many. Thank you to the cooperators who performed all the trials last year. Thank you for the privilege of working with you and practicing science with you on your farms. Keep the questions coming!

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## Staff

**Stefan Gailans** SENIOR RESEARCH MANAGER  
**Emma Link** SENIOR RESEARCH COORDINATOR  
**Hayley Nelson** RESEARCH COORDINATOR\*

## Contributors

**Anne Carey** IOWA STATE UNIVERSITY  
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\*FORMER PRACTICAL FARMERS OF IOWA STAFF



## Mission

To empower farmers to generate and share knowledge through timely and relevant farmer-led research.

## Vision

A community of curious and creative farmers taking a scientific approach to improving their farms. These farmers are leaders among their farming peers whose work contributes to the field of agricultural research, resulting in more profitable, diverse and environmentally sound farms.

## Guiding Principles

Practical Farmers and the Cooperators' Program are always seeking to grow our network and our members' impact. We proactively and passionately seek out creative ideas and flexible funding in order to support farmer-led research. These guiding principles define common characteristics of the Cooperators' Program and, in an effort to make the most of finite resources, serve as a filter for our work.

## The Cooperators' Program is

- **Farmer-Led.** We believe that farmers should lead both the creation and exchange of knowledge. Farmers set our research goals and priorities. We also help farmers inform academic agricultural research that affects their farms by connecting researchers and farmers in meaningful dialogue and promoting the exchange of ideas.
- **On-Farm.** We believe that real-world, applied research on farms is critical for building a better agriculture in Iowa and beyond. We prioritize research conducted on-farm by farmers, but recognize the limitations and understand not all topics can sufficiently be addressed with this approach.
- **Collaborative.** We believe in working together. Research that is collaborative facilitates the sharing of knowledge and, ultimately, builds community. We prioritize multi-farm projects as well as single-farm trials that have broad support within the cooperator community or could yield important insights for other farmers. We occasionally collaborate with university researchers and other partners who have gained the trust and confidence of farmers through their work, research and extension activities.
- **Relevant.** We believe that research should answer questions individual farmers have about their farms. This often involves supporting proof-of-concept investigation, ground-truthing new ideas and products and helping farmers design research that can satisfy their curiosity about their farms. Our farmer-researchers and partners are on the cutting edge of innovation in agriculture, and the Cooperators' Program supports their efforts.
- **Accessible.** We believe the knowledge, experience and findings generated by the Cooperators' Program should be available to the public. Farmers are our primary audience; we present results using farmer voices while also adhering to standards of scientific reporting. The products of the Cooperators' Program are used by farmers to make more informed decisions.
- **Empowering.** We believe that farmers are capable of conducting experiments on their own farms and carrying out the process from beginning to end. As the experts on their farming systems, we believe the role of PFI staff is to support farmers' inherent curiosity. Being at the helm of the on-farm research process builds on this curiosity by boosting farmers' scientific skills and confidence while generating powerful questions and advancing farmer-ownership of research conclusions and created knowledge.
- **Science-Based.** We believe the scientific method and good experimental design are necessary tools for farmers. The work of PFI farmers who conduct on-farm research is highly valued and trusted by both the broader PFI membership and non-members, including farmers, academic researchers and the general public.
- **Committed.** We believe in following through. Cooperators and PFI staff are eager to participate, engage and complete on-farm projects. We reward cooperator efforts and commitments to on-farm research by providing modest honoraria and showcasing their contributions.

# The Power of Trials At-A-Glance

**76%** Of trials resulted in a moderate to very large change in knowledge for the participating cooperator.

**Marissa Waldo:** *"Oftentimes, sidedressing is just assumed to be necessary for an in-season nitrogen supply [to corn]. It was eye-opening to see no significant yield difference between manure-only and manure plus sidedressing."*

**Carmen Black:** *"It was useful to focus on a crop [like cauliflower] that we haven't given a lot of attention to even though it's something we have been growing."*

**94%** Of trials were sufficiently designed to answer cooperator questions.

**Jon Bakehouse:** *"I like the straightforward processes to collect and report data. We now have a good first answer to our initial question [about roll-crimping a cover crop], with ideas and strategies to address a couple of new questions."*

**Kate Edwards:** *"I wanted to find out what cover crop to plant before squash and was able to determine which one to plant."*

**Chris Deal:** *"One of my biggest questions for several years has been whether I was being too aggressive with the amount of nitrogen I was using. This trial allowed me to explore that important question."*

**This means...** Designing and conducting a trial is a vital tool for learning.

**88%** Of trials spurred new ideas or other observations on the farm.

**Robert Harvey:** *"I was scouting fields more often looking for signs of fertilizer rate reductions besides the usual pests."*

**Hannah Breckbill:** *"I want to keep trying this fertility regimen to see if it helps other crops in other circumstances. I'm also curious what the fertility regimen does to thistle pressure."*

**Jon Yagla:** *"This trial really made me think about how spacing impacts [garlic] yield."*

**This means...** Conducting a trial sparks curiosity and hones the power of observations.

**54%** Of trials result in cooperators making a likely change to the farm.

**Anna Hankins:** *"We have already implemented new feeding techniques and are paying much more attention to our feed ingredients even when using a conventional mix."*

**Emery Davis:** *"Seed treatments [for soybeans] don't seem to pay for themselves let alone make the farm more profitable. I think knowing that, and the exposure risk of seed treatments, I'll stick to planting untreated seed."*

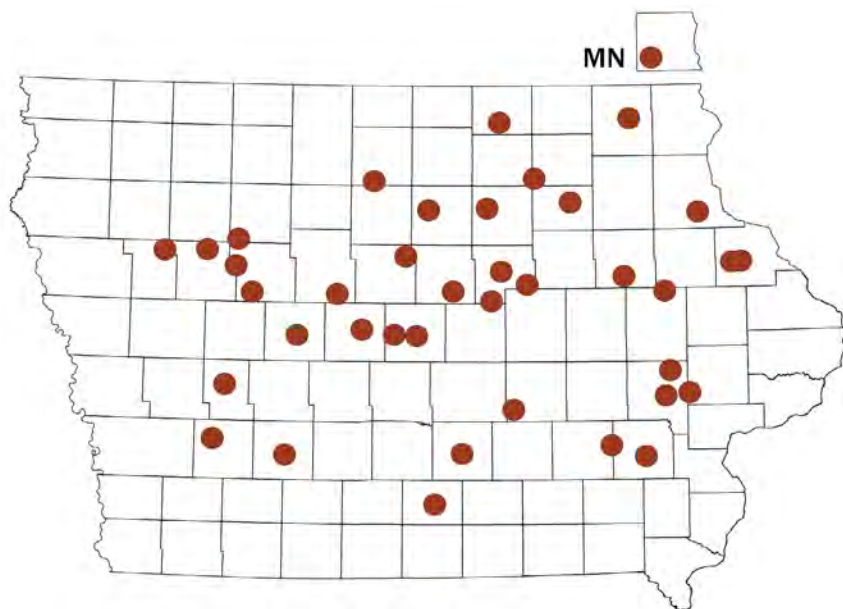
**22%** Of trials lead to cooperators deciding it's unlikely they'll make a change to the farm.

**Daniel Sheetz:** *"Flame-weeding soybeans is a slower process [than cultivating], and I would need to increase the size of my flame-weeder to make flame-weeding a viable option in my operation."*

**Dick Sloan:** *"I definitely won't bother fertilizing cover crops. I see bigger differences every fall based on planting date."*

**This means...** Conducting trials aids decision-making. Trials can be part of the journey that leads to change, or a check for confidently rejecting a possible change to the farm.

# 2022 FARMER-LED Research Trial Locations



IN 2022,

**45** COOPERATORS

PARTICIPATED IN

**75** RESEARCH TRIALS

## FREQUENTLY ASKED QUESTIONS About the Cooperators' Program

Since 1987, PFI's Cooperators' Program has empowered curious farmers to conduct on-farm experiments that answer their questions and guide their decision-making. Our program is unique in that farmers have always been at the helm – they are the ones brainstorming projects, setting on-farm research priorities and gathering the data on their farms.

While PFI staff guide farmers through the process of setting up an on-farm trial (and no prior research experience is necessary), farmers are very much partners and leaders in the process. Most on-farm research trials take place on the farms of participating farmers, and the Cooperators' Program research agenda is developed and carried out by farmers.

### What's a "cooperator?"

We refer to our farmer-researchers as cooperators because the first experiments in the program were done in cooperation with agricultural researchers. Nowadays, on-farm research trials are collaborative efforts between farmers and PFI staff scientists who guide the design of experiments based on questions posed by the participating farmers. On-farm research projects are also often collaborative endeavors among several farmers. So "cooperator" applies on many levels!

### Do I have to be a "scientist" to participate?

Not at all! You do not need a research or science-based background to participate. All you need is an idea you want to test on your farm and PFI's staff scientists help with the rest. That said, just like scientists, you are making observations about your farm – and decisions based on available data – on a regular basis. So you're arguably a scientist already! What we do in the Cooperators' Program is empower you to answer your pressing farm questions using the simple yet rigorous tools of scientific research.

## How exactly does it work?

Each year, farmers who have conducted on-farm research – and those who’ve told us they aspire to – are invited to our annual Cooperators’ Meeting. Held in December, this gathering is about connecting as a community of on-farm researchers, and focuses on sharing results and observations from the past year’s farmer-led research trials.

During the meeting, cooperators are encouraged to describe what they did, why they did it and what they found. Cooperators also generate ideas and make plans for future projects based on previous results and new questions. Before the onset of spring, cooperators and PFI staff mutually agree on project plans and commitments.

When the time comes to conduct the trials, farmers are ultimately responsible for planting seeds, tending to animals and taking measurements throughout a trial.

## What will I gain from participating?

- Useful, reliable research that helps you understand what works and what doesn’t on your farm
- Connection with a community of curious farmers with whom you can exchange ideas and experiences, and who can help you expand your knowledge of what’s possible with on-farm research
- The chance to become a leader who inspires improvements to our agricultural landscape

**Okay, you’ve got me hooked. I have something I’d like to investigate on my farm.**

## What should I do now?

We’d love to hear about it! Contact Stefan Gailans, senior research manager, to learn more and get started.

**I can’t be a farmer-researcher but would like to see the results. How can I do that?**

The results of our Cooperators’ Program research provide relevant, unbiased and science-based information that farmers can trust about new practices. You’ll see summaries of our 2022 research in the following pages. For more in-depth results (as well as reports from previous years’ trials), visit us online at [practicalfarmers.org/research](https://practicalfarmers.org/research).



TO LEARN MORE ABOUT THE  
COOPERATORS’ PROGRAM, VISIT

[practicalfarmers.org/research](https://practicalfarmers.org/research)

HAVE QUESTIONS OR WANT TO  
GET INVOLVED?

CONTACT US AT (515) 232-5661  
OR [stefan.gailans@practicalfarmers.org](mailto:stefan.gailans@practicalfarmers.org).

# 2022 Field Crop Trials

## Featured Trials

### **TIMING OF ROLL-CRIMPING RYE COVER CROP AND PLANTING SOYBEANS**

Jon Bakehouse

### **CAN WE REDUCE N RATES AND IMPROVE ROI?**

Alec & Rachel Amundson, Nathan Anderson, Jon Bakehouse, Pete Bardole, Sam Bennett, Vaughn Borchardt, Jack Boyer, Chris Deal, Wade Dooley, Bill Frederick, Wayne Fredericks, Robert Harvey, Kevin Prevo, Tim Sieren, Kevin Veenstra, Marissa Waldo

### **FLAME-WEEDING ORGANIC SOYBEANS**

Daniel Sheetz

### **CLOVER COVER CROP TERMINATION DATE FOR A RYE-CORN SYSTEM**

Dick Sloan

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### **ARE FUNGICIDE AND INSECTICIDE SEED TREATMENTS NECESSARY FOR CORN?**

Dick Sloan

### **ARE SOYBEAN SEED TREATMENTS NECESSARY?**

Emery Davis

### **CEREAL RYE AND OAT VARIETY TRIALS**

ISU Ag Engineering & Agronomy Farm, ISU Northeast Research Farm, ISU Northern Research Farm, ISU Southwest Research Farm

### **COVER CROP EFFECT ON SOIL WATER**

Landon Brown, Will Cannon, Jeremy Gustafson, Aaron Lehman, Sam Ose

### **DELAYED RYE COVER CROP TERMINATION IN SOYBEANS**

Tim Sieren

### **FERTILIZING COVER CROPS**

Dick Sloan

### **INTERSEEDING COVER CROPS TO CORN**

Jack Boyer, Dick Sloan

### **INTERSEEDING COVER CROPS TO CORN AND SOYBEANS**

John Van Horn

### **N FERTILIZER EFFECT ON CEREAL RYE YIELD AND QUALITY**

Dick Sloan



HARVESTING STRIPS OF SOYBEANS FROM A TRIAL AT DICK SLOAN'S IN OCTOBER 2022.



# Timing of Roll-Crimping Rye Cover Crop and Planting Soybeans

COOPERATOR

Jon Bakehouse, *HASTINGS*

The organic no-till movement emphasizes eliminating both chemical and tillage inputs in crop production. The research on organic no-till clearly shows that successful weed control with cover crops relies on consistent, thick cover crop biomass and effective mechanical forms of cover crop termination (e.g., roller-crimpers). However, determining when to mechanically terminate a cover crop is difficult as there are tradeoffs with weed control benefits, termination efficacy and cash crop yield.

Though he is not a certified organic grower, Jon Bakehouse recently purchased a roller-crimper and wanted to know how to best use it to terminate a cereal rye cover crop in the soybean phase of his crop rotation. Jon compared soybean yield and overall profitability of roll-crimping + planting soybeans at two different stages of the cereal rye cover crop's development: at the anthesis (flowering) stage of cereal rye, and several weeks later at the dough (grain physiological maturity) stage of cereal rye.



ROLL-CRIMPING AT DOUGH STAGE (CENTER) ON JUNE 14, 2022. ON THE LEFT AND RIGHT, YOU CAN SEE ANTHESIS STAGE STRIPS WHICH WERE ROLL-CRIMPED AND PLANTED TWO WEEKS EARLIER ON MAY 30.

*"WE GOT SOLID RESULTS ALONG WITH SEVERAL IDEAS ON HOW TO IMPROVE FOLLOWING TRIALS, AS WELL AS IDEAS FOR NEW, RELATED TRIALS."*

- JON BAKEHOUSE

## FINDINGS

Delaying roll-crimping and soybean planting until the cereal rye dough stage lowered soybean yield by nearly 8 bu/ac and net returns by \$81.14/ac compared with anthesis-stage termination. The soybeans in the dough-stage treatment were planted two weeks later than those in the anthesis treatment, which likely contributed to reduced soybean yield.

Jon found that both treatments required herbicide after roll-crimping to completely kill the cover crop and to control weeds. However, he reports that, "Roll-crimp performance [at anthesis] varied.... Crimping [at dough] seemed to perform better" and required less follow-up herbicide use. Jon hopes to repeat the experiment in the future, and he's going to consider how he can preserve planting soybeans early while still waiting until dough stage to terminate the rye cover crop with the roller-crimper. He reports that "[This trial] got my creative juices flowing and it prompted even more questions to explore."

**Net returns, soybean yields and herbicide costs were higher in the anthesis treatment compared with the dough treatment.**

|  | ANTHESIS | DOUGH    |
|--|----------|----------|
| Herbicide application, May 31 (\$/ac) <sup>x</sup> | \$35.05  | --       |
| Herbicide application, July 2 (\$/ac) <sup>x</sup> | \$38.55  | \$38.55  |
| Soybean yield (bu/ac)                              | 43.5     | 35.8     |
| Soybean price (\$/bu) <sup>y</sup>                 | \$15.09  | \$15.09  |
| Gross returns (\$/ac)                              | \$656.42 | \$540.22 |
| Net returns (\$/ac)                                | \$582.82 | \$501.67 |

<sup>x</sup>Herbicide costs provided by Jon Bakehouse.

<sup>y</sup> Average soybean price was accessed from ISU Extension and Outreach.

# Can We Reduce N Rates and Improve ROI?

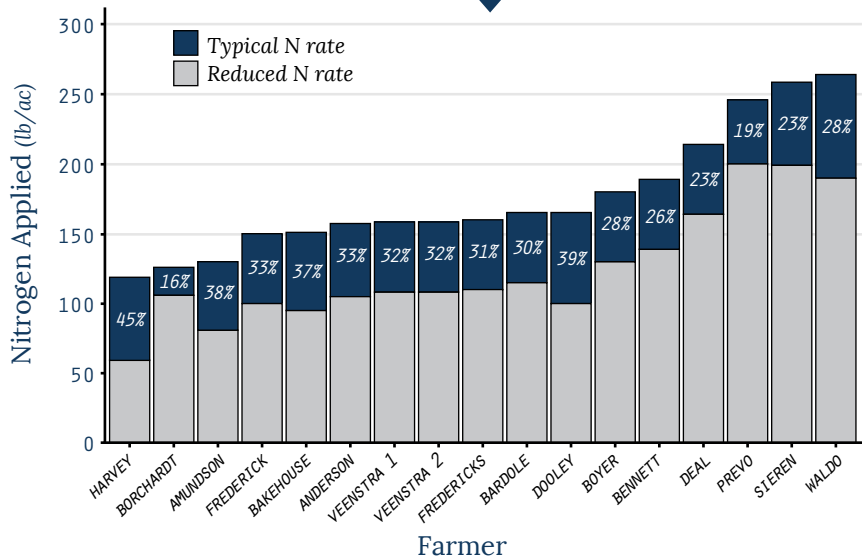
## COOPERATORS

Alec & Rachel Amundson, OSAGE; Nathan Anderson, AURELIA; Jon Bakehouse, HASTINGS; Pete Bardole, JEFFERSON; Sam Bennett, GALVA; Vaughn Borchardt, FENTON; Jack Boyer, REINBECK; Chris Deal, JEFFERSON; Wade Dooley, ALBION; Bill Frederick, JEFFERSON; Wayne Fredericks, OSAGE; Robert Harvey, REDFIELD; Kevin Prevo, BLOOMFIELD; Tim Sieren, KEOTA; Kevin Veenstra, GRINNELL; Marissa Waldo, CASCADE

Corn farmers are wondering if the soil health-building practices they have implemented in the past five-plus years – such as reduced tillage, cover crops, diversified rotations and others – will let them reduce their typical N rates. Sixteen farmers put their soil health to the test in 17 replicated strip trials comparing their typical nitrogen rate against that rate reduced by 15%–45%. If farmers can maintain corn yields and save money at the reduced N rate, they might feel more confident reducing (or at least questioning) fertilizer rates going forward.

And what if the reduced N rate lowers corn yields and loses money? Farmers will still have gained valuable information: They can be more assured that their typical nitrogen rate is the best rate for their farm at this time, and better equipped to gauge how additional soil health-promoting practices could help reduce it in the future.

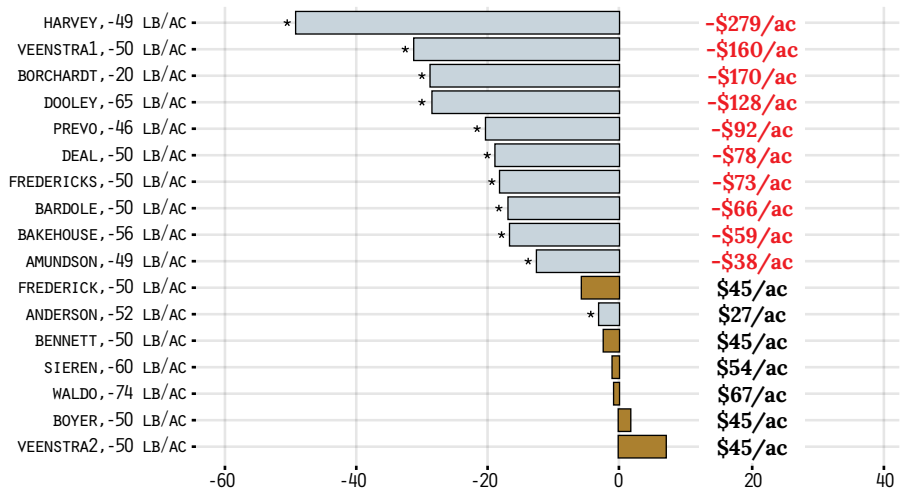
TYPICAL N RATES RANGED FROM 108-264 LB N/AC  
On average, rates were reduced by 30% (20-74 N/ac lower than typical rate)



SEVENTEEN TRIALS TESTED TWO NITROGEN (N) APPLICATION TREATMENTS IN THE 2022 GROWING SEASON. A COOPERATOR'S TYPICAL N RATE (NAVY BLUE BAR), CHOSEN REDUCED N RATE (GRAY BAR) AND THE REDUCTION RELATIVE TO THE TYPICAL RATE (WHITE TEXT).

SIGNIFICANT YIELD REDUCTIONS ARE NOT INDICATIVE OF FINANCIAL OUTCOMES

CHANGE IN CORN YIELD (BARS) AND FINANCIAL OUTCOMES (TEXT AND COLORS) WITH REDUCED NITROGEN (N) APPLICATION. THE Y-AXIS SHOWS THE FARMER WITH AMOUNT OF N REDUCED. RED TEXT INDICATES A TRIAL WITH A SIGNIFICANT FINANCIAL LOSS AT THE REDUCED N RATE. BLACK TEXT REPRESENTS TRIALS SHOWING A SIGNIFICANT FINANCIAL SAVINGS.



Impact of reduced N rate on corn yield (bu/ac) relative to typical N treatment

\* = Significant reduction in yield at 95% confidence level

## FINDINGS

Eleven of the 17 trials (65%) saw statistically significant reductions in corn yields at the reduced N rate. However, it is important to note that statistical significance in yield declines is not necessarily related to financial outcomes. After all, reducing the N rate also reduces costs and this must be factored into net returns.

Using an average fertilizer cost (\$0.90/lb N) and average corn price (\$6.59/bu), seven farms (41%) saved money in the reduced N treatment (black numbers in second figure). Ten (59%) farms lost money in the reduced N treatment, and those farmers may want to gain another year of data at the aggressive reduction rate or explore a less aggressive rate. These results represent the first in a multi-year project, and farmers are already looking forward to increasing the number of data points collected under this project's umbrella in the coming years. As more farmers contribute their data to this project, the power of the results will only continue to grow.

*"WITHOUT [THIS TRIAL], I MAY HAVE CUT BACK NITROGEN TOO MUCH TOO SOON."*

— KEVIN VEENSTRA



CORN GROWING THROUGH A MULCH OF CEREAL RYE COVER CROP RESIDUE AT KEVIN VEENSTRA'S ON JUNE 15, 2022. KEVIN HAS BEEN USING COVER CROPS AND NO-TILL ON HIS FARM NEAR GRINNELL, IOWA, FOR OVER SIX YEARS.

### *Marissa & Andrew Waldo*

Cascade, Iowa

**Farm overview:** Diversified crop rotation including corn, soybeans, cereal rye, multi-species cover crops, corn planted in 60-inch row-widths with interseeded cover crops, manure and no tillage.

**Typical N rate:** 264 lb N/ac as manure and sidedress fertilizer

**Reduced N rate:** 190 lb N/ac as manure only

**Corn yield:** 182 bu/ac (both treatments!)

**Cost savings from reduced treatment:** \$67/ac

*"We will be seriously assessing whether or not additional N is needed to achieve optimum yield – and more importantly, highest ROI [return on investment] – in corn. This opens the door to explore other inputs as well." – Marissa Waldo*



## Want to put your soil health to the test?

We're looking for corn farmers in Illinois, Iowa, Minnesota, Missouri, Nebraska and Wisconsin to join this multi-year project. Eligible fields will have at least a five-year history of soil health practices (cover crops, diverse rotation, integrated grazing, reduced tillage, etc.). The trial involves eight treatment strips that are about 2 acres each. Four strips (~8 acres) will receive your typical fertilizer rate, and four strips (~8 acres) will receive a reduced rate of your choosing.



Reach out to PFI's senior research manager, Stefan Gailans, to sign up or learn more at [stefan.gailans@practicalfarmers.org](mailto:stefan.gailans@practicalfarmers.org).



# Flame-Weeding Organic Soybeans

## COOPERATOR

Daniel Sheetz, TOLEDO

Flame-weeding is an organic weed control method in which weed plant tissues are exposed to propane-fueled flames, injuring or killing the weed. Daniel Sheetz wondered if adding flame-weeding to his standard weeding practices could decrease weed pressure in his organic soybean production. Together with PFI staff, Daniel designed an experiment with two treatments: 1) his standard practices of tine-weeding, rotary hoeing and three successive passes of cultivation compared with 2) his standard practices plus an additional pass with a flame weeder. Daniel's original plan was to flame-weed between the first and second cultivation passes. He was unable to do that and ended up flame-weeding on July 26 after the third cultivation pass.

*"THE TIMING OF THE FLAME-WEEDING IS PROBABLY IMPORTANT IN ORDER TO ACQUIRE MORE RELEVANT RESULTS."*

- DANIEL SHEETZ



DANIEL FLAME-WEEDING SOYBEANS USING A SIX-ROW FLAME CULTIVATOR KIT MOUNTED TO A CULTIVATOR TOOL BAR ON JULY 26, 2022. DANIEL'S ORIGINAL PLAN WAS TO FLAME-WEED EARLIER IN THE SEASON.

## FINDINGS

Adding a flame-weeding pass in late July did not affect weed density compared with Daniel's standard weeding practice. "My flame-weeding pass was later than planned, therefore the results were less than I expected," Daniel reflected, expressing optimism that earlier flame-weeding when the weeds were smaller may have been more effective.

Despite initial observable damage to the soybeans from the late-stage flame-weeding, the practice did not negatively affect soybean stand density or yields. Daniel remarked that, "Flame-weeding is a slow process and I would need to increase the size of my flame-weeder to make flame-weeding a viable option in my operation."

**Flame-weeding did not statistically affect weed density or soybean stand count as recorded on Sept. 24, 2022.**

|          | WEED DENSITY (no./ft <sup>2</sup> ) | SOYBEAN STAND (no./ac) |
|----------|-------------------------------------|------------------------|
| No flame | 1.5                                 | 136,778                |
| Flame    | 2.1                                 | 128,066                |

# Clover Cover Crop Termination Date for a Rye-Corn System

COOPERATOR

Dick Sloan, ROWLEY

Since expanding his corn-soybean crop rotation to include small grains over the past decade, Dick Sloan has conducted several experiments aimed at optimizing management of a nitrogen-fixing green manure cover crop between the small grain and corn phases of his rotation. This year, Dick was curious about how the termination date of clover green manure might affect nitrogen availability to a succeeding crop. He commented, “By maximizing nitrogen availability from the clover cover crop, I will minimize my need for nitrogen in the corn year of my rotation.”



LIGHT-GREEN STRIPS DEPICT DYING CLOVER WHERE DICK SPRAYED IN THE FALL TERMINATION TREATMENT ON SEPT. 27, 2021. PHOTO TAKEN SEPT. 30, 2021.

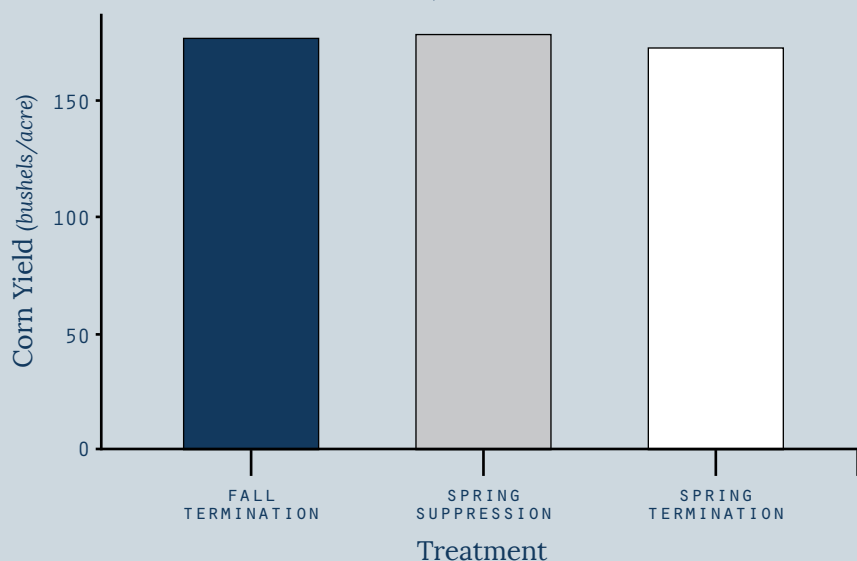
Dick compared corn yields and net financial returns under three different clover cover crop termination strategies: 1) fall termination, 2) spring termination and 3) spring suppression. He hypothesized that terminating clover in the fall would provide more nitrogen in the corn year and greater corn yield than terminating or suppressing the clovers in the spring.

“THOUGH THE TREATMENTS DIDN’T SHOW A YIELD DIFFERENCE AT THE END, I GAINED SEVERAL INSIGHTS INTO THE DIFFERENCES BETWEEN FALL AND SPRING TERMINATION OF CLOVER AFTER RYE.” -DICK SLOAN

## FINDINGS

Dick found no differences in corn yields among the three cover crop termination treatments he tested. Suppressing the clover cover crop in the spring ended up being the least expensive management option – and, in fact, the herbicides Dick used for this treatment unexpectedly terminated the cover crop by mid-June. The fact that corn yields were similar across the three treatments has important implications for Dick’s practices, he noted, and he looks forward to the opportunity for earlier corn planting that fall clover termination affords. “I can get a jump on spring planting of corn after clover with fall termination. [Also], I think I have good opportunities to minimize the cost of fall termination.”

STATISTICAL ANALYSIS REVEALED THE THREE COVER CROP TERMINATION STRATEGIES DID NOT AFFECT CORN YIELD.



# 2022 Horticulture Trials

## Featured Trials

### COVER CROPS FOR WINTER SQUASH

Kate Edwards with Ella Ostedgaard & Alayna Kuntz

### LIVING MULCH FOR PATHWAY WEED MANAGEMENT IN BELL PEPPERS

Kate Edwards, Mark Quee

### PRUNING VS. CAGING HEIRLOOM TOMATOES IN HIGH TUNNELS

Lee Matteson

### FINE-TUNING FERTILITY FOR BETTER BROCCOLI

Hannah Breckbill & Emily Fagan, Kate Edwards with Ella Ostedgaard & Alayna Kuntz, Mark Quee

### EFFECT OF SEEDING DATE ON HARVEST WINDOW AND YIELD OF OVERWINTERED SPINACH

Hannah Breckbill & Emily Fagan, Jon Yagla

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### EFFECT OF SOIL PRIMER (REJUVENATION) ON NAPA CABBAGE

Hannah Breckbill & Emily Fagan

### FALL CAULIFLOWER VARIETY TRIAL

Carmen & Maja Black and Helaina Thompson, Kate Edwards, Roxane Mitten, Jon Yagla

### SELECTING GARLIC AND POTATO ONION SEED STOCK TO OPTIMIZE YIELD AND CONSUMER MARKET VALUE

Roxane Mitten, Jordan Scheibel, Jon Yagla

### HONEYBERRY ESTABLISHMENT

Eric Franzenburg, Alice McGary, Jeff Sindelar, Tom Wahl

### OVERWINTERED SALAD GREENS VARIETY TRIAL

Hannah Breckbill & Emily Fagan, Jon Yagla



BELL PEPPERS GROWING ALONGSIDE A LIVING MULCH OF ANNUAL RYEGRASS IN THE WALKWAYS AT MARK QUEE'S IN JULY 2022.



# Cover Crops for Winter Squash

## COOPERATORS

Kate Edwards with Alayna Kuntz and Ella Ostedgaard, *WILD WOODS FARM, SOLON*

Cover crops are planted by many vegetable growers between crop cycles for the multitude of benefits they provide. Kate Edwards had previous success growing cereal rye as a cover crop and had heard of other growers having success with hairy vetch, a leguminous cover crop that has the added benefit of providing nitrogen for the next crop.

However, Kate knew vetch would not be a good cover crop option before most of her crops. “To get the best results from vetch, you have to wait to incorporate it until after it flowers,” she commented. “Winter squash and our other fall crops are the only crops planted late enough to do this.” With this background knowledge, Kate decided to test how hairy vetch and cereal rye each affected squash yields.

*“WE HAVE ALREADY PLANTED OUR 2023 WINTER SQUASH FIELD TO ALL VETCH.”*

- KATE EDWARDS



KATE TERMINATING RYE COVER CROP ON JUNE 8, 2022. SQUASH WERE SEEDDED SIX DAYS LATER ON JUNE 14.

## FINDINGS

Growing hairy vetch before winter squash doubled the number of marketable butternut squash produced per plot, and more than doubled total squash weight compared to cereal rye. Kate commented that how she terminated hairy vetch was key to managing weeds and high yields, as she has previously had issues with weeds after a vetch cover crop. “In the past, we had plowed the vetch in and had mowed and tilled the rye,” Kate said. “This time we mowed everything and tilled it. I think this made a difference.” After this success, Kate has more confidence to test a variety of cover crops on her farm instead of just cereal rye.

**Statistical analysis revealed the vetch cover crop led to higher winter squash yields compared with a cereal rye cover crop.**

|       | TOTAL MARKETABLE WEIGHT (lb fruit/plot) | TOTAL MARKETABLE COUNT (no. fruit/plot) |
|-------|---|---|
| Vetch | 31.7                                    | 16                                      |
| Rye   | 12.7                                    | 8                                       |

# Living Mulch for Pathway Weed Management in Bell Peppers

## COOPERATORS

**Kate Edwards**, WILD WOODS FARM, SOLON;  
**Mark Quee**, SCATTERGOOD FRIENDS FARM, WEST BRANCH

Managing weeds in the aisles between rows of plasticulture vegetables can be challenging and time-consuming. Some common weed suppression methods include applying mulches such as straw and corn stover, adding landscape fabric or planting a living mulch, which is a cover crop grown simultaneously to a cash crop. Living mulches have gained attention for potential soil health and other benefits in recent years. However, they can compete with the cash crops for water and nutrients.

Kate Edwards and Mark Quee were curious about how planting a living mulch would affect crop yield compared to other weed-suppression methods. Both farmers decided to test the effect of living versus non-living mulch on pepper yields. Kate used straw as a non-living mulch while Mark tried landscape fabric.



LIVING MULCH AND LANDSCAPE FABRIC TREATMENTS ALONG A CROP ROW AT MARK'S ON JULY 17, 2022.

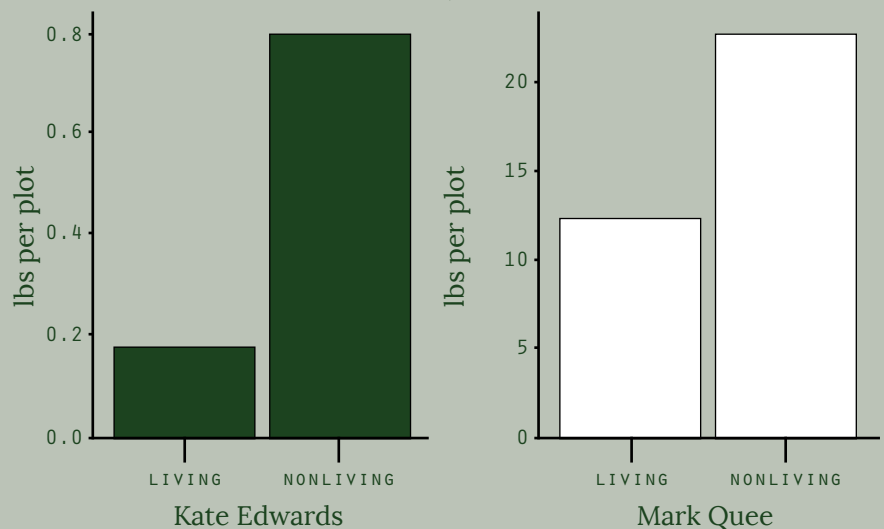
*"I'VE TOYED WITH THE IDEA OF PLANTING LIVING MULCHES FOR YEARS AND NOW I SEE HOW THEIR NUTRIENT DEMANDS CAN DETRACT FROM THE CASH CROP PRODUCTIVITY."*

-MARK QUEE

## FINDINGS

At both farms, pepper yield was significantly lower where living mulch was planted between rows. Both Kate and Mark determined from this trial that they will likely not use living mulches in the future. Kate reported, "We confirmed that we should go back to non-living mulch. And I plan to do so." For those interested in experimenting with living mulches, these results suggest that living mulch competes heavily with cash crops for resources. Fertility treatments and irrigation may have to be increased to achieve desired cash crop yields.

STATISTICAL ANALYSIS REVEALED BELL PEPPER MARKETABLE WEIGHT WAS LOWER IN THE LIVING MULCH TREATMENT ON BOTH KATE'S AND MARK'S FARMS.





# Pruning vs. Caging Heirloom Tomatoes in High Tunnel

COOPERATOR

Lee Matteson, *LEE'S GREENS, COLO*

Single-leader pruning is a standard management practice for growing high tunnel tomatoes. However, Lee Matteson wondered if caging his high tunnel tomatoes would improve the quantity of fruit and reduce labor costs compared to this typical practice. Lee investigated the yield of 'Beauty King,' an indeterminate heirloom tomato, under two management treatments: 1) single-leader pruning and 2) caging with no pruning.



LEE MATTESON AMONG THE PRUNED AND TRELLISED (LEFT) AND CAGED AND UNPRUNED (RIGHT) TOMATO PLANTS IN HIS HIGH TUNNEL ON MAY 10, 2022.

*"I AM ALWAYS LOOKING TO IMPROVE YIELD AND EFFICIENCY. IT TOOK LESS WORK WITH THE CAGES TO PRODUCE HEIRLOOM TOMATOES. SO, IF I CAN PRODUCE MORE WITH LESS INPUTS, THAT'S ALWAYS A WIN-WIN."*

- LEE MATTESON



A ROW OF PRUNED AND TRELLISED PLANTS AT LEFT AND A ROW OF CAGED AND UNPRUNED PLANTS AT RIGHT IN LEE MATTESON'S HIGH TUNNEL ON MARCH 22, 2022.

## FINDINGS

Lee's caged tomatoes produced more fruit by weight overall, as well as more individual fruits, than the single-leader pruned treatment. The caged tomatoes also required much less labor over the course of the growing season – 30 minutes total per plot compared to 63 minutes per plot for the pruned treatment. Lee found value in these results because they confirmed what he suspected would happen and will help him optimize tomato production in the future.

**Statistical analysis revealed Lee's caged tomatoes produced more fruit by weight and by number of individual fruits than his single-leader pruned tomatoes.**

|        | TOTAL MARKETABLE WEIGHT (lb fruit/plot) | TOTAL MARKETABLE COUNT (no. fruit/plot) |
|--------|---|---|
| Pruned | 45.9                                    | 72.0                                    |
| Caged  | 61.6                                    | 106.3                                   |



# Fine-Tuning Fertility for Better Broccoli

## COOPERATORS

**Hannah Breckbill & Emily Fagan**, HUMBLE HANDS HARVEST, DECORAH; **Kate Edwards with Ella Ostedgaard & Alayna Kuntz**, WILD WOODS FARM, SOLON; **Mark Quee**, SCATTERGOOD FRIENDS FARM, WEST BRANCH

In this trial, Hannah Breckbill, Emily Fagan, Kate Edwards and Mark Quee wanted to know how fertilizer practices on their farms affected broccoli production. “As veggie farmers,” Kate remarked, “we are often left to figure out agronomic practices from bits and pieces from other farmers at conferences and social media. There isn’t always a tried-and-true fertilizer program.” Because of this knowledge gap, experimentation is necessary for these farmers.

Each grower had different existing fertilization practices and soil fertility, and each decided to compare their typical practice with different new practices that interested them. Hannah and Emily compared their standard dose of Sustane at planting with a larger application at planting and two split applications. Kate tested how using no fertilization compared with side-dressing with blood meal and feather meal. Mark compared no fertilization with side-dressing with blood meal.



KATE HARVESTING BROCCOLI IN A TRIAL FIELD ON SEPT. 28, 2022.



BROCCOLI AMENDED WITH FEATHER MEAL PRODUCED SIGNIFICANTLY LARGER HEADS THAN THE CONTROL TREATMENT THAT RECEIVED NO AMENDMENT AT KATE’S FARM.

## FINDINGS

Because each farm tested slightly different treatments, each understandably found slightly different results. Hannah and Emily found that their existing Sustane application rate was the right rate for optimizing their yields, and Kate found that side-dressing with blood meal led to greater broccoli yields. In contrast, Mark found that side-dressing with blood meal reduced broccoli yields in his already fertile soils.

Despite this mix of results, they all took away lessons and now have a clearer idea about how to optimize broccoli yield through fertilization on their farms. “In the past, we have thought broccoli variety was the reason behind different head size,” Kate said. “But now I am starting to think that fertility plays a more important role.”

“WE HAVE A RATE OF APPLICATION NOW SO WE CAN MORE CONFIDENTLY GROW BROCCOLI.”

- HANNAH  
BRECKBILL

# Effect of Seeding Date on Harvest Window and Yield of Overwintered Spinach

## COOPERATORS

**Hannah Breckbill & Emily Fagan**, *HUMBLE HANDS HARVEST, DECORAH*;  
**Jon Yagla**, *THE MILLET SEED FARM, IOWA CITY*

Overwintering fall-planted spinach using high tunnels and row covers gives Iowa farmers a delicious, early-spring greens crop. This spinach is highly desirable both for its sweet taste and because it can be harvested early in the season when few other crops are available. Iowa producers Emily Fagan and Hannah Breckbill of Humble Hands Harvest and Jon Yagla of The Millet Seed Farm wished to sharpen their understanding of the optimum time to plant spinach for overwintering.

“It will be great to practice getting good spinach harvests as early in the year as possible, and continuing for as long as possible,” Emily said. Both farms compared yield and harvest windows of overwintered spinach planted on three fall dates.



EMILY OF HUMBLE HANDS HARVEST STANDS AMONG THEIR PLOTS OF OVERWINTERED SPINACH INSIDE A HIGH TUNNEL ON APRIL 28, 2022.



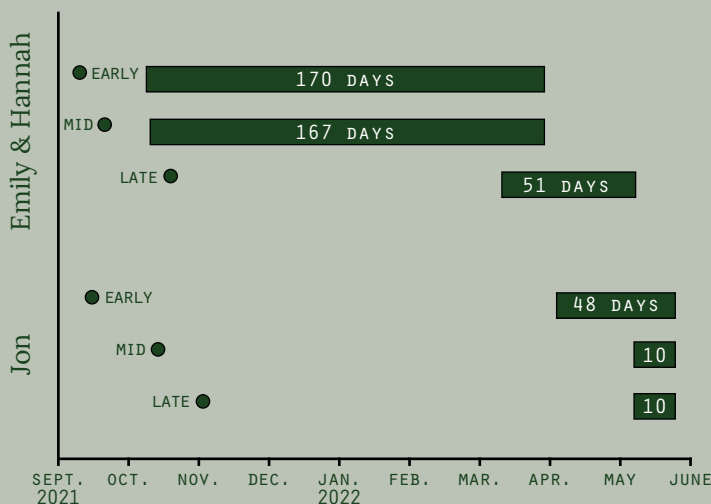
SPINACH PLOTS WITH THREE DIFFERENT FALL SEEDING DATES AT JON'S FARM ON MAY 11, 2022.

## FINDINGS

Both farms found that spinach seeding date affected harvest windows. At Emily and Hannah's, seeding earlier versus later in the fall influenced the harvest window but not yield. Seeding earlier let them harvest in both late fall and spring, while harvest of their latest-seeded spinach was limited to spring only. However, the late-seeded spinach lasted twice as long into spring and had similar yields.

At Jon's, harvest was limited to spring only for all seeding dates. But seeding earlier resulted in greater yield, an earlier spring harvest and a longer harvest window by nearly 40 days. All three farmers were left with more questions about overwintering greens to investigate in future years. Hannah and Emily said, “There are lots of things to explore around how much harvest we can get in the fall without compromising spring production for various species.”

SPINACH PLANTING DATES AND HARVEST WINDOWS





# 2022 Livestock Trials

## Featured Trials

**DEWORMING PASTURE-RAISED PIGS WITH SWINEX**

Dayna Burtness

**REPLACING CORN WITH OATS IN RATION FOR PASTURE-RAISED BROILER CHICKENS**

Anna Hankins & Shae Pesek, Carlos Williams & Maja Black

**RAISING TURKEYS ON FARMYARD VS. ANNUAL COVER CROPS**

Anna Hankins & Shae Pesek



TURKEYS GRAZING IN THE FARMYARD AT ANNA HANKINS AND SHAE PESEK'S IN SEPTEMBER 2022.



# Deworming Pasture-Raised Pigs With SwineX

## COOPERATOR

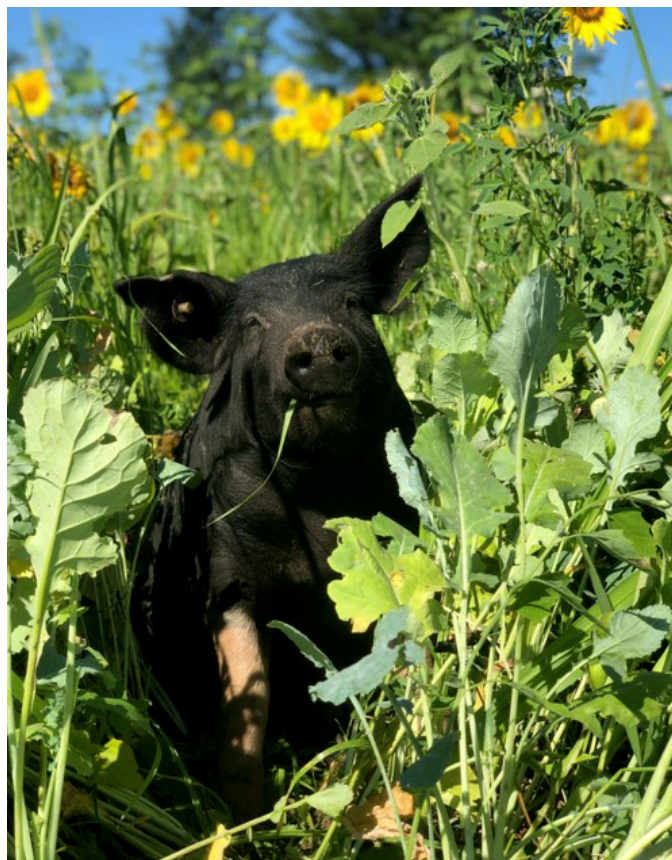
**Dayna Burtness**, NETTLE VALLEY FARM, SPRING GROVE, MINNESOTA

Dayna Burtness raises pigs on pasture in southeast Minnesota and has a goal of reducing her farm's reliance on chemical dewormers. Pastured pigs are naturally exposed to parasites in soil that do not affect the humans eating the pork but can cause health problems in the pigs and poor feed-to-weight conversion ratios. To combat this, many farmers, including Dayna, use chemical dewormers (e.g. LevaMed) to reduce the parasite populations in their pigs. However, there is a concern that chemical dewormers deposited on pasture via manure may harm soil organisms and soil health. Alternative, non-chemical dewormers (e.g. SwineX) are also available and may be better for soil health.

Dayna designed an experiment to test how treating pigs twice a year with LevaMed (in June and August) versus treating them once with LevaMed (in June) and once with SwineX (in August) affects pigs' average daily gains and final pig weight. She hypothesized that deworming with LevaMed twice would lead to greater average daily gains.

*"I'M ON MY WAY TO BEING CONVINCED THAT I DON'T NEED TO USE CHEMICAL DEWORMERS LIKE LEVAMISOLE, BUT ANOTHER YEAR OF TRIALING IS NECESSARY."*

- DAYNA BURTNES



A PIG ON PASTURE AT DAYNA'S.

## FINDINGS

There were no statistically significant differences in average daily gains and live and hanging weights between pigs treated with chemical LevaMed and alternative SwineX dewormers. "I honestly didn't think the SwineX would work," Burtness said in reaction to these results. Now, she is starting to become convinced that SwineX may be a viable option for deworming on her farm but wants to expand on this trial. Next year, she intends to add a third treatment: no second dewormer treatment in August.

**SwineX and LevaMed treatments led to similar average daily gains and final hanging weights of pigs. Results are averages from 10 pigs in each of the two treatment groups.**

|         | AVERAGE DAILY GAIN (lb/pig/day) | HANGING WEIGHT (lb/pig) |
|---------|---------------------------------|-------------------------|
| LevaMed | 2.04                            | 199.2                   |
| SwineX  | 2.11                            | 202.8                   |

# Replacing Corn With Oats in Ration for Pasture-Raised Broiler Chickens

## COOPERATORS

**Anna Hankins & Shae Pesek**, *OVER THE MOON FARM & FLOWERS, COGGON*;  
**Carlos Williams & Maja Black**, *SUNDOG FARM, SOLON*

Anna Hankins and Shae Pesek, and Carlos Williams and Maja Black, raise broiler chickens on pasture and typically offer the chickens a corn and soy feed ration. They wondered whether replacing a portion of the corn in a typical ration with oats would affect weight gain and economics of the broiler chickens. Customer desire for birds fed a more diversified ration (rather than solely corn and soybeans) was the inspiration for this project. However, the ration with oats would have to be similarly priced and perform similarly to the typical feed to make economic sense. "Chicken has a very small profit margin, which is why feed efficiency is so important," Carlos said at the onset.

*"IN A PASTURE SETTING THERE ARE MANY FACTORS OUT OF OUR CONTROL, BUT THIS TRIAL MADE US THINK ABOUT THE FACTORS THAT ARE IN OUR CONTROL AND HOW WE BEST KEEP THEM CONSISTENT."*

- ANNA HANKINS



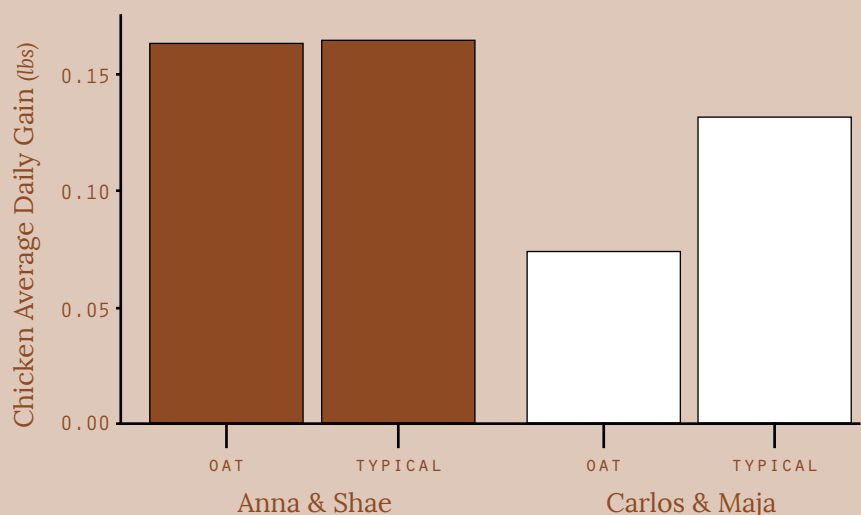
BROILER CHICKENS ON THE TYPICAL RATION AT ANNA AND SHAE'S IN MAY 2022.

## FINDINGS

The two farms differed slightly in how chickens fed oats gained weight. At Anna and Shae's farm, chickens fed the oat ration gained weight equally as well as the chickens fed the typical ration – and feed costs were similar between the two treatments. At Carlos and Maja's farm, however, chickens fed the typical ration outperformed those fed the oat ration.

Despite different results, the experiment answered questions about the economics of using a more diversified feed that might be attractive to consumers. It also offered the farmers a chance to more deeply explore poultry production cost analysis. Anna noted, "I'm so excited about this trial because it means we've done so much poultry math this spring and we are so much more in the know about our own cost analysis when it comes to feed."

ANNA AND SHAE FOUND THAT BOTH OAT AND TYPICAL RATIONS PERFORMED SIMILARLY, WHILE CARLOS AND MAYA FOUND THAT TYPICAL FEED SIGNIFICANTLY OUTPERFORMED THE OAT RATION.



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## Want to Learn More?

If anything in this report has piqued your interest or spurred any questions, please get in touch with us – we'd love to hear from you. Maybe you want to learn more about the Cooperators' Program or hear more about a trial directly from a cooperator. Or maybe you have some ideas of your own. Is it time to give it a try and put it to the test with on-farm research?

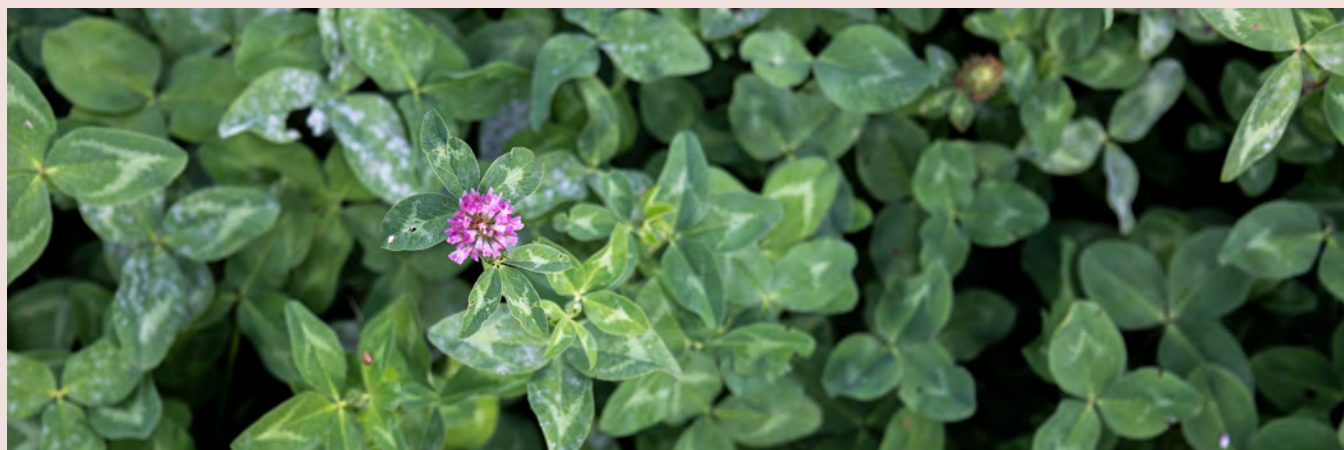
We look forward to hearing from you,

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