



PRACTICAL FARMERS OF IOWA
**COOPERATORS'
PROGRAM**

FARMER-LED RESEARCH

2023 Cooperators'
Program Report

[PRACTICALFARMERS.ORG/RESEARCH](https://practicalfarmers.org/research)



PRACTICAL FARMERS OF IOWA COOPERATORS' PROGRAM

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 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 multifarm 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 in, engage with and complete on-farm projects. We reward cooperator efforts and commitments to on-farm research by providing modest honoraria and showcasing their contributions.



Cover photo:
Soybeans growing through a rye cover crop left standing after termination at Michael Vittetoe's near Washington, Iowa, on May 28, 2023. "It is helpful to have detailed analysis of yield differences, etc., to help make decisions moving forward," Michael says of his trial. Read more about it on pg. 13.

This page:
Planting a cauliflower variety trial at Scattergood Farm near West Branch, Iowa, on July 5, 2023. Read more about the project results on pg. 9.



Independent Together

Dick Sloan was in a reflective mood this past winter as farmers were starting to plan on-farm experiments for 2024. A long-time participant in the Cooperators' Program, Dick took part in 25 on-farm trials, mostly on cover crops and diversified crop rotations, between 2013 and 2022. Now retired from farming, Dick no longer conducts trials. But the spirit of the program has remained palpable. Reflecting on his time as a cooperator, he summed up what the Cooperators' Program is all about – “doing good science,” as he put it, alongside others.

“All of us caring together makes us stronger and more independent together,” Dick says. This synergy is the ultimate outcome of working with and learning from other committed farmer-researchers. Dick's words also perfectly describe two core aspects of the Cooperators' Program: collaboration through science.

We believe in working together to design relevant, rigorous on-farm experiments to advance farmer-ownership of research conclusions and created knowledge. The program attracts those who desire a framework for being intentional about improving their farms and working with others to explore ideas.

The on-farm experiments explored in the Cooperators' Program emerge from the many desires and curiosities of PFI members. Because of the wide array of field crop, vegetable and livestock enterprises in our midst, one might suppose such diversity results in a hodgepodge of on-farm research projects. While it's true that farmer-cooperators have myriad ideas and strategies they're curious about, research themes inevitably crystallize and emerge through the process of collaboration. This was true of 2023 research projects, too, which reflect themes that transcend enterprises.

As you'll read, both field crop and vegetable farmers assessed strategies for terminating cover crops without tillage or herbicides. Fred Abels, Jon Bakehouse, Keith Gorham, Kevin Veenstra and Michael Vittetoe found some success using roller-crimpers on cereal rye ahead of soybeans. Meanwhile, smothering cover crops with tarps for various lengths of time revealed important lessons for organic vegetable

farmers Hannah Breckbill and Emily Fagan. “Three weeks is a really ideal amount of time to leave a tarp on,” Emily says, “but two weeks will do in a pinch.”

Soil health and fertility were on the minds of many cooperators in 2023. Several corn farmers found they could reduce nitrogen fertilizer rates and save money in fields they've been improving with cover crops over the years. Kate Edwards, Jason Grimm and Terry Troxel were curious how their potatoes would respond to various organic fertilizers.

Both corn and vegetable farmers tested alternative soil amendments to traditional fertilizers. Some worked better than others. Kate Solko and Kyle Maxwell, who farm next to a brewery, found that what is commonly considered a waste product from brewing beer (spent grains) increased eggplant yield.

Ultimately, the scientific experiments done in PFI's Cooperators' Program impart the power to independently judge a practice and confidently decide whether to adopt it for oneself. And mirroring Dick's comments, those who conduct the experiments tell us this power is amplified when done within a community of caring and curious individuals who inspire one another.

You'll learn more about the projects mentioned above, and others, in the summaries that follow. To dive deeper into these projects, we encourage you to explore the full research reports on our website at practicalfarmers.org/research. If you'd like a printed copy of any research report, please contact us.

In cooperation and curiosity,

Staff

Stefan Gailans SENIOR RESEARCH MANAGER

Emma Link SENIOR RESEARCH COORDINATOR

Contributor

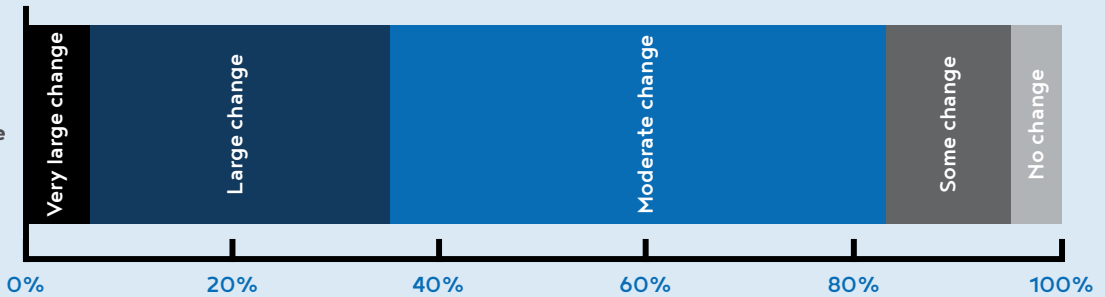
Gina Nichols AARHUS UNIVERSITY

The Impact of Trials At-A-Glance

After completing a trial and discussing the results with PFI staff scientists, we ask cooperators to reflect on their experience. Cooperators tell us about their knowledge gained; how helpful the trial was for identifying ways to be more financially viable; and whether trial results influenced them to make changes to their farm. The common thread among these reflections: on-farm research aids learning and decision-making.

83%

of trials resulted in a moderate to very large change in knowledge for the participating cooperator.



“We learned a lot about growing cauliflower on our farm. If we do fall cauliflower again, we would aim to transplant at least two weeks earlier and I’d have stronger opinions about what varieties to select. I’d probably avoid growing orange and purple cauliflower, unless I had a ton of room. I have a better sense of the fertility and water needs for cauliflower.”

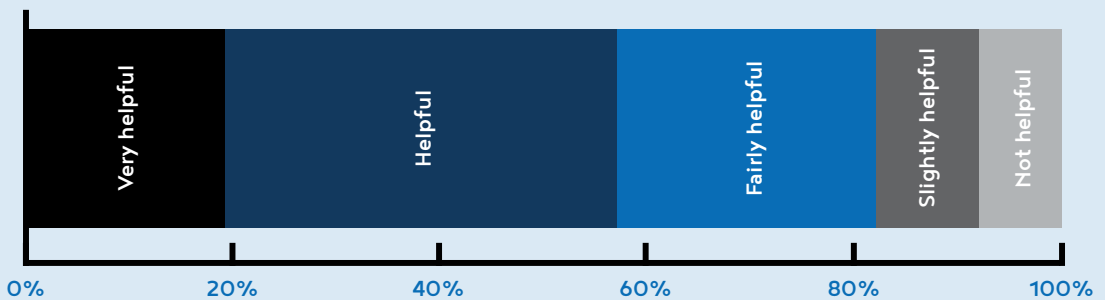
- *Natasha Hegmann*, “Fall Cauliflower Variety Trial”

“I learned that different [lamb] castration timing doesn’t matter as much as I thought it might.”

- *Emily Fagan*, “Castration Timing in Goats and Sheep”

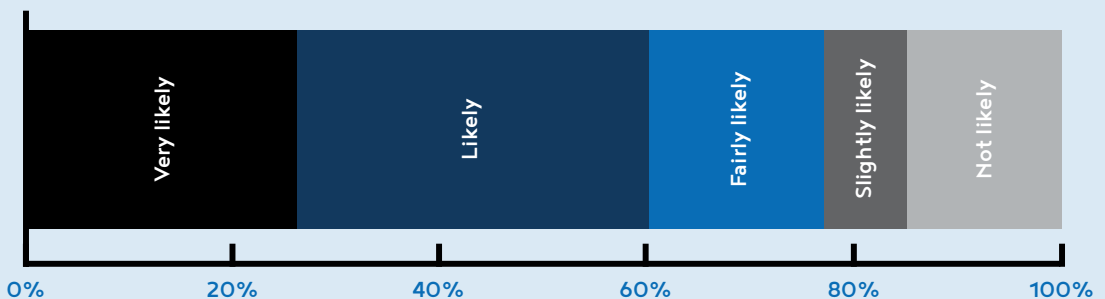
82%

of trials were fairly to very helpful for identifying ways to increase the financial viability of cooperators’ farms.



77%

of trials led to cooperators saying they were fairly to very likely to make changes to their farm.



“I’ve been wanting to go back to 100% no-till, and this trial has shown me how to do it, without sacrificing yield.”

- *Tim Sieren*, “Strip-Till vs. No-Till Soybeans or Corn Following a Cover Crop”

“I will grow the SD Buffalo oats next year. They did the best for both grain and straw, and I think they will fit my system better than the Saddle oats I had been growing.”

- *Neil Peterson*, “Oat Variety Trial”

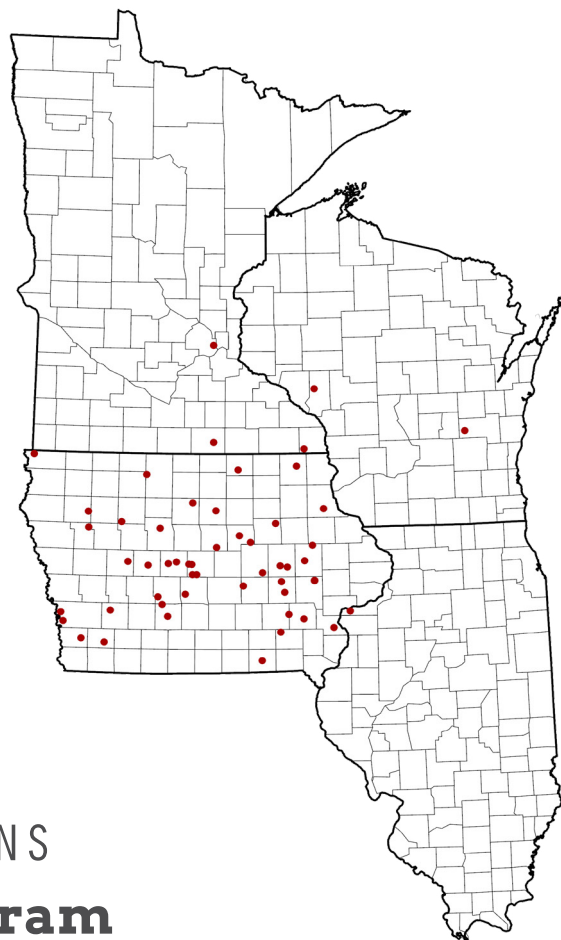
2023 FARMER-LED Research Trial Locations

IN 2023,

48 COOPERATORS

PARTICIPATED IN

78 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 takes 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 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. Participants share results and observations from the past year's farmer-led research trials and plan future ones.

During the meeting, cooperators are encouraged to describe what they did, why they did it and what they found. They 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 does and doesn't work 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 farmers can trust about new practices. You'll see summaries of our latest 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.



TO LEARN MORE ABOUT THE
COOPERATORS' PROGRAM, VISIT

practicalfarmers.org/research

HAVE QUESTIONS OR WANT TO
GET INVOLVED?

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

Soybean Maturities in Delayed Termination Rye

COOPERATORS

Alec Amundson, OSAGE, IOWA; **Landon Brown**, NEW PROVIDENCE, IOWA; **Jeremy Gustafson**, BOONE, IOWA; **Ross McCaw**, MARENGO, IOWA; **Scott Shriver**, JEFFERSON, IOWA; **Tracy Skaar**, HAYWARD, MINNESOTA

Planting green is a practice where farmers plant soybeans into a growing cereal rye cover crop and terminate the cover crop after the soybeans have emerged. This practice maximizes cover crop growth and its ability to suppress weeds. But delaying termination by more than two weeks after soybean planting can lead to lower soybean yields.

Alec Amundson, Landon Brown, Jeremy Gustafson, Ross McCaw, Scott Shriver and Tracy Skaar decided to test if planting later-maturing soybean varieties can prevent yield decline when planting green and delaying rye termination. They each planted an early- and late-maturity soybean variety (average of 0.8 relative maturity groups different) into green cereal rye and tested two different cover crop termination timings (near-plant vs. delayed).

Cooperators waited an average of four days after soybean planting to terminate rye in their near-plant termination treatment and an average of 21 days after planting to terminate rye in their delayed-termination treatment.



EARLY- AND LATE-MATURITY SOYBEANS NEAR THE END OF THE GROWING SEASON IN TRACY SKAAR'S FIELD TRIAL. PHOTO TAKEN SEPT. 18, 2023.

"SOYBEAN RELATIVE MATURITIES DON'T MAKE MUCH DIFFERENCE [IN YIELD DECLINE]. WE NEED TO MONITOR SOIL AND WEATHER CONDITIONS WHEN DETERMINING RYE TERMINATION TIMING."

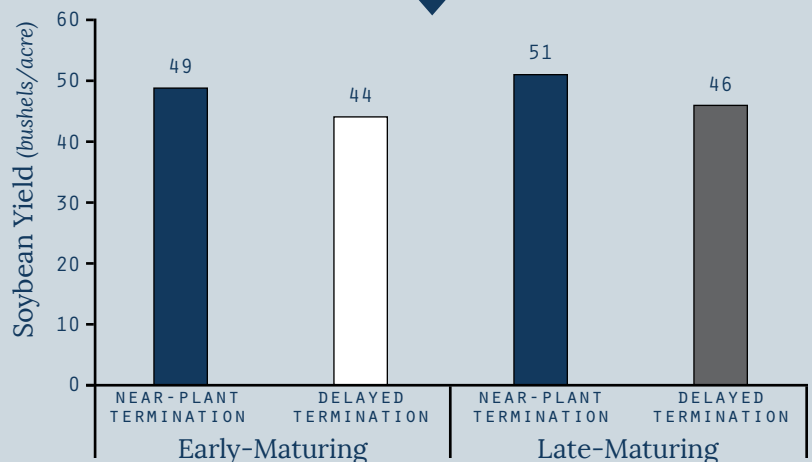
-ALEC AMUNDSON

FINDINGS

Soybean yields were significantly greater in the near-plant cover crop termination group than in the delayed-termination group when considering all trials together. Results also showed that later-maturity soybeans did not offset yield decline under delayed cover crop termination; yield decline was seen in both early and later relative-maturity soybeans across all sites.

2023 was a dry year at all trial locations and several cooperators reported lower-than-expected yields across their fields, especially in the delayed termination treatments. This result underscores the need to manage cover crops differently in dry years. For instance, a cover crop may need to be terminated earlier to avoid hurting soybean yield.

AVERAGED ACROSS ALL FARMS, STATISTICAL ANALYSIS REVEALED THAT TERMINATING THE COVER CROP WITHIN ONE WEEK OF PLANTING SOYBEANS (NEAR-PLANT) TENDS TO MAXIMIZE YIELD FOR BOTH EARLY- AND LATE-MATURING SOYBEANS.



Fall Cauliflower Variety Trial

COOPERATORS

Natasha Hegmann & Pete Kerns, TURKEY RIVER FARM, ELKPORT, IOWA; **Michael Pipho**, ROOSTER'S CROW FARM, DUNKERTON, IOWA; **Mark Quee**, SCATTERGOOD FARM, WEST BRANCH, IOWA; **Carmen & Maja Black** SUNDOG FARM, SOLON, IOWA

Timing the fall planting of cauliflower and other slow-maturing crops is often difficult, especially when planting a new variety. Many cauliflower varieties are available to farmers in an array of colors, plant and head sizes and average days to maturity. Building on several past PFI studies, a group of cooperators evaluated seven cold-tolerant cauliflower varieties planted as fall crops to see how each performed. They also hoped to use the present trial to gauge customer interest in novel cauliflower colors.

"IF WE DO FALL CAULIFLOWER AGAIN, I'D PROBABLY AVOID GROWING THE ORANGE AND PURPLE CAULIFLOWER UNLESS I HAD A TON OF ROOM."

- NATASHA HEGMANN

FINDINGS

Snow Crown was consistently high-yielding and significantly out-yielded all other trialed varieties at two of the three farms that tested it. However, the variety did have some downsides. "I find the quality of the Snow Crown heads to be pretty poor," Mark noted. "They curd too loose and lots of purpling." Of the orange varieties trialed, Cheddar generally performed the best. Lavender, the only purple variety trialed, produced minimal harvests.

Cooperators had varying takeaways from their experiences during the trial. While some learned that they do not want to continue investing in fall cauliflower, others now feel more confident choosing seed-starting dates and trying specific varieties on a larger scale.



A HEAD OF CLEMENTINE CAULIFLOWER READY FOR HARVEST AT TURKEY RIVER FARM NEAR ELKPORT, IOWA. PHOTO TAKEN OCT. 8, 2023.



CAULIFLOWER IN A TRIAL PLOT AT SUNDOG FARM NEAR SOLON, IOWA. PHOTO TAKEN AUG. 20, 2023.

The four farm locations each tried different cauliflower varieties and had different takeaways from the trial.

COOPERATOR	VARIETIES TRIALED	HIGHEST-YIELDING VARIETIES	TAKEAWAYS
Hegmann and Kerns	Clementine, Flame Star, Amazing, Skywalker, Lavender	Amazing, Clementine	Start plants two weeks earlier; likely prioritize higher-yielding crops for late-fall CSA boxes
Pipho	Cheddar, Clementine, Lavender, Skywalker	Snow Crown	Plans to plant more fall cauliflower in future after identifying varieties and pain points for transplanting
Quee	Snow Crown, Cheddar, Lavender, Flame Star, Amazing, Clementine, Vitiverde & Denali	Snow Crown, Cheddar	Start plants two weeks earlier; need to investigate black rot-resistant varieties
Black	Snow Crown, Clementine, Cheddar, Flame Star, Amazing, Lavender	Snow Crown	NA

Castration Timing in Goats and Sheep

COOPERATORS

Hannah Breckbill & Emily Fagan, HUMBLE HANDS HARVEST, DECORAH, IOWA;
Adam Ledvina, IOWA KIKO GOATS, CHELSEA, IOWA; **Bailey Lutz**, HOLLYHOCK LAND
 & LIVESTOCK, DECORAH, IOWA

Kid and lamb castration timing may affect animal health and wellbeing, final hanging weights and labor timing and costs. Farmers commonly castrate animals when they are anywhere from one or two days old to several months old, and there are currently no set regulations or best-practice recommendations in the U.S.

Cooperators Hannah Breckbill and Emily Fagan, Adam Ledvina and Bailey Lutz wondered if the timing of kid or lamb castration would affect the final hanging weights of their animals or the general health in their herds. Adam and Bailey tested whether castrating goat kids at four weeks versus eight weeks affected goat final weight. Adam also included an uncastrated (intact) kid treatment. Hannah and Emily assessed whether castrating lambs at one to four weeks old versus six to eight weeks old affected final hanging weights.

“MANY ASSUME LEAVING BUCKS INTACT RESULTS IN HIGHER GROWTH RATES, BUT THIS TEST PROVED OTHERWISE.”

- ADAM LEDVINA



ADAM LEDVINA CARRYING A GOAT. PHOTO TAKEN SEPTEMBER 2023.

FINDINGS

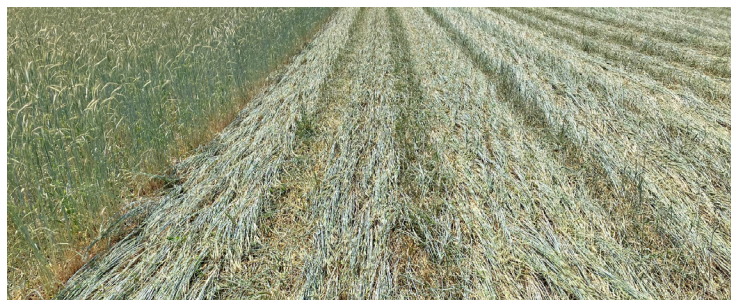
Kid and lamb age at castration did not affect kid average daily gains (Ledvina and Lutz) or lamb final weight (Breckbill and Fagan). All the animals were healthy throughout the trial. Adam and Emily agreed that they will now probably stick with an early castration date. For Adam, the main reason is to “prevent any accidental breeding,” and for Emily because “it’s easier to handle the lambs, and to do the castration itself [at an earlier date].”

Bailey, who uses the pronoun they, wants to experiment more with castration timing to find what will work best on their farm. All three cooperators were happy to have answered some questions through this trial and were eager to continue experimenting with their livestock methods. Adam calls for “more farms to participate in these sorts of trials.”

Organic No-Till

Organic no-till refers to reducing or eliminating tillage from organic cropping systems. We know that the principles of organic no-till (*cover crops, reduced tillage, reduced inputs, reduced fuel use, reduced labor*) transcend the many different farm types in our network. Put another way, this topic is receiving growing attention from farmers, certified organic or not.

Timing of Roll-Crimping a Cereal Rye Cover Crop



KEITH GORHAM ROLL-CRIMPED CEREAL RYE ON MAY 26, 2023.

[See page 12](#)

In-Row Roll-Crimping Cereal Rye Cover Crop Seeded in Twin-Rows Ahead of Soybeans



MICHAEL VITTETOE SEEDED A CEREAL RYE COVER CROP IN TWIN-ROWS IN FALL 2022, PLANTED SOYBEANS BETWEEN THE TWIN-ROWS ON APRIL 14, 2023 AND THEN ROLL-CRIMPED THE TWIN-ROW CEREAL RYE ON MAY 16, 2023.

[See page 13](#)

Tarping for No-Till Cover Crop Termination



HANNAH BRECKBILL AND EMILY FAGAN APPLIED TARPS IN SPRING 2023 FOR VARIOUS LENGTHS OF TIME TO LEARN HOW LONG IT WOULD TAKE TO SUCCESSFULLY TERMINATE A CEREAL RYE COVER CROP.

[See page 14](#)

Timing of Roll-Crimping a Cereal Rye Cover Crop

COOPERATORS

Fred Abels, HOLLAND, IOWA; Jon Bakehouse, HASTINGS, IOWA; Keith Gorham, ILLINOIS CITY, ILLINOIS; Kevin Veenstra, GRINNELL, IOWA

The roller-crimper is an implement developed by the Rodale Institute that flattens a standing cover crop and crushes the stem, mechanically killing it. The roller-crimper lets farmers reduce tillage and suppress weeds while using cover crops. It also lets them plant directly into a cover cropped field, known as “planting green,” then terminate the cover crop later.

A challenge, however, is that farmers often find it hard to know the best time to roll-crimp cover crops for both maximal termination and minimal effect on soybean yield. Fred Abels, Jon Bakehouse, Keith Gorham and Kevin Veenstra investigated whether the timing of when they roll-crimp a rye cover crop (at rye anthesis versus at grain-filling) affected yield of soybeans that were no-till drilled into the rye cover crop prior to roll-crimping.

“[THE TRIAL HELPED ME] GAIN CONFIDENCE IN USING A RYE COVER CROP IN A SUPER DRY YEAR AND LEARN MORE ABOUT ROLL-KILL EFFICACY.

- JON BAKEHOUSE



KEVIN VEENSTRA'S TRIAL FIELD AFTER ROLL-CRIMPING. SOYBEANS HAVE CLEARLY EMERGED FROM THE CEREAL RYE MAT. PHOTO TAKEN JUNE 26, 2023.



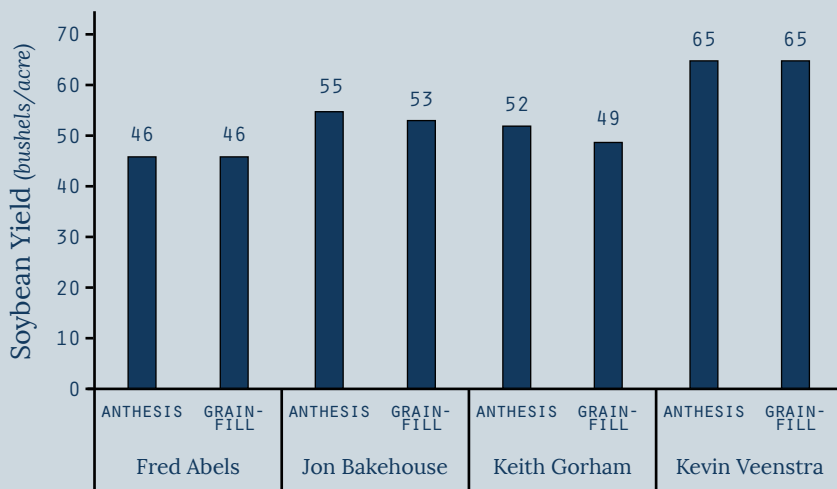
FRED ABELS USING HIS ROLLER-CRIMPER TO TERMINATE CEREAL RYE AT GRAIN FILL. PHOTO TAKEN JUNE 14, 2023 BY BRADY APPEL.

FINDINGS

All four cooperators found that roll-crimp timing did not significantly affect soybean yields in 2023. Yields across the sites ranged from 46 to 65 bushels per acre. Fred, Keith and Kevin roll-crimped rye in the anthesis treatment an average of 14 days after soybean seeding, and an average of 27 days after soybean seeding in the grain-filling treatment.

Jon planted later than the others and roll-crimped his anthesis treatment the day before seeding soybeans, and 19 days after seeding soybeans in his grain-filling treatment. 2023 was a very dry spring at all four trial locations. Some cooperators were pleased that their results showed they can roll-crimp at anthesis even in a dry year without a yield decline, while others wondered if their results might differ in a year with more average precipitation.

STATISTICAL ANALYSIS REVEALED NO DIFFERENCE IN SOYBEAN YIELDS BETWEEN THE TWO ROLL-CRIMP TIMINGS AT ANY FARM IN 2023.



In-Row Roll-Crimping Cereal Rye Cover Crop Seeded in Twin-Rows Ahead of Soybeans

COOPERATOR

Michael Vittetoe, WASHINGTON, IOWA

The in-row roller crimper is designed to roll-crimp only in the interrow between cash crop rows. Michael Vittetoe hopes that in-row roll-crimping will help him overcome some past issues he has had while planting his soybeans green, specifically by reducing shade stress on his soybeans.

He designed a trial to test how in-row roll-crimping a cereal rye cover crop at boot stage, and then chemically terminating it shortly afterwards, affects soybean yield compared to chemically terminating the cover just after boot stage and letting the rye stand while partially shading the young beans. Michael was excited to see how these practices affect the need for weed management passes and soybean responses to field moisture conditions.

"THE IN-RW ROLLER IS AN INTEGRAL PART OF MY FUTURE PLANS FOR OUR FARM OPERATION...MY GOAL FOR THIS TRIAL IS TO BETTER LEARN HOW TO MANAGE MOISTURE, WEED CONTROL AND PLANT NUTRITION RELEASED FROM THE CEREAL RYE COVER CROP."

-MICHAEL VITTETOE

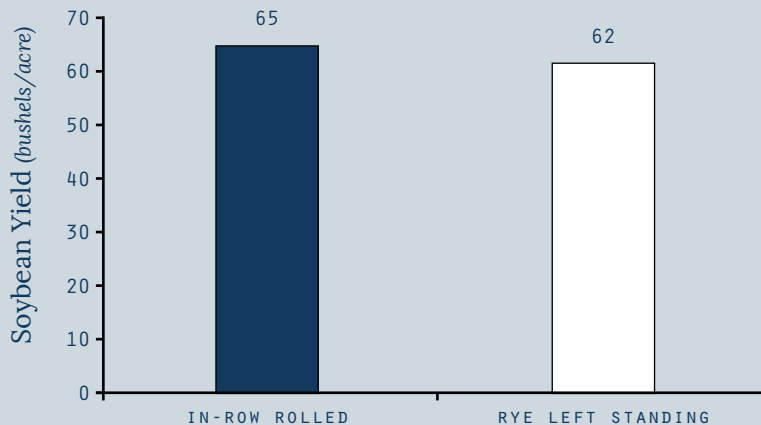


MICHAEL VITTETOE'S IN-RW ROLL-CRIMPER IN ACTION CRIMPING RYE WITH UNDISTURBED SOYBEAN ROWS IN BETWEEN THE ROLLERS. MICHAEL SEEDED A COVER CROP IN 10-INCH TWIN-ROWS ON 30-INCH CENTERS SO HE CAN PLANT SOYBEANS BETWEEN COVER CROP ROWS. PHOTO TAKEN MAY 16, 2023.

FINDINGS

Michael found that soybeans in his in-row roll-crimped treatment out-yielded those left in standing rye by 3 bushels per acre. The yield advantage was also enough to pay for the extra pass of the roll-crimping. Michael remarked that he was not surprised by these results based on trials he has done on his own in the past. He's glad he did this trial, he says, because "it is helpful to have the more detailed analysis of yield differences, etc., to help make decisions moving forward." He says that his standard plan for terminating cover crops when planting soybeans green is using the in-row roller.

STATISTICAL ANALYSIS REVEALED IN-RW ROLL-CRIMPING AT BOOT STAGE BEFORE CHEMICALLY TERMINATING ONE WEEK LATER SIGNIFICANTLY INCREASED YIELDS COMPARED TO LEAVING THE RYE STANDING AFTER CHEMICAL TERMINATION.



Tarping for No-Till Cover Crop Termination

COOPERATORS

Hannah Breckbill & Emily Fagan, HUMBLE HANDS HARVEST, DECORAH, IOWA

Tarping is a practice where farmers apply black tarps to the soil for weeks to months to prepare a bed before planting. The tarps block sunlight and heat up the ground underneath them, which kills weeds and cover crops, creates a stale seed bed, warms the soil and speeds up residue decomposition.

Farmers Emily Fagan and Hannah Breckbill of Humble Hands Harvest have been using tarping as a no-till bed prep tool, but they weren't sure how long they needed to leave the tarps on to effectively kill a cover crop. To find out, they tested tarping for various lengths of time to see which is best at killing a cereal rye cover crop and curtailing growth of annual and perennial weeds. As part of the experiment, Emily and Hannah applied the tarps in mid-May and compared the effectiveness of leaving them on for one, two, three and four weeks.



HUMBLE HANDS EMPLOYEE MACKENZIE MILLER ASSESSES GROUND COVER IN A TREATMENT PLOT THAT WAS TARPED FOR FOUR WEEKS. PHOTO TAKEN JUNE 22, 2023, THE DAY THE TARP WAS REMOVED.

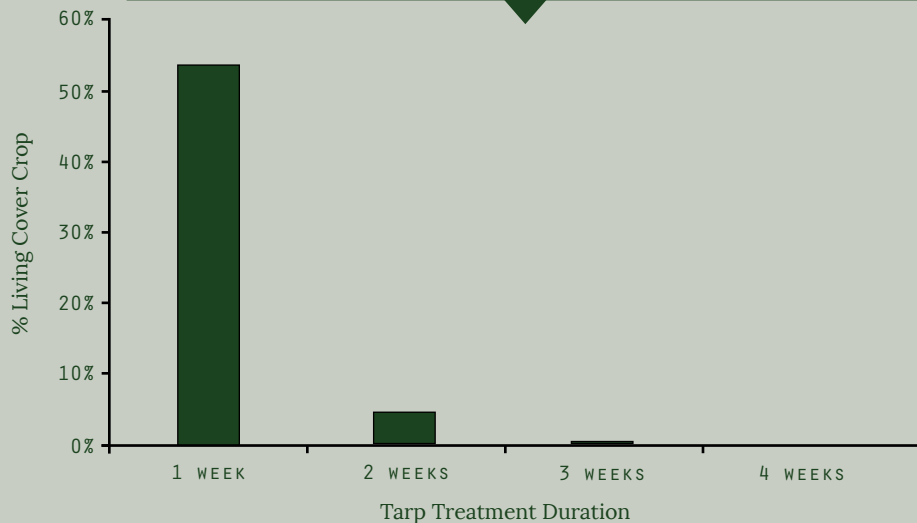
"LEARNING MORE SPECIFICALLY ABOUT TIMING FOR TARPING WILL HELP US BE MORE ORGANIZED AND EFFECTIVE ABOUT WEED CONTROL AND COVER CROP TERMINATION AS WE TRANSITION TO NO-TILL. IF WE HAVE A CLEAR UNDERSTANDING OF HOW LONG IT TAKES TO KILL COVER CROPS AND SET BACK CANADA THISTLES, WE'LL BE ABLE TO DO LESS HAND WEEDING AND HOEING AND SAVE A LOT OF TIME AND EFFORT OVER THE COURSE OF THE SEASON."

- EMILY FAGAN

FINDINGS

Three and four weeks of tarping effectively terminated the rye cover crop and set back weeds for at least one week. One week of tarping was not enough time to effectively kill cover crops and was less effective at preventing weeds. Emily also noticed a fair amount of rye regrowth after only two weeks of tarping. Emily and Hannah reported that no tarping length they tested killed perennial weeds permanently, but the two longer tarping durations delayed regrowth of these weeds.

NO LIVING COVER CROPS REMAINED IN THE PLOTS WHERE TARPES WERE APPLIED FOR THREE AND FOUR WEEKS WHEN OBSERVING PLOTS SEVEN DAYS AFTER REMOVING A TARP.



Soil Health & Fertility

Practical Farmers has a long history of helping farmers evaluate fertilizer use on-farm. Deciding whether to use fertilizer or how much to use can be stressful, especially when fertilizer takes up a sizable chunk of production costs. Practices like cover crops, diversified rotations, compost and more foster biologically healthy and fertile soils that may alleviate the need for expensive fertilizer. On-farm trials let farmers gain on-the-ground, place-based experience and knowledge that support and empower decision-making.

Organic Fertilizers for Potatoes



"THE SUSTANE [FERTILIZER] INCREASED THE YIELD OF THE POTATOES...IT INCREASED THE NUMBER OF BIGGER POTATOES HARVESTED. BIGGER POTATOES SELL FASTER. SMALL POTATOES SELL SLOW AND TO A LIMITED MARKET. USING SUSTANE MADE MARKETING AND SELLING A LOT EASIER." – TERRY TROXEL

[See page 16](#)

Holganix Bio 800+ Compost Tea for Corn

[See page 17](#)

Can We Reduce N Rates to Corn and Improve ROI?



"I THOUGHT MY N RATES WERE TOO HIGH TO START OFF. THIS TRIAL GIVES ME CONFIDENCE IN REDUCING THEM ACROSS THE BOARD." – SEAN DENGLER.

[See page 18](#)

Utrisha N Biological Nitrogen Supplement for Organic Corn



"I THOUGHT THE PRODUCT WOULD INCREASE YIELD," NOAH WENDT SAID GOING INTO THE TRIAL. AFTER SEEING NO RESPONSE FROM HIS ORGANIC CORN, NOAH DOUBTS THE FINANCIAL VIABILITY OF UTRISHA N AND THINKS HE'LL USE LESS OF IT IN THE FUTURE.

[See page 20](#)

Brewers Spent Grains as a Soil Amendment



KATE SOLKO AND KYLE MAXWELL, OF ROOT TO RISE FARM NEAR AMES, IOWA, HAVE AMPLE ACCESS TO SPENT GRAINS FROM NEXT-DOOR NEIGHBORS ALLUVIAL BREWING COMPANY. THEY WONDERED IF APPLYING SPENT GRAINS TO EGGPLANT BEDS COULD REPLACE OFF-FARM INPUTS AS A SOURCE OF SOIL FERTILITY.

[See page 21](#)

Organic Fertilizer for Potatoes

COOPERATORS

Kate Edwards, WILD WOODS FARM, SOLON; **Jason Grimm**, GRIMM FAMILY FARM, WILLIAMSBURG, IOWA; **Terry Troxel**, IOWANA FARM, CRESCENT, IOWA

Potatoes have higher nutrient demands than many other horticultural crops and thus require extra care to maximize yield, quality and long-term soil health. A wide variety of organic fertilizer options are available to organic farmers, but it's often difficult to know what fertilizer type and rate is best for maximizing yields and minimizing costs.

Kate Edwards, Jason Grimm and Terry Troxel each conducted trials to assess how commercially available organic fertilizers affect potato yields on their farms. Reflecting a goal shared by other participants, Jason said he undertook the trial “to improve our potato yield and help dial-in a nutrient management program for future seasons.”



GEORGIA CONRAD (LEFT) AND HAILEY FRANK (RIGHT) WITH POTATOES HARVESTED FROM KATE EDWARDS’ TRIAL. KATE CONSISTENTLY REPORTS THAT FARM STAFF ARE EXCITED TO PARTICIPATE IN RESEARCH TRIALS AND ARE A BIG PART OF WHY SHE CONDUCTS TRIALS. PHOTO TAKEN AUG. 1, 2023.

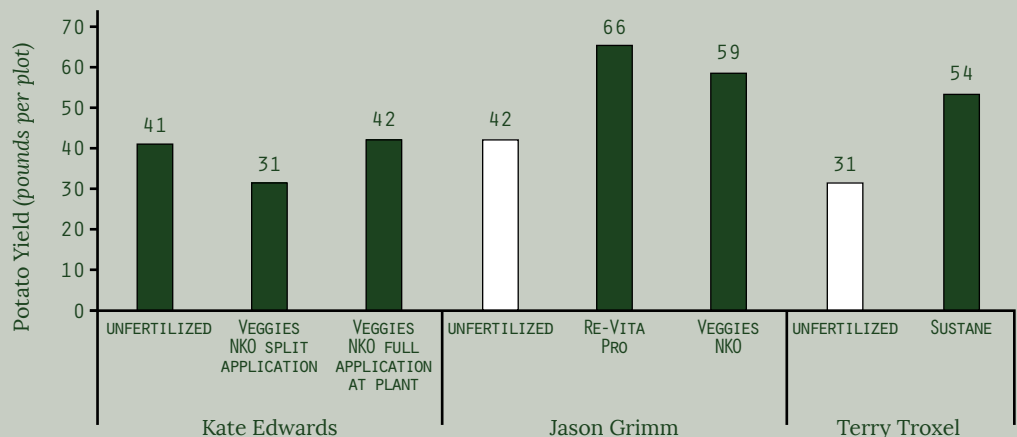
“IT IS SO EASY TO ADD SUSTANE FERTILIZER AND IT IS ECONOMICAL. WHY WOULDN’T I USE IT?”

-TERRY TROXEL

FINDINGS

Jason and Terry both found that fertilized potatoes outyielded unfertilized potatoes. Kate found no differences in yield between fertilized and unfertilized potatoes. Terry found that increased yields were attributed to the fertilizer producing more big potatoes in than the unfertilized treatment. Fertilizing did not, however, produce bigger individual potatoes than the unfertilized treatment.

STATISTICAL ANALYSIS REVEALED THAT FERTILIZER HAD NO EFFECT AT KATE EDWARDS’ FARM, WHILE JASON GRIMM AND TERRY TROXEL IMPROVED YIELDS WITH THE FERTILIZERS THEY TRIALED.



Holganix Bio 800+ Compost Tea for Corn

COOPERATOR

Jack Boyer, *REINBECK, IOWA*

PFI cooperators, including Jack Boyer, have a long history of testing biological products that are marketed to complement or partially replace regular fertilizer or pest management programs, or both. These products frequently claim to boost crop yields, improve soil health and enhance ecosystem services like nutrient cycling. However, most research from PFI and other on-farm and academic researchers has shown that these types of products generally do not affect yield.

Holganix Bio 800+ is a commercial compost tea marketed as containing hundreds of different genera and species of soil microbes that can promote plant growth and enhance soil ecosystem processes, such as breaking down organic matter, cycling nutrients and fixing nitrogen. For this trial, Jack investigated whether adding Holganix Bio 800+ to his typical corn fertilizer program would boost corn yield. All acres in the trial received Jack's typical fertilizer regimen. In the treatment plots, he added Holganix Bio 800+, applying it at manufacturer-recommended concentrations at corn planting.



CORN PLANT ROOTS PULLED FROM JACK BOYER'S TRIAL FIELD IN JULY. CORN FROM THE CONTROL TREATMENT IS ON THE LEFT; CORN FROM THE HOLGANIX BIO 800+ TREATMENT IS ON THE RIGHT.

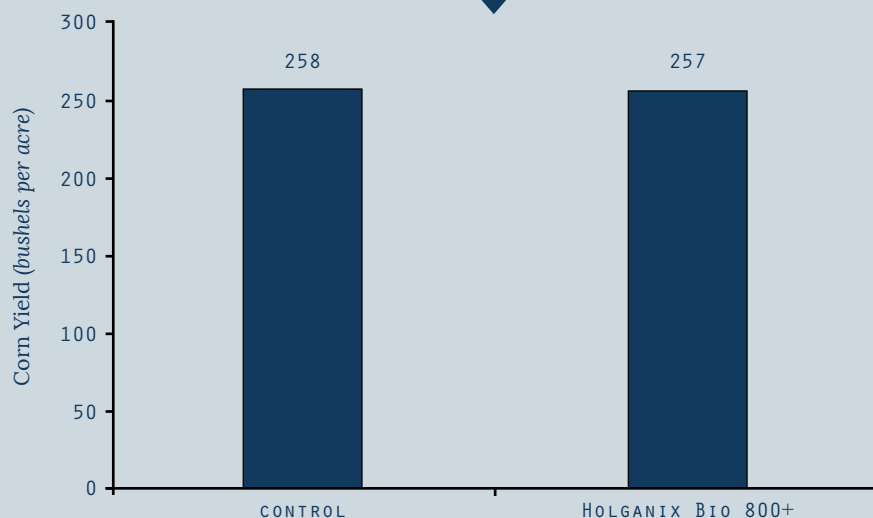
"[HOLGANIX BIO 800+] DIDN'T LIVE UP TO ITS PROMOTIONAL ADVERTISING. I CONTINUE TO EVALUATE VARIOUS BIOLOGICAL PRODUCTS, BUT TO DATE I HAVEN'T FOUND ANY THAT PROVIDE ECONOMIC BENEFITS."

- JACK BOYER

FINDINGS

Holganix Bio 800+ did not affect corn yield and cost an extra \$20 per acre to apply compared to Jack's typical fertilizer program. Jack plans to continue his annual practice of evaluating other new biological products to see if they live up to their hype by increasing yields and profits.

STATISTICAL ANALYSIS DETERMINED NO EFFECT OF HOLGANIX BIO 800+ ON CORN YIELD COMPARED WITH THE UNTREATED CONTROL.



Can We Reduce N Rates to Corn and Improve ROI?

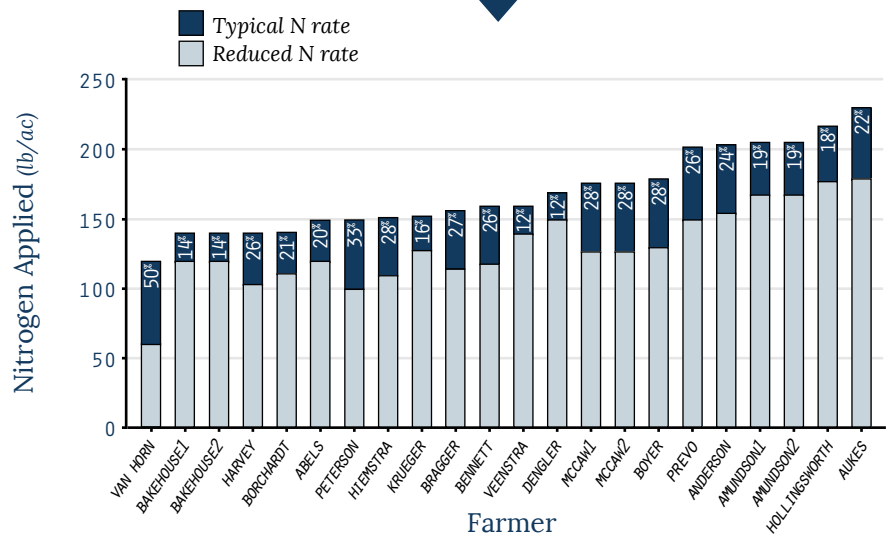
COOPERATORS

Fred Abels, HOLLAND, IOWA; Alec & Rachel Amundson, OSAGE, IOWA; Nathan Anderson, AURELIA, IOWA; Terry Aukes, LARCHWOOD, IOWA; Jon Bakehouse, HASTINGS, IOWA; Sam Bennett, GALVA, IOWA; Vaughn Borchardt, FENTON, IOWA; Jack Boyer, REINBECK, IOWA; Joe Bragger, INDEPENDENCE, WISCONSIN; Sean Dengler, TRAER, IOWA; Robert Harvey, REDFIELD, IOWA; Josh Hiemstra, BRANDON, WISCONSIN; J.D. Hollingsworth, PACKWOOD, IOWA; Keaton Krueger, OGDEN, IOWA; Ross McCaw, MARENGO, IOWA; Mark Peterson, STANTON, IOWA; Kevin Prevo, BLOOMFIELD, IOWA; John Van Horn, GLIDDEN, IOWA; Kevin Veenstra, GRINNELL, IOWA

In fields with long-term soil health-building practices, corn farmers compared yields, finances and greenhouse gas (GHG) emissions at their typical nitrogen rate with those observed at a reduced rate. Nineteen farmers performed 22 replicated strip trials testing their typical N rate against that rate reduced by 12%-50%. If farmers can maintain corn yields and/or save money at the reduced N rate, results might spark confidence to reduce (or at least question) fertilizer rates going forward.

On the other hand, if the reduced N rate lowers corn yields and loses money, farmers will still have gained valuable information: They can be more confident that their typical rate is the right rate for their farm, but maybe new long-term practices could help reduce it in the future.

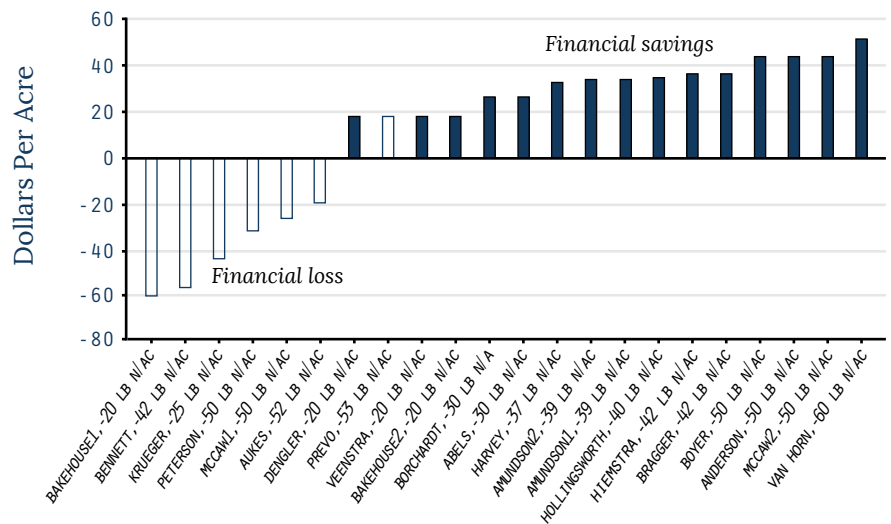
TYPICAL N RATES RANGED FROM 120-232 LB N/AC
On average, rates were reduced by 23% (20-60 lb N/ac lower than typical rate)



TWENTY-TWO TRIALS TESTED TWO NITROGEN APPLICATION TREATMENTS IN THE 2023 GROWING SEASON. THE GRAPH SHOWS A COOPERATOR'S TYPICAL N RATE (DARK BLUE BAR), CHOSEN REDUCED N RATE (LIGHT BLUE BAR) AND THE REDUCTION RELATIVE TO THE TYPICAL RATE (WHITE TEXT).

YIELD REDUCTIONS ARE NOT INDICATIVE OF FINANCIAL OUTCOMES Sixteen farms saw savings when reducing N

CHANGE IN FINANCIAL OUTCOMES (COLUMNS) AND CORN YIELD (SOLID, OPEN) WITH REDUCED N RATE. THE X-AXIS LABELS LIST EACH FARMER AND THE AMOUNT THEY REDUCED THEIR TYPICAL N RATE TO ACHIEVE THE REDUCED N TREATMENT, ORDERED BY THEIR CHANGE IN FINANCIAL OUTCOMES WHEN REDUCING N RATES. THE Y-AXIS PRESENTS THE FINANCIAL OUTCOME IN THE REDUCED N TREATMENT RELATIVE TO THE TYPICAL N TREATMENT. SOLID COLUMNS INDICATE NO SIGNIFICANT CORN YIELD RESPONSE TO REDUCING N RATE. OPEN COLUMNS INDICATE A SIGNIFICANT NEGATIVE CORN YIELD RESPONSE TO REDUCING N RATE.



FINDINGS

Seven of the 22 trials (32%) 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 financial returns.

Using an average fertilizer cost (\$0.86/lb N) and average corn price (\$5.02/bu), 16 farms (73%) saved money in the reduced N treatment. Kevin Prevo was one of the farmers who saw lower corn yields at the reduced N rate, but he didn't suffer a financial loss: The revenue drop from a cut to corn yield was more than covered by the reduced cost of applying less N.

All farms decreased GHG emissions by reducing N fertilizer. For the 16 farms that could do so while also saving money, we calculated that those farmers would have to apply their reduced N rate to only 22–65 acres on their farms to offset the average annual emissions of a single vehicle. That is a climate-smart win-win for farming and the environment.

"I LOVE REPLICATED TRIALS LIKE THESE. WE'RE ALWAYS LEARNING AND EVERY YEAR IS DIFFERENT."

– KEVIN PREVO

J.D. Hollingsworth

Packwood, Iowa

Farm overview: No-till corn and soybeans with cereal rye, turnip, radish cover crops; hog manure.

Typical N rate: 218 lb N/ac as manure, preplant and at-plant fertilizer

Reduced N rate: 178 lb N/ac as manure, preplant and at-plant fertilizer (-40 lb N/ac)

Corn yield, typical N rate: 220 bu/ac

Corn yield, reduced N rate: 218 bu/ac

Cost savings from reduced rate: \$34/ac

Area to apply reduced rate to offset GHG of one car: 32 acres

"Using manure, especially when we apply it early to be able to get our cover crops on early, has its challenges on not knowing how much N you may or may not have lost. Seeing that it may actually pay to reduce our N rate is very exciting!" – J.D. Hollingsworth



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. Four strips will receive your typical fertilizer rate, and four strips 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.

Utrisha N Biological Nitrogen Supplement for Organic Corn

COOPERATORS

Keaton Krueger, OGDEN, IOWA; Scott Shriver, JEFFERSON, IOWA; Noah Wendt, HUXLEY, IOWA

Utrisha N is a fertilizer amendment product that contains nitrogen-fixing bacteria and is marketed as increasing soil nitrogen supply to crops. It is designed to be foliar-applied to a wide variety of crops, including corn, and is certified organic by OMRI. These attributes piqued the interest of PFI cooperators, especially a group of organic farmers who have fewer nutrient management tools available to them.

They wondered if Utrisha N could alleviate N limitation, increase yields and drive financial returns on their farms. Though many other interested cooperators could not participate due to the 2023 drought, Keaton Krueger, Scott Shriver and Noah Wendt did replicated strip trials testing whether adding Utrisha N to their typical fertilizer program provided any yield benefits on their organic (Scott and Noah) or conventional (Keaton) farms.

"THIS [FOLIAR] PRODUCT HAS TO BE APPLIED IN A SEPARATE PASS BECAUSE IT IS NOT COMPATIBLE WITH THE TYPICAL POST APPLICATION PRODUCTS I APPLY. IT ALSO IS VERY SENSITIVE TO CHLORINE, SO THE WATER THAT I USED TO SPRAY IT WITH HAD TO BE LEFT IN THE TANK WITH THE LID OFF FOR A COUPLE DAYS TO USE IT. THESE LIMITATIONS PLUS THE COST MAKE IT UNLIKELY FOR ME TO USE IT ON MY CURRENT OPERATION." - KEATON KRUEGER



CORN WITH SIGNS OF NITROGEN DEFICIENCY IN KEATON KRUEGER'S TRIAL. KEATON OBSERVED MORE SIGNS OF NUTRIENT STRESS IN PLOTS NOT TREATED WITH UTRISHA N FOR SEVERAL MONTHS BUT ULTIMATELY FOUND NO SIGNIFICANT DIFFERENCES IN YIELD BETWEEN THE TWO TREATMENTS. PHOTO TAKEN AUG. 8, 2023.

FINDINGS

Utrisha N applied at V6-V8 stage corn did not increase yield at any of the farms. Applying this product was also a bit challenging and costly due to the need to apply it in a separate pass from other management operations. The lack of a yield boost from Utrisha N echoes previous results from academic research throughout the north-central U.S. It also adds to a growing body of work by PFI cooperators showing no yield responses to a variety of biological amendments over the years.

Utrisha N did not statistically improve corn yields at any location and therefore was more costly than control treatments.			
	TREATMENT	CORN YIELD (bu/ac)	COST TO APPLY UTRISHA N (\$/ac)
Krueger	Control	235	--
	Utrisha N	238	\$17.18
Shriver 1	Control	232	--
	Utrisha N	233	\$22.20
Shriver 2	Control	198	--
	Utrisha N	200	\$22.20
Wendt	Control	189	--
	Utrisha N	183	\$11.50

Brewers Spent Grain as a Soil Amendment for Eggplant

COOPERATOR

Kate Solko & Kyle Maxwell, *ROOT TO RISE FARM, AMES, IOWA*

The spent grain left over after brewing beer, known as brewer’s spent grain or BSG, contains a lot of nutrients and organic matter that make it a potentially useful agricultural fertilizer. Kate Solko and Kyle Maxwell operate Root to Rise Farm on the same property as a brewery. They are excited about the potential of BSG as a soil amendment because using it would let them decrease off-farm inputs and find a use for an otherwise wasted product. To find out, they designed a trial to test how using BSG versus Sustane 8-2-4, their typical organic fertilizer, affects yield and disease pressure in an eggplant crop.

“WE NOW HAVE A GOOD IDEA THAT THE WASTE PRODUCT FROM OUR NEIGHBOR WILL BE A BENEFIT TO US.”

- KATE SOLKO AND KYLE MAXWELL



KATE SOLKO WITH BREWER’S SPENT GRAIN. KATE AND KYLE APPLIED FRESH BSG TO BEDS WITHOUT FIRST COMPOSTING IT. PHOTO TAKEN JUNE 6, 2023.



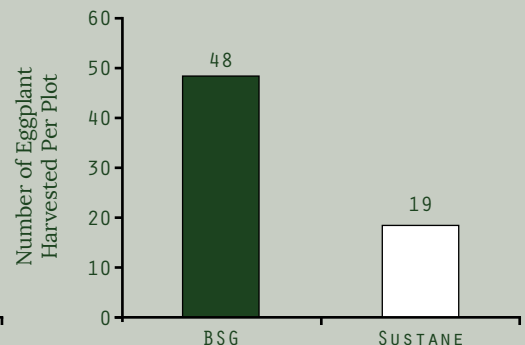
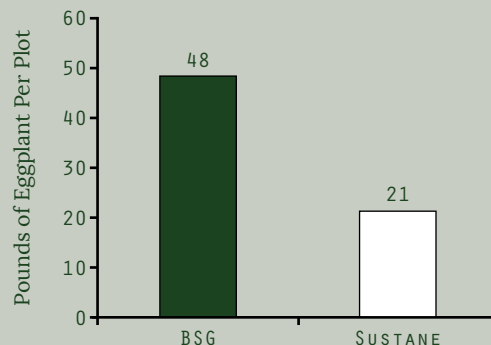
THREE OF THE EXPERIMENT PLOTS ARE IN THE CENTER ROW OF THIS PHOTO, WITH CLEAR DIFFERENCES IN PLANT HEIGHT MARKING THE TRANSITION BETWEEN SUSTANE PLOTS (FRONT AND BACK) AND BSG PLOT (MIDDLE). PHOTO TAKEN AUG. 22, 2023.

FINDINGS

Kate and Kyle found that fertilizing with brewer’s spent grain more than doubled both the number of marketable eggplants and the total weight of marketable eggplant harvested compared to fertilizing with their typical Sustane rate. The two treatments were compositionally very different; BSG is raw organic matter, while Sustane is a concentrated nutrient product without much associated organic matter.

Thus, it’s not possible to determine what application rates or features of the fertilizers drove this difference in yield. Nevertheless, the trial demonstrates that BSG can support healthy and high-yielding plants. Kate and Kyle are eager to keep experimenting with BSG and may trial bioprocessing the BSG through fermentation or composting before applying it in the 2024 growing season.

STATISTICAL ANALYSIS DETERMINED THAT BSG MORE THAN DOUBLED BOTH THE WEIGHT (LEFT) AND NUMBER (RIGHT) OF EGGPLANT HARVESTED PER PLOT.



On The Horizon

In December 2023, about 90 current and would-be Cooperators' Program participants gathered in Ames, Iowa, to share their results from 2023 and make plans for future research projects. The work currently underway includes both extensions of projects featured in previous pages as well as entirely new efforts. Beyond the specific objectives of the projects listed below, cooperators tell us that personal growth and interest in learning are largely what motivates them.

Field Crops

- Biochar as a Seed Treatment for Corn
- Biologicals for Reducing Fertilizer Rate for Corn
- Can We Reduce N Rates to Corn and Improve ROI?
- Do Cover Crops Increase the Number of Days Suitable for Field Work?
- Interseeding Cover Crops to Corn in 60-in. Rows
- N Application to Cereal Rye Cover Crop for Roll-Crimping Ahead of Soybeans
- Red Clover Cover Crop Frost-Seeding Rate
- Soybean Maturities in Delayed Termination Rye Cover Crop
- Soybean Planting Date Before Roll-Crimping a Cereal Rye Cover Crop
- Strip-Till vs. No-Till for Relay-Cropping With Small Grains
- Strip-Till vs. No-Till Soybeans or Corn Following a Cover Crop

Horticulture

- Biochar as a Seed Treatment or Soil Amendment for Vegetables
- Brewer's Spent Grain as a Soil Amendment for Eggplant
- Drip Irrigation for Red and White Potatoes
- Effect of Covering Brassicas Seeded for Transplants
- Fertilizer Rate for Organic Potatoes
- Growing Tomatoes for Seed vs. Sale
- Onion Variety Trial
- Planting Date for Red and White Potatoes
- Radish Varieties for Summer Production
- Shading Cool-Season Crops for Summer Harvest
- Sweet Pepper Variety Trial
- Tarping and Allelopathic Cover Crop for Perennial Weed Management
- Tarping for No-Till Annual Weed Suppression

Livestock

- Effect of Bale Grazing on Pasture
- How Does Weaning Time Affect Growth of Goat Kids?
- Sprouted Grains for Lactating Goats

Meanwhile, we're already looking ahead to projects that will start this fall and continue into the 2025 growing season. Let us know if you'd like more information about any of these opportunities:

- Alternative Cover Crops to Cereal Rye for Corn or Soybeans
- Can We Reduce N Rates to Corn and Improve ROI?
- Do Cover Crops Increase the Number of Days Suitable for Field Work?
- Effect of Bale Grazing on Pasture
- Timing of Grazing Newly Planted Native Grasses Effect on Species Survival
- Wide-Row Cover Crops Ahead of Corn

Acknowledgements

Thank you to the organizations and agencies who provide funding for our Cooperators' Program:

- Cargill, Success from the Ground Up grant
- Ceres Trust
- Foundation for Food & Agriculture Research under grant number 22-000243
- Stranahan Foundation
- USDA, Agricultural Marketing Service through grant 23SCBPIA1187.
- U.S. Department of Agriculture, under agreement number NR216114XXXXG003
- U.S. Department of Agriculture, under agreement number NR216114XXXXG004
- U.S. Department of Agriculture, under agreement number NR243A750004G023
- Walton Family Foundation



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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,

Stefan Gailans

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