
PRACTICAL FARMERS OF IOWA
COOPERATORS' PROGRAM
FARMER-LED RESEARCH
2019 Cooperators' Program Report
PRACTICALFARMERS.ORG/RESEARCH

"When I think about my progress as a farmer and a person and as a PFI cooperator... I used to think that I had more answers than I do now. Now I'm more content to say simply 'Taste this. Appreciate this. And wonder at all this.'"

– Mark Quee
2019 PFI Master Researcher Award Recipient

PRACTICAL FARMERS of Iowa

OUR MISSION

Equipping farmers to build resilient farms and communities.

OUR VISION

An Iowa with healthy soil, healthy food, clean air, clean water, resilient farms and vibrant communities.

OUR VALUES

Welcoming everyone

Farmers leading the exchange of experience and knowledge

Curiosity, creativity, collaboration and community

Resilient farms now and for future generations

Stewardship of land and resources

STAFF CONTACTS

STEFAN GAILANS | RESEARCH AND FIELD CROPS DIRECTOR | *stefan@practicalfarmers.org*

HAYLEY NELSON | RESEARCH ASSISTANT | *hayley@practicalfarmers.org*

LIZ KOLBE | HORTICULTURE AND HABITAT PROGRAMS MANAGER | *liz@practicalfarmers.org*

MEGHAN FILBERT | LIVESTOCK PROGRAM MANAGER | *meghan@practicalfarmers.org*

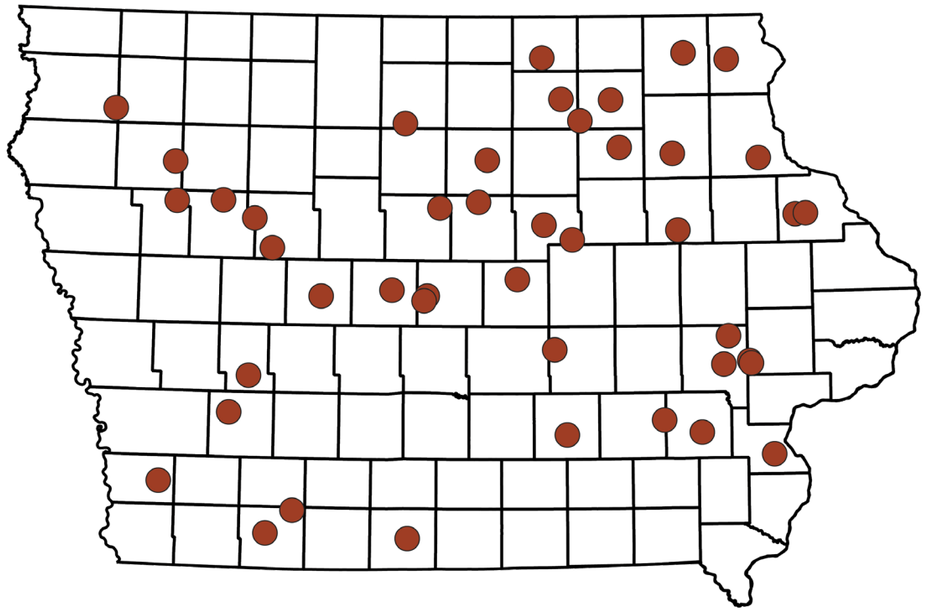
CELIZE CHRISTY | NEXT GENERATION COORDINATOR* | *celize@practicalfarmers.org*

**FORMERLY SWINE AND POULTRY COORDINATOR*

TABLE OF CONTENTS

Full research reports can be found at **practicalfarmers.org/research.**

2019 FARMER-LED
RESEARCH PROJECT LOCATIONS



IN 2019, 50 COOPERATORS CONDUCTED 72 RESEARCH TRIALS.

Practical Farmers' Cooperators' Program involves a community of curious and creative farmers taking a scientific approach to improving their farms. Farmers in the program conduct timely and relevant research to answer their most pressing farming questions. Knowledge generated from this farmer-led research is shared widely and helps inform farmers how to be more profitable, how to be better environmental stewards and ultimately, how to make their farms more resilient. Since 1987 when the Cooperators' Program began, more than **240 cooperators** have conducted **1,443 research trials** on their farms.

Each year, cooperators gather in December to share results and observations from their trials. During this meeting, participants also brainstorm new ideas and make plans for future projects under the guidance of PFI staff. These projects often become collaborative efforts among several farmers. When it comes time for conducting the trials, farmers are ultimately the doers – they're responsible for planting seeds, tending to animals and taking measurements throughout a trial.

Valid and reliable farmer-generated information is a cornerstone of the Cooperators' Program. Since the beginning, PFI cooperators have used methods that allow for statistical analysis of their results. Chief among these methods is replication (see figures on opposite page). The farming practices compared in an experimental trial are repeated (replicated) at least three or four times across the field. In the case of trials involving livestock, practices are often compared among two or more groups of animals in a herd or flock. Thus, trial results do not depend on a single comparison only, but on three or more. This approach lends a level of statistical reliability similar to scientific experiments conducted by university researchers.

Cooperators will tell you that conducting on-farm research with this amount of rigor involves a lot of time and effort. But they'll also tell you how worthwhile the effort is for generating reliable, scientifically sound information. So, while PFI cooperators don't have all the answers, they do have a tool for working towards those answers.

Reading the results

In this report, we indicate statistical significance in a couple of ways. Asterisks (*) indicate significant positive or negative responses to a treatment at a particular farm. In other instances, letters ("a", "b", etc.) indicate results that are statistically different from each other. The highest yield or count in a trial is marked with a letter "a." A result marked with a "b" is significantly different from the one marked with an "a," but neither is statically different from a result marked "ab." If no asterisks or letters appear, this means we did not detect a statistical difference.

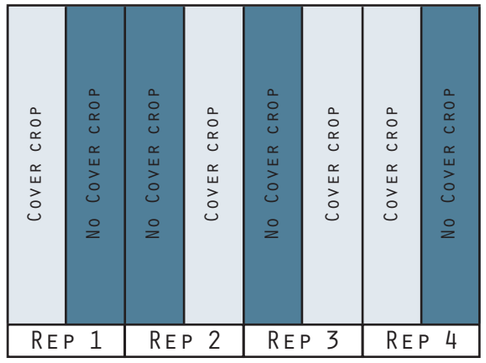


Figure 1. *Sample replicated strip trial design for a cover crop comparison.*

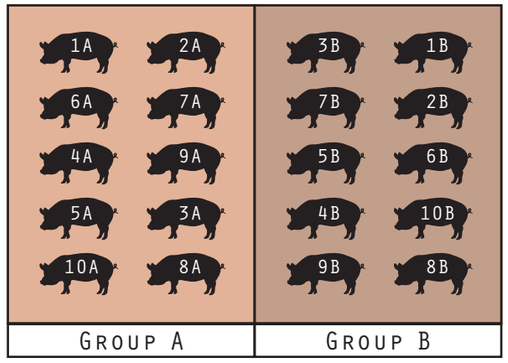


Figure 2. *Sample trial design comparing two groups of hogs fed two different diets.*

PFI farmers continue to design on-farm research projects that explore best ways to implement soil health practices on their farms. Research in 2019 explored how cover crops could potentially reduce pesticide and fertilizer use. Farmers also showed that integrated crop-livestock systems are key to making cover crops and diversified rotations affordable. For instance, participants found that grazing cover crops with cattle can be a profitable enterprise, while feeding pigs small-grains crops raised on the farm can facilitate a diversified crop rotation. Farmers are looking to Practical Farmers of Iowa for ways to successfully incorporate soil health practices on their farms. Uncovering the real-world economic benefits of soil health practices through farmer-led research is one way PFI farmers are answering the call.

In the pages that follow, you'll find summaries of a few research projects conducted in 2019 from our field crops, horticulture and livestock program areas. To dive deeper and learn about more projects – including full descriptions of research design and methodology – read the full reports on our website at ***practicalfarmers.org/research***.

FIELD CROPS

STEFAN GAILANS
Research and Field Crops Director

HAYLEY NELSON
Research Assistant

Field crop farmers are the largest membership contingency at Practical Farmers. Our field crops research focuses heavily on making cover crops and diverse rotations practical and profitable on cooperators' farms. To do that, we conduct research on cover crop and small grains varieties, planting and fertilizer strategies, termination strategies and fitting these practices into farmers' rotations.

2019 RESEARCH

EXPERIMENT

Winter Cereal Rye Cover Crop Effect on Cash Crop Yield

IN PARTNERSHIP WITH IOWA LEARNING FARMS

COOPERATORS

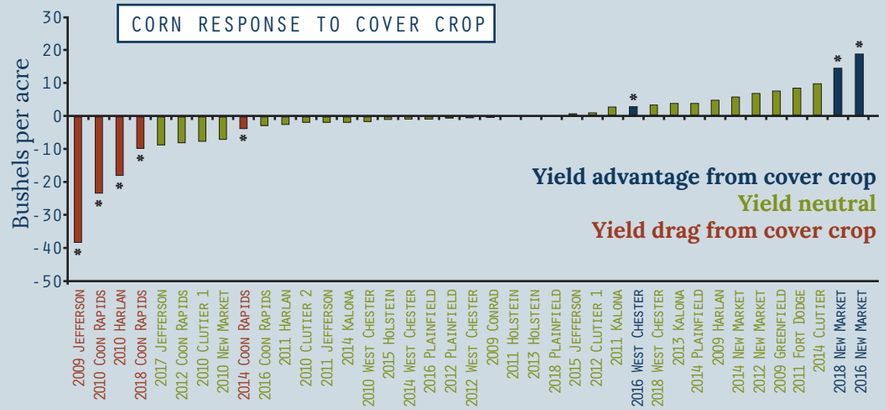
Bill Buman, *HARLAN;* **Randy Caviness,** *GREENFIELD;* **Jim Funcke,** *JEFFERSON;* **Devan Green,** *CONRAD;* **Rick Juchems,** *PLAINFIELD;* **Mark Pokorny,** *CLUTIER;* **George Schaefer,** *KALONA;* **Jerry Sindt,** *HOLSTEIN;* **Rob Stout,** *WEST CHESTER;* **Gary & Dave Nelson,** *FORT DODGE;* **Kelly Tobin,** *NEW MARKET;* **Whiterock Conservancy,** *COON RAPIDS*

Cover crops are known for their ability to prevent the loss of soil and nutrients from farm fields. But how do cover crops ultimately affect corn and soybean yields? In 2008 and 2009, 12 farms began a study to answer that question. Cooperators established and maintained multiple paired strips that ran the length of their fields – half of the strips received cover crops and the other strips were without cover crops. Each farm was in a corn-soybean rotation. Five farms conducted the study for 10 years (Funcke, Juchems, Stout, Tobin and Whiterock). Two cooperators (Stout and Tobin) completed their 10 years with soybean harvest in 2019.

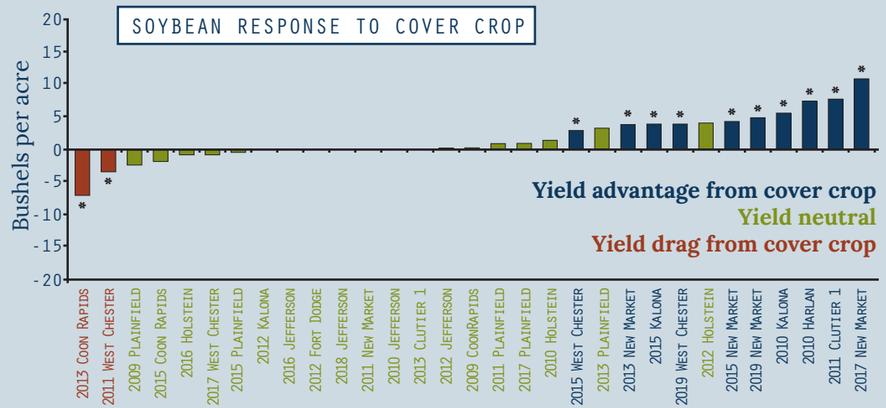
FINDINGS

Since 2008, 39 site-years were dedicated to determining the effect on corn yields and 31 site-years were dedicated to determining the effect on soybean yields. After 10 years of the study, the cooperators reported mostly no effect of the cereal rye cover crop on corn and soybean yield.

Statistical analysis determined that from 2008-2019, the cover crop had a neutral effect on corn yields in 31 of the 39 total instances (green columns). Asterisks indicate the instances where corn yields were either positively (blue) or negatively (red) affected by the cover crop.



Statistical analysis determined that from 2008-2019, the cover crop had a neutral effect on soybean yields in 19 of the 31 total instances (green columns). Asterisks indicate the instances where soybean yields were either positively (blue) or negatively (red) affected by the cover crop.



Planting Corn in 60-in. Row-Widths for Interseeding Cover Crops

COOPERATORS

Fred Abels, *HOLLAND;* **Robert Alexander,** *GRANVILLE;* **Nathan Anderson,** *AURELIA;* **Jack Boyer,** *REINBECK;* **Jeremy Gustafson,** *BOONE;* **Mark Yoder,** *LEON*

The earlier you seed a cover crop, the more you can expect that cover crop to grow and the more you stand to reap its many benefits. Doubling the width of the corn row from the contemporary 30-in. to 60-in. presents the opportunity to interseed a diverse array of cover crops in June and achieve upwards of 4,000 pounds per acre of biomass from those cover crops come corn harvest in the fall. The wide corn rows allow ample sunlight to reach the cover crop. But how does widening the corn row ultimately affect corn yield? This was the second year of on-farm research trials designed to answer that question.

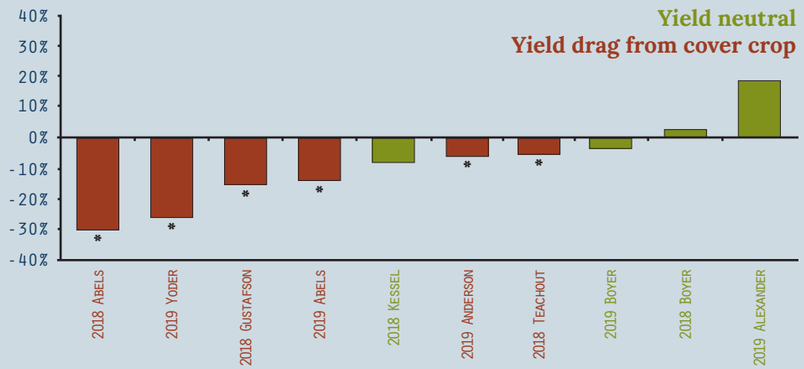
FINDINGS

After two years of on-farm research, planting corn in 60-in. row-widths has resulted in statistically equal grain yields to corn planted in 30-in. row-widths in four of the 10 trials (green columns in figure). In the six other trials, corn yields were reduced by 5–30% when planted in 60-in. row-widths (red columns in figure). When it came to the June-seeded cover crops, the 60-in. row-widths certainly accommodated biomass production. Cover crops interseeded to corn in 60-in. row-widths produced over 2,000 pounds per acre of biomass at two of the farms in 2019 (5–25 times as much produced in 30-in. corn rows). This represents the major appeal to planting corn in 60-in. row-widths: More cover crop biomass means more opportunities for livestock grazing in the fall. The cooperators also cited increasing cover crop diversity on their farms as motivation for conducting these trials. For interseeding cover crops into 60-in corn to gain broader appeal, more farmers like the cooperators in this trial will need to navigate the challenges and benefits of this practice.

"I wanted to see if I could maintain crop yields in 60-in. row-widths relative to 30-in. row-widths while growing cover crop biomass significant enough to have some grazing value."

– NATHAN ANDERSON

CORN YIELD – % RESPONSE TO 60-IN. ROW-WIDTHS



Statistical analysis determined that corn planted in 60-in. row-widths yielded 5–30% less than corn planted in 30-in. row-widths at six farms in 2018–2019, as indicated by the asterisks (red).

Cover crops interseeded to corn in 30-in. row-widths (left) and 60-in. row-widths (right) at Nathan Anderson's on July 18 (top row) and Sept. 19 (bottom row).

Camelina Cover Crop for Corn and Soybeans

COOPERATORS

Bill Frederick, *JEFFERSON;* **Wendy Johnson,** *CHARLES CITY;* **Rob Stout,** *WASHINGTON*

Winter cover crops in corn-soybean production systems in Iowa are mostly limited to small-grain species like cereal rye or winter wheat because of their ability to successfully overwinter when seeded in early fall. Even so, farmers who have used cereal rye cover crops for over five years have begun to express interest in finding alternative, successful, non-small-grain cover crops for corn-soybean production systems. Andy Lenssen, professor of agronomy at Iowa State University, has recently been experimenting with camelina, a winter-hardy brassica species that has shown promise as a cover crop in experiments conducted on university research stations. In 2018, Andy offered the chance for PFI cooperators to try camelina as a cover crop on their farms. He provided the seed and the cooperators planted strips of camelina following corn or soybean harvest.

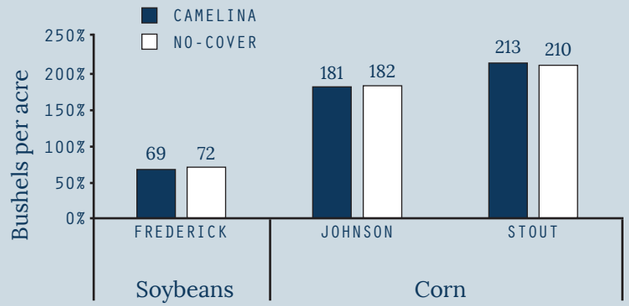
"I think camelina has a lot of potential as a cover crop. Low seeding rates because of its small seed size will lower application costs."

– BILL FREDERICK

FINDINGS

The camelina cover crop emerged in the fall at all farms but only successfully overwintered at Bill's and Rob's; the camelina suffered winterkill at Wendy's (the northern-most farm involved). In spring 2019, the camelina grew to 6–11 in. tall at Bill's and Rob's before they terminated the cover crop and planted soybeans and corn, respectively. Across all three farms, corn and soybeans produced statistically equal yields between the camelina and no-cover-crop treatments. This is an important finding that echoes the results of a long-term on-farm study coordinated by Iowa Learning Farms and PFI that showed cover crops had a mostly neutral effect on corn and soybean yields. Because the camelina cover crop failed to overwinter at one farm in this project, more work on best management practices should probably be conducted before camelina is used as cover crop on a wider scale in Iowa.

CROP YIELDS



Statistical analysis determined no significant difference in soybean or corn yields.

Camelina cover crop at Bill Frederick's farm near Jefferson on May 4, 2019. The camelina was seeded Oct. 5, 2018.

EXPERIMENT

Cereal Rye Cover Crop for Reducing Herbicides in Soybeans

COOPERATOR | **Sam Bennett,** *GALVA*

Based on previous on-farm research he has conducted, Sam Bennett has seen evidence that a cereal rye cover crop can suppress weeds and reduce herbicide inputs in soybeans. To build on those findings, in this project he grew soybeans following a cereal rye cover crop and compared three herbicide packages that varied in residual activity and cost. Sam hypothesized that as long as he had adequate cover crop growth in the spring, he could reduce herbicides without sacrificing weed control or soybean yield. "We're always trying to answer the question of how to make covers pay for themselves," Sam said.

"I'm building confidence that I can rely on the cover crop more heavily, and build a lower cost and reduced chemistry herbicide program around the cover crop."

– SAM BENNETT

SAM BENNETT

FINDINGS

Soybean yields were statistically equivalent between the full- and low-cost herbicide packages. Among all three herbicide packages tested, Sam scored top returns on investment with the low-cost package. Because yields between the low-cost and full herbicide packages were statistically similar, returns on investment for the low-cost package were greater by $16.08/ac, owing to reduced costs (less herbicide used). Moreover, Sam observed very low weed pressure across all packages. With proper management, it seems that farmers could reallocate some expenses typically spent on herbicides to cover crop seed and planting. In addition to weed suppression, farmers would reap other proven environmental benefits of cover crops such as reduced soil erosion, reduced nutrient loss and improved soil porosity and water infiltration.

SOYBEANS GROWING IN COVER CROP RESIDUE ON JUNE 6, 2019 AT SAM BENNETT'S.

Soybean yields, treatment costs, revenues and returns on investment.

Herbicide package	Soybean yield (bu/ac)	Treatment cost ($/ac)	Revenue @ $8.30/bu ($/ac)	Return on investment ($/ac)
Low-cost	**58 ab**	**$24.50**	**$480.57**	**$456.07**
Intermediate	**57 b**	**$32.29**	**$476.42**	**$444.13**
Full	**59 a**	**$52.20**	**$492.19**	**$439.99**

Low-cost = glyphosate (May 17); glyphosate (June 26).

Intermediate = glyphosate+Engenia (May 17); glyphosate (June 26).

Full = glyphosate+Engenia (May 17); glyphosate+generic Dual+Clethodim+generic Firstrate (June 5).

Statistical analysis determined significant soybean yield differences among the herbicide packages as indicated by the different letter-rankings.

EXPERIMENT

Does Repeated Use of a Cereal Rye Cover Crop Reduce the Need for N Fertilizer for Corn?

COOPERATOR | **Jack Boyer,** *REINBECK*

Jack Boyer has been planting a cereal rye cover crop in a corn-soybean rotation on his farm for over six years. Because Jack knows that a cover crop can improve soil, he was curious if the N fertilizer rate he applies to corn could be reduced due to several years of repeated cover crop use. He compared his typical N rate (180 lb N/ac) with a reduced rate (130 lb N/ac). Jack hypothesized that corn yields would be comparable between the two N fertilizer rates; as such, reducing the N rate would be more profitable due to lowered input costs.

"This trial was worthwhile because it showed I was able to reduce N input without reducing yield."

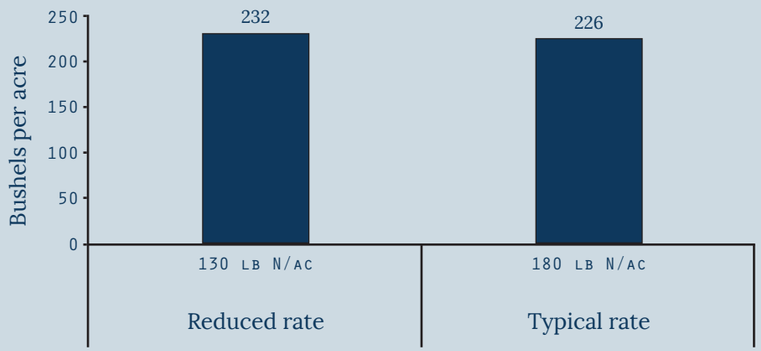
– JACK BOYER

JACK BOYER

FINDINGS

Just as Jack had suspected, he was able to maintain corn yields while reducing his N fertilizer rate by 50 lb N/ac. In this case, applying 130 lb N/ac compared to 180 lb N/ac reduced Jack's costs by $26/ac. Without any loss in corn yield, those reduced costs directly translated to $26/ac in improved economic returns. Jack has been using a cereal rye cover crop in his corn-soybean rotation because he knows this practice is beneficial to the soil and reduces loss of nutrients, like N, to the environment. After six years of using a cereal rye cover crop and capturing those environmental benefits on his family's farm, it now appears that he is also capturing economic benefits as well owing to reduced N fertilizer costs. Encouraged by these results, Jack wonders if he can further reduce his N fertilizer rate and improve returns.

CORN YIELDS



STATISTICAL ANALYSIS DETERMINED NO SIGNIFICANT DIFFERENCE IN YIELD BETWEEN THE TWO N RATES.

HORTICULTURE

LIZ KOLBE
Horticulture and Habitat Programs Manager

With interest growing for Iowa fruit and vegetable production, the number of Practical Farmers members who raise these crops is increasing, too. These farmers are interested in conducting on-farm research to create profitable, diverse farms. Current priorities for horticulture research include enterprise budgets, season extension, variety selection, fertility, pollinator services and pest and weed management.

2019 RESEARCH

CABBAGE VARIETY TRIAL
Carmen Black, Kate Edwards, Emily Fagan

CAULIFLOWER VARIETY TRIAL
Rob Faux, Mark Quee, Shanti Sellz

HEIRLOOM TOMATO VARIETY TRIAL
Rob Faux

ONE-CUT LETTUCE VARIETY TRIAL
Jordan Scheibel, Jon Yagla

SWEET POTATO ENTERPRISE BUDGET
Kate Edwards, Emily Fagan, Jordan Scheibel, Jon Yagla

TEA BAG DECOMPOSITION IN AGROFORESTRY AND CROP FIELDS
Kathy Dice & Tom Wahl

ORGANIC CONTROL OF SQUASH VINE BORER IN WINTER SQUASH
Mark Quee, Julia Slocum

EXPERIMENT

Organic Control of Squash Vine Borer in Winter Squash

COOPERATORS | **Mark Quee,** *SCATTERGOOD FARM, WEST BRANCH;* **Julia Slocum,** *LACEWING ACRES, AMES*

Squash vine borers can be devastating pests to cucurbit crops and are difficult to control with organic methods. In this trial, Julia Slocum and Mark Quee used a randomized, replicated design to compare five organic methods of squash vine borer control in susceptible winter squash varieties.

In 2020, two different farmers are continuing trials with row covers in winter squash. Their objective is to determine the optimal time to remove row covers to achieve sufficient pollination and effective protection against squash bugs.

"Vine-borer damage has been increasing the past four years and I need to figure out a way to control them. I'm seeking the most effective and time-efficient organic method to control them."

– MARK QUEE

Row cover being applied to treatment plots at Scattergood Farm.

Julia Slocum

FINDINGS

Row cover was the most effective control practice on both farms. For Mark, this meant a larger harvest from those plots with less labor; all other treatments required weekly applications and were not as effective, while the row cover was applied in late June and removed in mid-July. For Julia, the row cover kept plants alive longer than the other treatments, but all plants in her trial eventually were killed by squash vine borers prior to harvest. However, she still gained valuable knowledge. Because she learned that she doesn't presently have an effective organic control strategy for squash vine borer, she determined that her CSA is better served by partnering with another farmer to provide squash for her boxes.

Plant survival and yield of Blue Hubbard squash at Mark Quee's

Treatment	Plants living at 8 weeks	Plot yield (lb/plot)	Plot count (fruit count/plot)
Bt	1.7 b	9.10	1.33 b
Control	2 b	9.17	1.33 b
Gauze	2.3 ab	14.83	2.33 ab
Row Cover	5.7 a	21.40	4.33 a
Spinosad	2.7 ab	13.63	1.67 ab

Plot size was 8 plants on 30-in. spacing, 8 ft between rows (160 ft^2).

Statistical analysis determined differences among treatments for the number of living plants at week 8 and for the number of fruit produced per plot. Values followed by different letters are considered statistically different.

EXPERIMENT

One-Cut Lettuce Variety Trial

COOPERATORS | **Jordan Scheibel,** *MIDDLE WAY FARM, GRINNELL;* **Jon Yagla,** *MILLET SEED FARM, IOWA CITY*

Salad greens are prized crops for vegetable growers. During 2017 and 2018, farmers conducted variety trials on head lettuces to search for the most heat-tolerant varieties for their farm. Jordan Scheibel and Jon Yagla were interested in a similar variety trial comparing production of Salanova varieties with Eazyleaf varieties for mini-heads and salad mix, particularly during the hot summer months. Both farmers planted four replications of Salanova and Eazyleaf lettuce varieties in randomized, replicated trials. They measured yield and scored varieties for quality characteristics.

Jon Yagla and Jordan Scheibel design their lettuce variety trial during the 2018 Cooperators' Meeting.

"I liked the Salanovas better; I think they work better as a series. I did order more green varieties than red varieties, and particularly ordered more Green Sweet."

– JORDAN SCHEIBEL

A recently transplanted lettuce trial at Millet Seed Farm.

FINDINGS

Varieties from both series (Eazyleaf and Salanova) performed similarly, overall. At Jon's farm where there were statistical differences in yield, green varieties from both lettuce series out-performed red varieties. Stanford, a red Eazyleaf variety, had issues with bolting and flavor on both farms. Both farmers were impressed with how well the Eazyleaf lettuces, which are less expensive, performed compared with the Salanova lettuces. Looking ahead at future production, Jon decided not to continue with one-cut lettuces at all, instead saving the space for full-sized head lettuce which does well for him. Though Jordan was impressed with some Eazyleaf varieties, he decided to only reorder Salanovas for 2020 production. "I liked the Salanovas better; I think they work better as a series. I did order more green varieties than red varieties, and particularly ordered more Green Sweet."

Yield and yield characteristics at Jon Yagla's.

Succession	Variety	Heads harvested (%)	Head weight (lb)
S1	Ezrilla (E)	97%	0.23
	Green Sweet Crisp (S)	100%	0.24
	Red Butter (S)	100%	0.15
S2	Ezrilla (E)	59% ab	0.32
	Green Sweet Crisp (S)	88% a	0.27
	Red Butter (S)	78% a	0.15
	Stanford (E)	34% b	0.11
S3	Ezrilla (E)	91% a	0.23 a
	Green Sweet Crisp (S)	97% a	0.27 a
	Red Butter (S)	72% a	0.12 b
	Stanford (E)	44% b	0.10 b

(E) indicates an Eazyleaf variety; (S) indicates a Salanova variety.

Statistical analysis determined differences among varieties for heads harvested in successions 2 and 3 and for head weight in succession 3. Values followed by different letters are considered statistically different.

EXPERIMENT

Cabbage Variety Trial

COOPERATORS

Carmen and Maja Black, *SUNDOG FARM, SOLON;* **Kate Edwards,** *WILDWOODS FARM, IOWA CITY;* **Emily Fagan,** *HUMBLE HANDS HARVEST, DECORAH*

Farmers in Iowa are curious about how heat-tolerant cabbage varieties developed on the East Coast will perform in Iowa's hot and humid summers. To be able to provide customers with summer cabbages for coleslaw season, three farms compared four cabbage varieties – Caraflex, Capture, Farao and Primo Vantage – to determine which performed best, in yield and quality, on their farms.

Carmen and Maja Black

Emily Fagan weighs cabbage by plot for the cabbage variety trial.

Kate Edwards

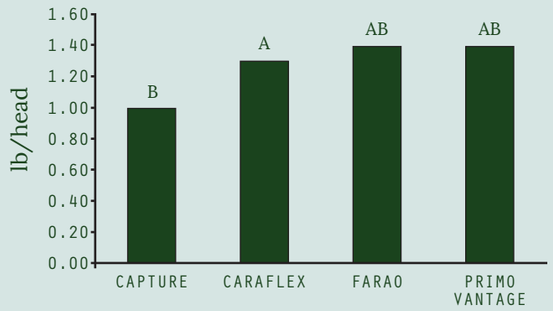
FINDINGS

All farmers in the trial liked Farao, Primo Vantage and Caraflex; most plan to grow all three again. Capture was a new variety, and did not perform well on any of the farms. Farmers thought perhaps this was either a bad seed year or the variety struggled with Iowa's summer heat. Kate noted that CSA members who were not typically excited about getting cabbage were excited about getting a Caraflex (conical) cabbage. So even if cabbage heads tended to be smaller, the variety is still worth it for her farm. Emily reported that she will definitely continue growing Farao and Primo Vantage, which had the highest yields and scored well on their resistance to black rot and splitting. "The quality measurements are really important to me. It doesn't matter what the cabbage weighs; if it's ugly no one will buy it." All three farmers intend to trial more summer cabbage varieties in 2020, and are hoping drier planting conditions during May will allow them to move the trial forward a couple of weeks.

"The quality measurements in this trial are really important to me. It doesn't matter what the cabbage weighs; if it's ugly no one will buy it."

– EMILY FAGAN

CABBAGE WEIGHT BY VARIETY AT EMILY FAGAN'S



Statistical analysis determined Farao and Primo Vantage produced the largest heads as indicated by the letters above the columns.

EXPERIMENT

Tea Bag Decomposition in Agroforestry and Crop Fields

COOPERATORS

Kathy Dice & Tom Wahl, *RED FERN FARM, WAPELLO*

Using tea bags is a cost-effective and standardized method to measure the decomposition rate of organic matter in soils. Some research warns that certain ecosystems may not be as well suited to the method (such as marshes), and that comparisons between ecosystems may not be prudent due to differing temperature and moisture availability. For this trial, Kathy Dice buried black and green tea bags in five perennial agroforestry systems, and also buried tea bags in one conventional corn/soy field. Mass loss of the tea bags indicates decomposition due to microbial activity and could serve as a proxy for soil health. Generally, the more microbial activity, the healthier the soil.

"I really don't trust the data we ended up with because of the issue with the scale and the roots. I'm ready to do it again!"

– KATHY DICE

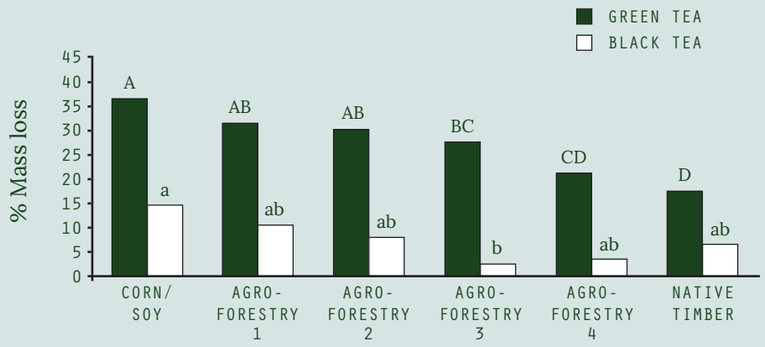
Kathy Dice (far right), Tom Wahl and their children Theresa and James

Connor Dunn, Red Fern Farm Intern, digs holes to bury tea bags for the trial.

FINDINGS

The results show there was very little statistical difference in the mass loss, particularly with the black tea. Interestingly, the corn/soy treatment had the most mass loss for green and black tea. But Kathy encountered several issues during the tea bag trial that she felt impaired the usefulness of the data, including interference of raccoons, split tea bags, extensive rootlet growth within the mesh of the teabag and imprecision of her scale (different weights on consecutive measurements of the same tea bag). Kathy is running the trial again in 2020 with several adjustments. First, she has purchased and tested a more precise scale for weighing tea bags. Second, she will only leave the tea bags buried for 10 days.

MASS LOSS OF TEA BAGS BY SITE



Statistical analysis determined differences in the amount of tea decomposition (mass loss) among the treatments as indicated by the uppercase letters above the green tea columns and lowercase letters above the black tea columns.

LlivestocK

MEGHAN FILBERT
Livestock Program Manager
CELIZE CHRISTY
Next Generation Coordinator
(formerly Swine and Poultry Coordinator)

Practical Farmers' livestock program represents a diverse suite of livestock farmers, encompassing beef cattle, swine, poultry, sheep, goat and dairy operations. Many of these farmers are raising livestock on pasture and practicing regenerative farming practices such as rotational grazing, integrating livestock and crops, and grass finishing. Grazing cover crops, diverse perennial and annual forages; feeding small grains to swine; and soil health through livestock integration have been identified as priorities in recent years.

2019 RESEARCH

EXPERIMENT

Economic and Soil Health Impacts of Grazing Cover Crops

COOPERATORS

Perry Corey, *LAKE CITY;* **Wesley Degner,** *LYTTON;* **Bill Frederick,** *JEFFERSON;* **Zak Kennedy,** *ATLANTIC;* **Mark Schleisman,** *LAKE CITY;* **Seth Smith,** *NEMAHA*

Evidence has been mounting around the profits that can be achieved when livestock graze cover crops. Grazing cover crops can benefit soil health, but the effects are longer-term and require proper grazing management.

Six cooperators, each integrated cattle-crop farmers, grazed cover crops in the fall, winter and/or spring. To determine the economic and soil health impact of grazing cover crops, the cooperators kept cover crop and grazing records and had their soil sampled in May 2019. The forage value of cover crops on each farm was estimated using ISU's Ag Decision Maker Economics of Cover Crops tool.

The project, funded by the Iowa Department of Agriculture and Land Stewardship (IDALS), began in 2015 strictly to quantify economic impacts from grazing cover crops. In 2019, soil health sampling was added to data collection. Data will continue to be collected through 2021.

Bill Frederick's cattle grazing cover crops in the spring.

Zak Kennedy

FINDINGS

Each cooperator profited from grazing cover crops within the year of planting. Profits averaged $76.48/ac, and varied on each farm due to cover crop and grazing management. The value of feed replaced by grazing assumes cattle would have been fed hay valued at $150/ton if cover crops were not available to graze. This calculation takes into account the expenses and revenue (such as cost-share) associated with cover crop grazing, number of cattle grazed, average weight of livestock, number of grazing days, and cooperator estimates of dietary needs provided by supplemental feed and crop residue. Farmers found they were able to save money by feeding less hay and other stored feed when cattle were grazing cover crops.

Soil was sampled from three treatment fields: cover crops with no grazing, grazed cover crops and from fields with no cover crops with no grazing. Samples from May 2019 show no detectable trends in soil health indicators among farms, and the impact of livestock integration may take more time to manifest.

Grazing cover crops continues to be a way to achieve short-term economic benefits that pay off in one year. More data is needed to show relationships between cover crop grazing and soil health.

Zak Kennedy found he did not have to feed any hay over a 37-day period while his cattle grazed a rye cover crop from April 14 to May 21, 2019 and stated, *"If a farmer can incorporate livestock into cover crops, it's hard to deny it works."*
– ZAK KENNEDY

Average net profit per acre, per animal unit (AU) and costs saved per AU per day from grazing cover crops on six farms in 2018-2019.

Net profit/ac	**$76.48**
Net profit/AU	**$61.17**
Cost saved/AU/day	**$2.54**

AU = 1,000 lb of animal. Cost savings resulted from feeding less hay and other stored feed while cattle were grazing cover crops. This is important, considering winter feed costs represent the single largest cost in cattle operations. Grazing cover crops reduces winter feed costs.

EXPERIMENT

Replacing Corn With Hybrid Rye in Feeder Pig Rations

COOPERATORS | **Tom & Irene Frantzen,** *NEW HAMPTON*

Farmers in the Midwest commonly know rye as a cover crop. A small amount is grown as food grain, and an even lesser amount is grown to feed pigs (though, this is common in parts of Europe). Tom and Irene Frantzen added KWS's Brasetto hybrid rye to their organic crop rotation in 2016. They have since observed that it can outcompete ragweed in their crop fields and wondered about feeding the grain to their pigs.

Previously, the Frantzens fed pigs eight different rations that adjusted quantities of hybrid rye and soybean oil to achieve the same digestible energy (DE) as their standard corn and soybean ration. The results from the prior trial informed the Frantzens of the optimal hybrid rye ration. This trial evaluated feed efficiency, daily gain and feed cost per pound of gain when organic feeder pigs were fed a standard corn/soy ration compared with a corn/hybrid rye/soy ration.

"We can successfully diversify integrated livestock and crop farms, while being better stewards of the land. In this trial, we not only learned the value of hybrid rye as a feedstuff for feeder pigs, but we are better equipped knowing how this crop benefits our entire farming system."

– TOM FRANTZEN

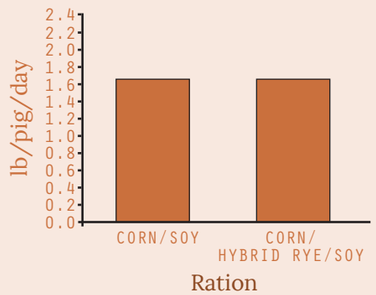
Tom Frantzen

FINDINGS

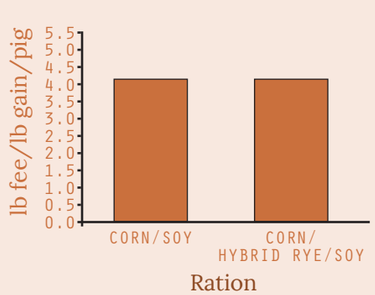
Pigs performed similarly when fed either a ration with corn/soy (control) or a ration with hybrid rye replacing half of the corn (treatment). Average daily gain, daily feed intake and feed conversion were statistically similar between the pigs fed the control and treatment rations. Feed cost per pound of gain for pigs in the control group averaged $0.59 compared to $0.56 for the pigs in the treatment group. It cost less to feed the treatment ration for two reasons: 1) because hybrid rye was less expensive for the Frantzens to raise and feed on the farm compared to corn; and 2) because the treatment ration was composed of half as much corn as the control ration. Growing hybrid rye helped diversify and extend the Frantzens' organic crop rotation, and served as an adequate feedstuff, which benefited the farm's field crop and livestock operations.

STATISTICAL ANALYSIS DETERMINED NO DIFFERENCES IN AVERAGE DAILY GAIN OR FEED CONVERSION BETWEEN THE GROUPS OF PIGS FED THE TWO RATIONS.

AVERAGE DAILY GAIN



FEED CONVERSION



DEMONSTRATION

Effects of Apple Cider Vinegar in Dairy Cattle

COOPERATORS | **Francis Blake,** *WAUKON;* **Kevin Dietzel,** *JEWELL;* **Scott Wedemeier,** *MAYNARD*

Apple cider vinegar (ACV) has long been used as a folk remedy for humans and livestock alike. Farmers involved in this study wanted to compare the milk quantity and quality of cows fed ACV to those who didn't consume it. In an ideal research setup, half of the herd would receive ACV and the other half would not, and the milk would be analyzed separately. Because splitting the herd and keeping milk separate was not possible, the farmers tried a different method: They fed ACV to their herd for three-months, followed by three months of not feeding it. They repeated this on-off cycle eight times. During the three-months ACV was fed, farmers administered raw, organic ACV to each herd at a rate of 4 oz per head per day. Because of the limitations imposed by the realities of a working dairy, results of this trial could not be analyzed statistically, but the farmers learned from their experiences and observations nonetheless.

Scott Wedemeier

Kevin Dietzel does not plan to continue feeding ACV to his cows based on his experiences during the trial, *"'I don't spend money unless there is a very good reason to, and so far, the benefits [to feeding ACV] seem marginal."*

– KEVIN DIETZEL

FINDINGS

In this demonstration, the farmers observed little difference in butterfat and protein in the milk of cows fed ACV or not fed ACV. The farmers agreed that feeding ACV didn't seem to adversely affect those milk components either. Scott Wedemeier found it interesting that at his farm when the herd was administered ACV, the cows produced 87 pounds of milk per cow per day versus 78 pounds when ACV was not offered. The 9-pound difference is difficult to parse out, though, because we were not able to perform statistical analysis of the results and because grazing dairies are heavily influenced by season, weather and forage variability.

Kevin Dietzel does not plan to continue feeding ACV to his cows based on his experiences, but wonders if increasing the rate – or adding ACV to feed instead of water – would reap any benefit. The farmers are pleased they saw no negative effects, but have to decide if the $5.40 per gallon price tag is worth the results.

Average milk test data for each farm when cows were fed apple cider vinegar (ACV) and when cows were not fed ACV.

	Yield per cow (lb)		Butterfat (%)		Protein (%)		Somatic cell count (x1000)		Milk urea nitrogen (%)	
Dairy farms	ACV	No ACV	ACV	No ACV	ACV	No ACV	ACV	No ACV	ACV	No ACV
Francis Blake	28.3	30.8	4.7	4.4	3.5	3.4	247.4	212.7	14.2	13.1
Kevin Dietzel	17.6	17.8	4.6	4.2	3.8	3.6	435.3	478.3	17.8	15.6
Scott Wedemeier	87.4	78.2	4.1	4.1	3.2	3.2	206.3	195.9	9.4	9.5

Because of the trial design, we could not make statistical comparisons between ACV vs. No ACV.

PRACTICAL **FARMERS** *of Iowa*

1615 Golden Aspen Drive, Suite 101
Ames, IA 50010

PRACTICALFARMERS.ORG