
PRACTICAL FARMERS OF IOWA
COOPERATORS' PROGRAM
FARMER-LED RESEARCH
2020 Cooperators' Program Report
PRACTICALFARMERS.ORG/RESEARCH

"2020 reminded me that Mother Nature was, and always is, in control. I value all researchers whose quest is to learn how to work with her instead of against her."

– Sam Bennett

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 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.

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STAFF

STEFAN GAILANS	RESEARCH AND FIELD CROPS DIRECTOR
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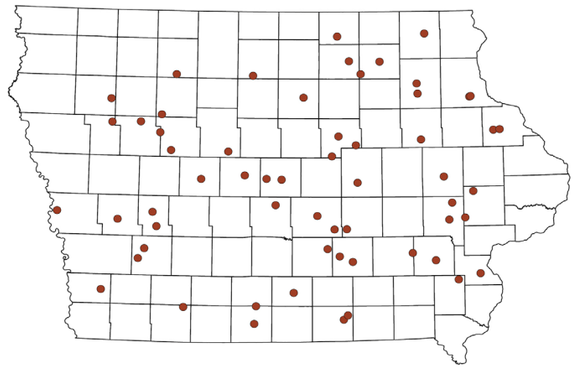
2020 FARMER-LED
RESEARCH TRIAL LOCATIONS



IN 2020, 66 COOPERATORS PARTICIPATED IN 81 RESEARCH TRIALS

The Cooperators' Program began in 1987 to encourage and guide research aimed at environmentally sound, lower-cost, profitable farming techniques. The program is one of several ways that Practical Farmers of Iowa carries out its mission to equip farmers to build resilient farms and communities.

What's a "Cooperator?"

We refer to the farmer-scientists who conduct on-farm research as cooperators because the first experiments in the program were done in cooperation with agricultural researchers (typically at Iowa State University). 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. (We do still often facilitate cooperation between PFI farmers and agricultural researchers, however; both find enjoyment and mutual benefit from these efforts). Moreover, on-farm research projects are often collaborative endeavors among several farmers. So "cooperator" applies on many levels!

Sharing Results, Generating Ideas

Each year, we gather at the Cooperators' Meeting in December to share results and observations from these trials. During this meeting, all 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.

Rooted in Sound Science

Valid and reliable farmer-generated information is a cornerstone of the Cooperators' Program. PFI cooperators use methods that allow for statistical analysis of their experiments' results. Replication (see figures) is a core approach that involves repeating (replicating) the farming practices being studied at least three or four times in strips across a row-crop field or among several vegetable beds. For trials involving different grazing or habitat management, cooperators select several fields or paddocks on the farm and collect multiple observations from within each field or paddock.

Because trials results are based on three or more comparisons, it's possible to achieve a level of statistical reliability similar to scientific experiments conducted by university researchers. Most cooperators will say that conducting on-farm research with this amount of rigor involves a lot of time and effort. They'll also say the effort is worthwhile because it generates reliable results and has empowered them to make observations elsewhere on their farms. PFI cooperators don't have all the answers, but they do have a tool for working towards those answers.

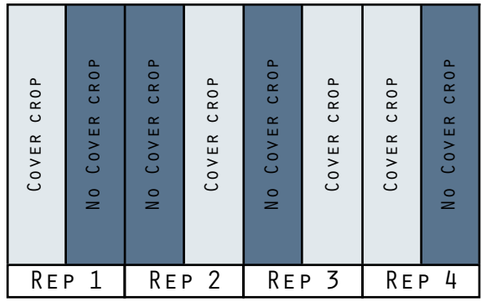


Figure 1. *Sample replicated strip trial design for a cover crop comparison.*

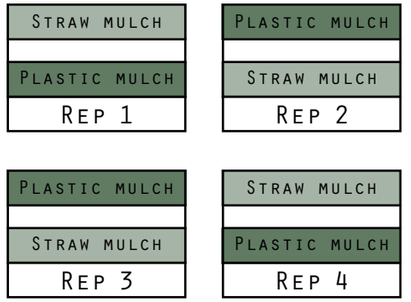


Figure 2. *Sample replicated design in vegetable beds for a mulch comparison.*

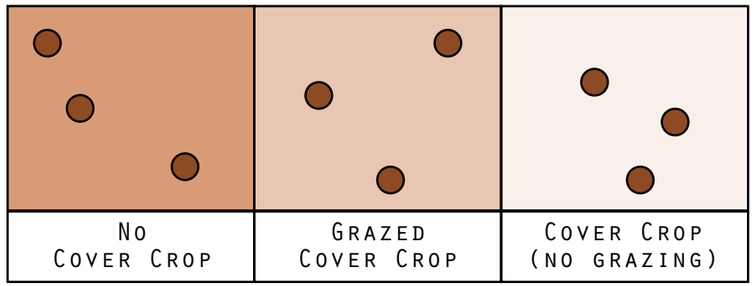


Figure 3. *Sample trial design involving multiple observations collected from three fields under different cover crop and grazing management schemes.*

A Snapshot of PFI's Big Tent

PFI on-farm research portrays the diversity of interests and farming systems among our membership. Research in 2020 explored the economic impacts of seed treatments for soybeans, and mulch and pruning for tomatoes. Farmers tested cover crops for suppressing weeds in soybeans and improving soil fertility in corn. Results of variety trials and bed-preparation techniques are influencing future production strategies for vegetable farmers.

While cooperator interests might change from one year to the next, what never changes – and seems clearer every year – is the power on-farm research gives farmers to evaluate just about anything they're curious about, and to help them make informed decisions about their farming practices. For the cooperators, the experience of conducting research on their farms emphasizes the value of careful, intentional observation. And, in their own words and reflections, on-farm research is always a worthwhile endeavor.

Thank you to the farmer-scientists who commit their time and ideas, try something new and put their curiosity into action for themselves and their farming colleagues in the spirit of learning, knowledge-sharing and improvement.

In the pages that follow, you'll find brief summaries of a few of the research projects from 2020, as well as some takeaways from the cooperators. To dive deeper and learn about more projects, we encourage you to check out the full research reports on our website at **practicalfarmers.org/research.**

Want to Get Involved?

Do you have something you'd like to investigate on your farm? We're always looking for new cooperators who wish to become curiosity-leaders that inspire improvements to our agricultural landscape. Contact us! (**stefan@practicalfarmers.org**)

FIELD CROPS

2020 FIELD CROP TRIALS

EXPERIMENT

Are Neonic+Fungicide Soybean Seed Treatments Justified?

COOPERATOR	**Dick Sloan,** *ROWLEY*

Dick Sloan questioned the value of neonicotinoid seed treatments and was concerned about their negative impacts on non-target insect species. The objective of this trial was to measure the effect of a common neonicotinoid plus fungicide soybean seed treatment on soybean yield, plant population and profitability. Dick hypothesized that treated seed would be less profitable than untreated seed and would not significantly improve soybean yield or plant population.

"I have good confidence in my soybean production system which exclusively uses naked, untreated seed."

– DICK SLOAN

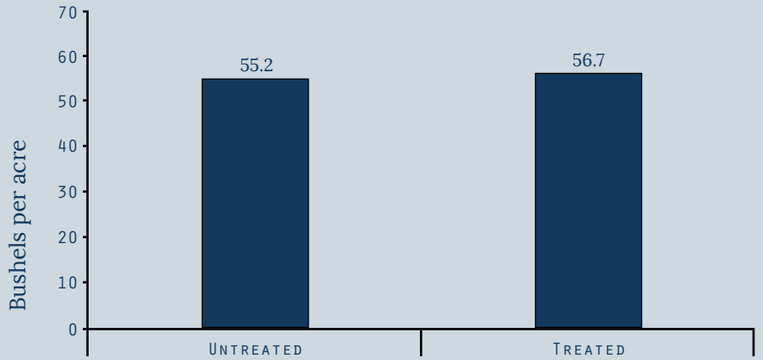
Dick Sloan

FINDINGS

Dick was able to confirm his hypothesis that soybean seed treated with neonicotinoids and fungicide provides no benefit to yield or the return on investments in comparison with untreated seed on his farm. Dick was not able to recoup the added cost of the seed treatment because yields were statistically similar. Furthermore, Dick's findings align with previous trials he and other PFI farmer-cooperators have conducted, as well as with a growing body of scientific literature.

In his own words: "This project confirms my earlier results that soybean seed treatments are not justified in my production system. I will continue to plant untreated soybean seed, avoiding the additional expense and risks of treated seeds."

SOYBEAN YIELD



Statistical analysis determined no significance in yield between the two treatments.

Spring-Seeded Cereal Rye Companion Cover Crop for Organic Soybeans

COOPERATORS | **Eric Madsen,** *AUDUBON;* **Daniel Sheetz,** *TOLEDO*

For organic field crops producers like Daniel Sheetz and Eric Madsen, managing weeds and erosion in organic soybeans poses an admirable challenge. Without herbicides, organic producers rely heavily on tillage and cover crops for weed control. And while fall-seeding cereal rye ahead of soybeans is the go-to cover crop strategy across Iowa for organic and conventional production alike, some organic growers worry about being able to control it the next spring.

Daniel's aim for a spring-seeded cereal rye ahead of soybeans was less about reducing tillage and more about providing backup weed control in soybeans when the window for tillage is really tight, such as when high-moisture field conditions delay tillage. For Eric, the idea of spring-seeding cereal rye is appealing as a potential way to reduce weed pressure in organic soybean as well as to minimize soil erosion.

"Conducting the on-farm trial was not as time-consuming or difficult as I had envisioned. Having actual data from my own farm is priceless."

– ERIC MADSEN

SPRING-SEEDED CEREAL RYE IS VISIBLE AMONG SOYBEANS IN ERIC MADSEN'S SPRING CEREAL RYE TREATMENT STRIP (LEFT) COMPARED TO HIS NO-COVER STRIPS (RIGHT) ON JULY 3, 2020.

FINDINGS

Spring-seeding cereal rye as a companion cover crop in organic soybean provided similar weed control to a no-cover treatment at Eric's and Daniel's farms in 2020; however, the same treatment reduced soybean yield at Eric's and reduced the return on investment at both Eric's and Daniel's farms by $192/ac and $53/ac, respectively. Reflecting on the trial, Eric commented, "I feel the drought likely skewed my results." It is possible that repeating the trial in a wetter year might result in different weed pressures and results.

In the three years preceding this trial, Daniel found some success fine-tuning the practice of spring-seeding cereal rye in both corn and soybean; however, when asked if he will change practices more permanently as a result of conducting this trial, he responded, "I will possibly select for shorter-season corn hybrids to give me an opportunity to plant rye in the fall."

"I enjoyed collaborating with the PFI staff and other farmers. I met new people that have different perspective and experiences than I have. Overall, the time spent to participate was worth every minute."

– DANIEL SHEETZ

Soybean yields, treatment costs, revenues and returns on investment (ROI).

	Treatment	Soybean yield (bu/ac)[a]	Treatment cost ($/ac)[b]	Revenue ($/ac)[c]	Return on Investment ($/ac)
Madsen	Spring Rye	52.0	$55.90	$1,033.50	$977.60
	No Cover	60.0	$0.00	$1,170.00	$1,170.00
Sheetz	Spring Rye	56.5	$52.90	$1,299.50	$1,246.60
	No Cover	56.5	$0.00	$1,299.50	$1,299.50

[a] Statistical analysis determined significant soybean yield differences between treatments at Eric Madsen's but not at Daniel Sheetz's. We used the overall yield average at Sheetz's for calculating ROI.
[b] Cost included cereal rye seed and drilling.
[c] Soybean price provided by Eric Madsen was $19.50/bu; price provided by Daniel Sheetz was $23.00/bu.

Terminating Cereal Rye After Seeding Soybeans (Or Not!)

COOPERATORS | **Jon Bakehouse,** *HASTINGS;* **Sam Bennett,** *GALVA*

Sam Bennett and Jon Bakehouse conducted on-farm research in 2019 to determine how long they could extend the growth of a cereal rye cover crop after planting soybeans before it would interfere with the soybean crop. That year, Sam was able to generate more rye biomass by delaying termination until 27 days after planting soybeans, and he did so without sacrificing soybean yield. Wet weather prevented Jon from terminating rye until much later than intended (24 and 52 days after planting), but he made an important observation: In the strips where he was forced to delay termination until 52 days after planting soybeans, a green cereal rye cover crop emerged the subsequent spring. The cereal rye had set and dropped seed prior to being terminated in 2019, then emerged as a "self-seeded" (and free!) cover crop in 2020. The objective of this research was to determine how long growth of a cereal rye cover crop in soybeans can be prolonged without sacrificing yield and profitability.

SOYBEANS ON JUNE 1, 2020 GROWING THROUGH RESIDUE FROM A CEREAL RYE COVER CROP THAT WAS TERMINATED AT SOYBEAN PLANTING ON MAY 12, 2020 AT JON BAKEHOUSE'S.

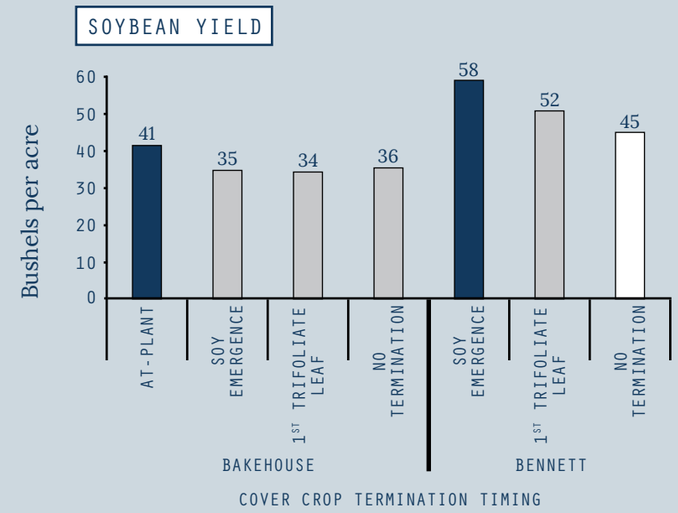
"These trial results will impact my decision-making process when it comes to terminating a fall-planted rye cover crop."

– SAM BENNETT

FINDINGS

For Sam, while the gains in rye biomass that occurred with each successively later termination date did result in less weed pressure, those same gains also translated to lower soybean yields, as well as losses in profitability of more than $60/ac. At Jon's, terminating the cover crop at soybean planting improved returns by $62/ac compared to when he terminated just after soybean emergence or later at the first trifoliate leaf stage.

In the end, both Jon and Sam were happy to have conducted the trial. "Any trial that helps me to get the most benefit out of my cover crops is worthwhile. While the yields and results weren't what we were hoping for, we learned a lot about the boundaries of managing the cover for a specific purpose," Sam remarked. Jon added, "The second year of this trial really started to hone in on specific questions that can't necessarily be answered in one year, especially when compared with data from years prior."



STATISTICAL ANALYSIS DETERMINED SOYBEAN YIELD DECLINED AS COVER CROP TERMINATION WAS DELAYED AT BOTH FARMS (AS INDICATED BY COLUMN SHADING FROM DARK TO LIGHT).

EXPERIMENT

Overwinter vs. Winterkill Clover Green Manure Cover Crops

COOPERATOR | **Dick Sloan,** *ROWLEY*

Dick Sloan hoped to determine which of two clover green manure mixes interseeded to an established winter small-grain crop would be more profitable and sustainable in his soybean-small grain-corn rotation. The objective of this trial was to compare corn yield and profitability of two green manure mixes – one that overwinters (medium red clover plus alsike clover) and one that winterkills (crimson clover plus berseem clover). Dick hypothesized the winterkill mix would produce similar results to the overwinter mix but would save the cost and labor of a burndown pass.

"I've played around with several summer mixes and had variable results, but it's hard to beat the medium red and alsike blend drilled in April into established winter small grains."

– DICK SLOAN

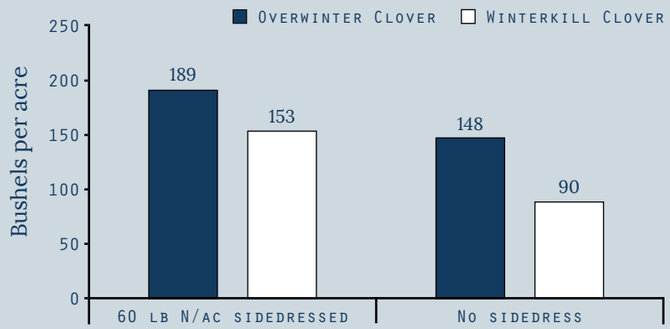
DICK SLOAN ASSESSED THE RED AND ALSIKE CLOVERS IN THE OVERWINTER STRIPS ON APRIL 30, 2020 PRIOR TO TERMINATING AND BEFORE PLANTING CORN ON MAY 4, 2020.

FINDINGS

The greater corn yields produced in the overwinter treatment generated more revenue. The returns on investment of the overwinter treatment were greater than those of the winterkill treatment by $147/ac where Dick sidedressed, and $231/ac where Dick did not sidedress. "I will continue to use medium red and alsike clovers by interseeding them to my winter small grains," Dick said. "A better use for berseem and crimson clover would be to plant them as part of a diverse mix following a small-grain harvest."

While Dick expected the crimson-berseem mix to be more competitive with the red-alsike mix, he observed that "the timing of planting different types of clover can greatly affect their productivity and usefulness. It's good to try new things – even if it doesn't work out the way I expect. I always learn something from on-farm research."

CORN YIELDS



REGARDLESS OF WHETHER DICK SIDEDRESSED N FERTILIZER, STATISTICAL ANALYSIS DETERMINED SUPERIOR CORN YIELDS FOLLOWING THE OVERWINTERING RED+ALSIKE CLOVERS COMPARED TO THE BERSEEM+CRIMSON CLOVER MIX THAT WINTERKILLED.

EXPERIMENT

Interseeded and Summer-Seeded Green Manure Cover Crops

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

The July harvest of Tom Frantzen's organic hybrid rye crop offers him the chance to grow a nitrogen-fixing green manure between rye harvest and planting corn the subsequent spring. Of two common green manures, Tom wanted to know which would be ideal for his operation. To determine this, he compared the effects on yield and profitability of corn preceded by red clover frost-seeded into hybrid rye and corn preceded by a cloverless green manure mix seeded after rye harvest (barley, oats, kale). He grazed both treatments with cattle in October.

TOM AND IRENE FRANTZEN NEXT TO THEIR ORGANIC HYBRID RYE SHORTLY BEFORE HARVEST IN JULY 2019.

TOM FRANTZEN'S COVER CROP MIX THAT WAS SEEDED AFTER RYE HARVEST (LEFT) AND CLOVER THAT WAS INTERSEEDED TO RYE IN SPRING (RIGHT) IN LATE SEPTEMBER 2019.

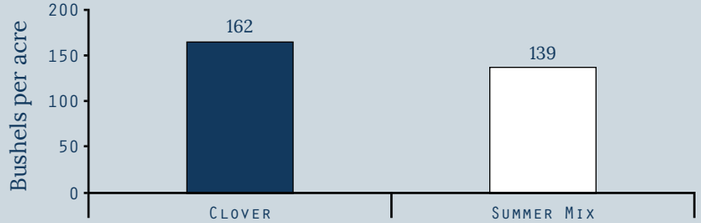
FINDINGS

Frost-seeding red clover into Tom's hybrid rye crop resulted in greater corn yields and a larger return on investment by $200/ac compared with planting a cloverless mix after rye harvest. In Tom's words, "What works is what makes money in the long and short run." In addition to improving corn yield and short-term returns on investment with the frost-seeded red clover treatment, Tom saved two tillage passes – something he values for its long-term benefits to his farm's soil ecology and structure.

"No-till frost-seeding [of red clover] has many advantages – and if it works, then tillage is reduced and the impact on soil is better."

– TOM FRANTZEN

CORN YIELDS



STATISTICAL ANALYSIS DETERMINED A SIGNIFICANT YIELD BENEFIT TO THE CLOVER GREEN MANURE.

HORTICULTURE

2020 HORTICULTURE TRIALS

CABBAGE VARIETY TRIAL
Carmen & Maja Black, Kate Edwards, Emily Fagan & Hannah Breckbill, Alice McGary

COMPARING LANDSCAPE FABRIC VS. STRAW MULCH IN TOMATOES
Jill Beebout

EFFECT OF SHEEP GRAZING COVER CROPS ON SUMMER SQUASH YIELD
Carmen & Maja Black

EVALUATING BROCCOLI BED PREPARATION METHODS FOR SOIL COMPACTION
Alice McGary

GINGER VARIETY TRIAL IN COVERED AND UNCOVERED BEDS
Cait Caughey, Mark Quee, Molly Schintler, Jon Yagla

HIGH TUNNEL TOMATO PRUNING
Carmen & Maja Black, Natasha Hegmann

POTTING SOIL COMPARISON FOR VEGETABLE SEEDLING QUALITY
Emily Fagan & Hannah Breckbill, Jon Yagla

SPINACH VARIETY TRIAL
Kate Edwards, Emily Fagan & Hannah Breckbill, Bonnie Riggan

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

Cabbage variety trial at Alice McGary's.

EXPERIMENT

Comparing Landscape Fabric vs. Straw Mulch in Tomatoes

COOPERATOR	**Jill Beebout,** *BLUE GATE FARM, CHARITON*

Mulch is routinely used by fruit and vegetable farmers as a weed suppressant – covering the soil blocks sunlight from germinating the weeds. This greatly decreases the time that farmers have to put into hand-weeding their beds. Another benefit to mulch is the ability to retain soil moisture during hot and dry periods. The purpose of this study was to determine the impact of fabric and straw mulch on tomato yield and labor spent prepping beds, weeding and cleaning up the beds. Jill Beebout hypothesized that tomato yield would not be affected, but plots with landscape fabric would take fewer hours to manage.

"This trial gave us the structure and the external push to try something that we had been curious about."

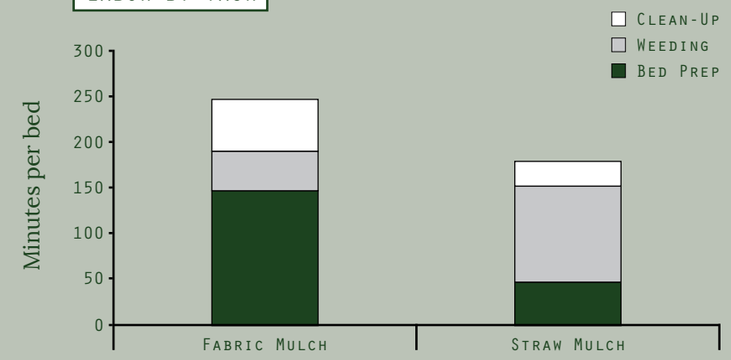
– JILL BEEBOUT

Straw mulch and landscape fabric were applied to multiple alternating beds of tomatoes in May 2020.

FINDINGS

As she suspected, Jill observed no differences in tomato yield between the landscape fabric and straw mulch treatments. This trial also showed that the landscape fabric required more labor compared to the straw due to more time spent on bed preparation. The straw treatment, however, did require over twice as much time when it came to weeding. Moreover, Jill said, "While the landscape fabric did require more time this year, the fabric is a multi-year material, so all of the set-up time for it will be greatly reduced for the following years. Also, we built a roller tool that will be used for clearing the mulch at the end of the season, which will also reduce the labor hours." Moving forward, Jill plans to continue and continue expanding the use of landscape fabric on long-season crops.

LABOR BY TASK



The landscape fabric required more labor for bed preparation and clean-up, while the straw required more labor for weeding.

EXPERIMENT

High Tunnel Tomato Pruning

COOPERATORS	**Maja & Carmen Black,** *SUNDOG FARM, SOLON;* **Natasha Hegmann,** *TURKEY RIVER FARM & GREENHOUSE, ELKPORT*

Pruning is a common technique used by farmers because it lets the plant divert its energy toward producing fruit instead of growing more foliage. With pruning, the plant produces larger fruit earlier in the season and there are fewer pest and disease issues. The objective of this project was to evaluate the impact of double-leader pruning on tomato yield and labor time in the high tunnel. Maja and Carmen Black and Natasha Hegmann hypothesized that overall yield would be lower from pruned plants, but pruning would save enough labor during harvest to offset the loss.

Natasha Hegmann

"This was a great record-keeping exercise. Every off-season we talk about how great it would be to get accurate yield data. Now I know what would need to happen to get there."

– NATASHA HEGMANN

High-tunnel set-up at Natasha Hegmann's farm near Elkport, Iowa.

FINDINGS

Maja and Carmen realized throughout this project how much they prefer harvesting pruned tomatoes compared to un-pruned tomatoes. They said, "It was very obvious to us that morale was higher for the pruned tomatoes compared to un-pruned tomatoes during harvest." Moving forward, Maja and Carmen plan to continue pruning tomatoes as it is much more enjoyable work and they saw no difference in yield compared to the unpruned tomatoes. Natasha also said she plans to stick with pruning her tomato plants in the future because "managing the unpruned plots was much more stressful and burdensome."

EXPERIMENT

Evaluating Broccoli Bed Preparation Methods for Soil Compaction

COOPERATOR	**Alice McGary,** *MUSTARD SEED FARM, AMES*

Soil compaction can cause farmers much distress because it generally leads to a reduction in agricultural productivity. Compaction can be influenced by tillage systems, machine size, irrigation methods, soil moisture content, diversity of crops and more. In this experiment, Alice compared four bed preparation techniques for broccoli to assess their effect on broccoli yield and soil compaction factors (bulk density, penetration resistance). She hypothesized that double-digging would reduce compaction, but would come with a high labor cost.

"In visual observations from previous side-by-side comparisons, double-digging has been very obviously beneficial to plant health. In this trial, it wasn't visually clear that it was helpful, so it shows that taking data is valuable."

– ALICE MCGARY

Preparing a plot for broccoli transplanting on April 26, 2020 using the double-dig method.

FINDINGS

Alice found that double-digging was the clear winner for broccoli yield and also resulted in the least amount of compaction as measured by soil penetration resistance. However, no differences in soil bulk density were measured among the four bed preparation techniques. The double-digging bed preparation technique is very time- and labor-intensive and not feasible to employ across the whole farm. In the future, Alice will do a little bit of double-digging every year. Moving forward, she would like to observe these bed preparation techniques on areas of her farm with better soil.

Alice compared four bed preparation techniques in a randomized plot design. She replicated each treatment four times (16 plots total).

Bed preparation	Description
Shovel	Tilled to a 2-inch depth to incorporate compost. A shoved was used to dig a large transplant hole (12 inches deep by 8 inches wide).
Shovel + Nutrients	Tilled to a 2-inch depth to incorporate compost. A shovel was used to dig a large transplant hole (12 inches deep by 8 inches wide). One shovelful of compost and ½ cup worm castings were mixed with soil in the transplant hole.
Dibble	Tilled to a 2-inch depth to incorporate compost. The broccoli was transplanted with bare hands acting as a dibble (no hole was dug).
Double Dig	Tilled to a 2-inch depth to incorporate compost. After the shallow till, "double-dug" plots to 18-24 in. depth, using "scoop and move" method. The crop was then hand-transplanted.

EXPERIMENT

Spinach Variety Trial

COOPERATORS	**Hannah Breckbill & Emily Fagan,** *HUMBLE HANDS HARVEST, DECORAH;* **Kate Edwards,** *WILD WOODS FARM, IOWA CITY;* **Bonnie Riggan,** *CALICO FARM, IOWA CITY*

Spinach is a cool-season crop that is usually planted in spring or fall. Given the heat-intolerant nature of spinach, it can be difficult to grow. Common issues include bitter taste, low yield and early bolting, a stress response where the plant diverts resources to seeds and flowers. In this project, Hannah Breckbill and Emily Fagan, Kate Edwards and Bonnie Riggan tested three common spinach varieties: Bloomsdale, Kolibri and Space.

The cooperators were curious about which spinach variety would grow best on their farms, as measured by both output and quality, to know what to promote at CSAs and early farmers markets. "We haven't had great success with spinach, but it's something that customers are excited about," Emily said. "So we are hoping to find a variety that will grow well for us."

Emily Fagan records observations of the three spinach varieties trialed in this project.

Bloomsdale spinach is bolting in the right-most row at Hannah Breckbill and Emily Fagan's farm near Decorah, Iowa. Space is in the middle row.

"I learned that we have a little work to do to grow spinach better, aside from choosing the right variety."

– EMILY FAGAN

FINDINGS

Kolibri was consistently a top performer in terms of yield across the six successions planted among the three farms. Bloomsdale not only bolted the earliest, but was the only variety that consistently bolted across the three farms. For quality, Bloomsdale ranked highest in terms of leaf volume (loft) at Hannah and Emily's farm, and occasionally had good loft numbers at Kate's and Bonnie's farms. Bonnie has struggled to germinate Bloomsdale spinach in the past, and this trial confirmed how difficult it is to work with. "Bloomsdale had the best loft, but the drawbacks … make it a tough one to keep in the rotation for production," Bonnie said. "I might still do it in the winter because the taste is superior, but for spring it's a no-go on this farm moving forward."

EXPERIMENT

Ginger Variety Trial in Covered and Uncovered Beds

COOPERATORS	**Cait Caughey,** *MULLEIN HILL FARM, MONDAMIN;* **Mark Quee,** *SCATTERGOOD FARM, WEST BRANCH;* **Molly Schintler,** *ECHOLLECTIVE FARM, MECHANICSVILLE;* **Jon Yagla,** *MILLET SEED FARM, IOWA CITY*

Little is known about growing ginger in the Midwest, so cooperators were curious about growing it in Iowa. They were especially curious about ideal growing conditions and what variety produces the best ginger. Cait Caughey was motivated to improve her growing practices, having only grown one variety of ginger in one environment. "Is growing [ginger] out in the field, covered, just as good?" Cait asked. "Can I grow out ginger from the co-op and have it produce the same yield?"

Molly Schintler was also motivated to improve her own practices. "Our greenhouse space is very limited, so if we can grow ginger plants that produce successfully in the field, that will open up greenhouse space for us to grow other products that cannot be field-grown," Molly said. The cooperators expected that ginger yield would not significantly differ when grown under a cover, though they did expect better yield from the Peruvian Yellow seed ginger (Puna Organics and Biker Dude) compared to the unspecified ginger variety procured from New Pioneer Food Co-op in Iowa City.

Transplanting ginger in the field at Mark Quee's in June 2020.

"I enjoyed planting based on treatments and learning the process of a trial that could beget replicable results. I would like to try again, and I think learning the method was absolutely worthwhile."

– CAIT CAUGHEY

Mark Quee sprouted ginger from seed pieces in trays in March 2020 before transplanting in the field or high tunnel.

Harvesting and inspecting ginger in Mark Quee's high tunnel in October 2020.

FINDINGS

The two ginger varieties performed similarly overall, except at Jon's, where the not-specified variety from the food co-op was superior to Peruvian Yellow in the outdoor setting. Across all farms, ginger firmness varied little between varieties and cover types, but the cooperators did find observable differences in rhizome color. Interestingly, the cover treatments gave mixed results among the farms. Mark used a high tunnel, and said he will only grow ginger indoors in the future due to low yield in the field. Mark learned how to strategically place his ginger: indoors and away from other plantings. "I'll probably try sourcing seed from both sources again," Mark said, "just to get more data." Molly and Jon, on the other hand, had better luck in the field than under the row cover or low tunnel. Molly wants to keep growing ginger outside if she can get a comparable yield from it.

LIVESTOCK

2020 LIVESTOCK TRIALS

CATTLE GRAZE COVER CROPS AT MARK GLAWE'S.

EXPERIMENT

Soil Health in Grazed CRP

COOPERATORS | **Dave & Meg Schmidt,** *EXIRA*

There are close to 1.7 million acres of Conservation Reserve Program (CRP) land in Iowa. Strict grazing restrictions, though, preclude the grasslands from being used as livestock forage. Research shows that properly managed grazing improves grasslands and contributes to soil health. Dave and Meg Schmidt wondered if grazing their CRP land would increase soil health. They forfeited their CRP payment in order to graze cattle on a portion of their CRP land for two weeks in August 2018, and then monitored soil health metrics (microbial respiration, active carbon, organic matter) for three years. For comparison, they included three additional fields: grazed perennial pasture, ungrazed CRP land and a row-crop field.

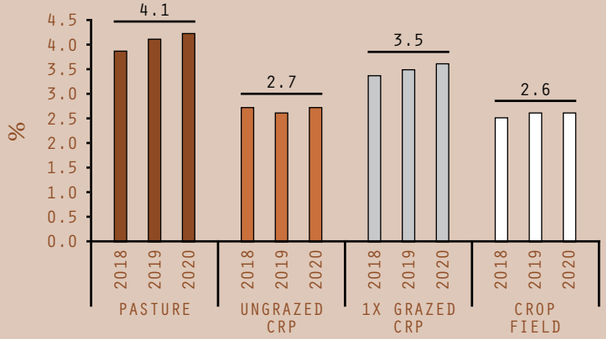
CATTLE GRAZE A PORTION OF DAVE AND MEG SCHMIDT'S CONSERVATION RESERVE PROGRAM FIELD IN AUGUST 2018.

FINDINGS

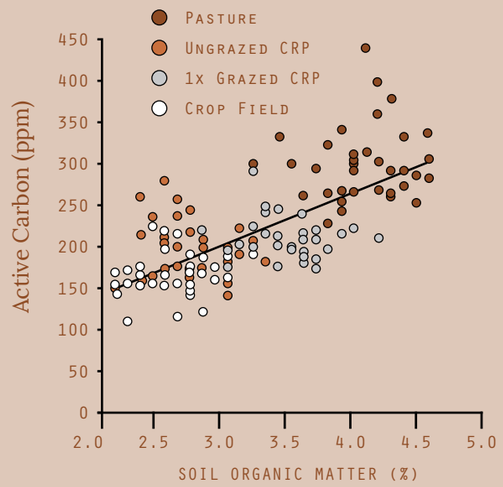
The grazed perennial pasture ranked highest for microbial respiration, active carbon and soil organic matter. The crop field ranked lowest. The grazed CRP ranked higher than the ungrazed CRP, but this is probably because the grazed CRP field reported more organic matter at the onset of the trial. Therefore, it's not fair to conclude that grazing (or not grazing) CRP had any influence on soil health. Our data shows that the health of a soil, as measured by microbial respiration and active carbon, is strongly related to soil organic matter.

This suggests that farmers who wish to improve soil health metrics in their fields should probably embrace practices that promote increasing organic matter. Admittedly, this can be a long-term process. Some fields are inherently high in organic matter while others could gain a lot more, and this is often a function of soil texture, long-term management and climate conditions.

SOIL ORGANIC MATTER



STATISTICAL ANALYSIS DETECTED NO MEASURABLE CHANGES IN SOIL ORGANIC MATTER FOR ANY OF THE FIELDS THROUGH THE DURATION OF THE STUDY. THE FIELDS REPORTED THE SAME AMOUNT OF ORGANIC MATTER AT THE CONCLUSION OF THE STUDY AS THEY DID AT THE ONSET.



AS SOIL ORGANIC MATTER INCREASES, SO TOO DO SOIL HEALTH METRICS LIKE ACTIVE CARBON (A NECESSARY FOOD SOURCE FOR SOIL MICROBES).

HABITAT

2020 HABITAT TRIALS

IDENTIFYING NECTAR RESOURCES ON FARMS

Jake Kundert

Prairie in bloom at Grow: Johnson County Historic Poor Farm.

OBSERVATION

Identifying Nectar Resources on Farms

COOPERATOR	**Jake Kundert,** *SOLON*

The objective of this project was to identify and analyze existing nectar resources (flowers) on areas of the Johnson County Historic Poor Farm where Iowa Valley Resource Conservation and Development rents land to operate its Grow: Johnson County program. Jake Kundert, with assistance from other Grow: Johnson County staff, performed flower surveys at regular intervals throughout the growing season from May through October 2020. Ultimately, they sought to identify geographic and temporal trends in flower abundance and diversity that could inform future farm management decisions to benefit pollinators.

Jake Kundert and Grow: Johnson County farm managers were able to identify trends and patterns in pollinator habitat on the farm and, as a result, are considering a variety of actions based on what they've learned.

"I found the simple act of monitoring the farm's pollinator resources on a regular basis to be gratifying and grounding. It's something that I will continue to do, if for no other reason than appreciating the farm landscape."

– JAKE KUNDERT

FINDINGS

Observations revealed several trends with implications for farm decision-making to benefit pollinators. One trend Jake noted was that early-season resources (early May) were lacking on the farm; one potential remedy that he and the Grow: Johnson County staff are considering is a hedgerow or native shrub planting to provide early-season flower resources.

He and the Grow: Johnson County staff also found areas on the farm that both provided noticeably more and surprisingly less flowering resources than anticipated. Overall, nectar resources peaked in July before falling off in August. This change in nectar resource availability could be addressed through the use of annuals or by planting native perennials that bloom in late summer. The vast majority of these late-season resources were from plants like goldenrod, indicating that more diversity in late-blooming native forbs might be beneficial for pollinators.

Future surveys could take into account the proximity of nectar resources to crops to capture the potential effectiveness (or lack thereof) of habitat in promoting ecosystem service benefits like pollination.

PRACTICAL FARMERS *of Iowa*

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