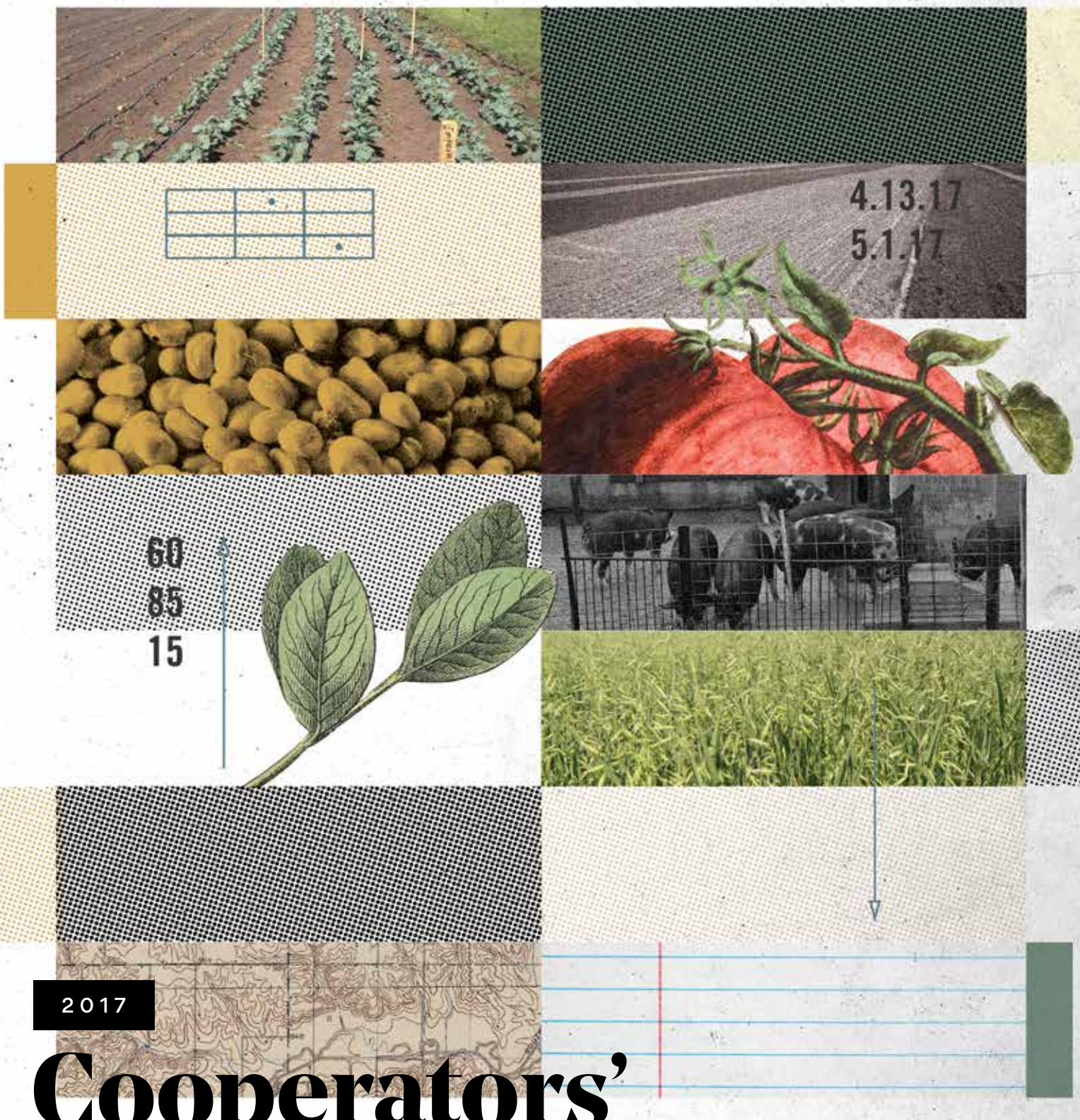
FARMER-LED RESEARCH



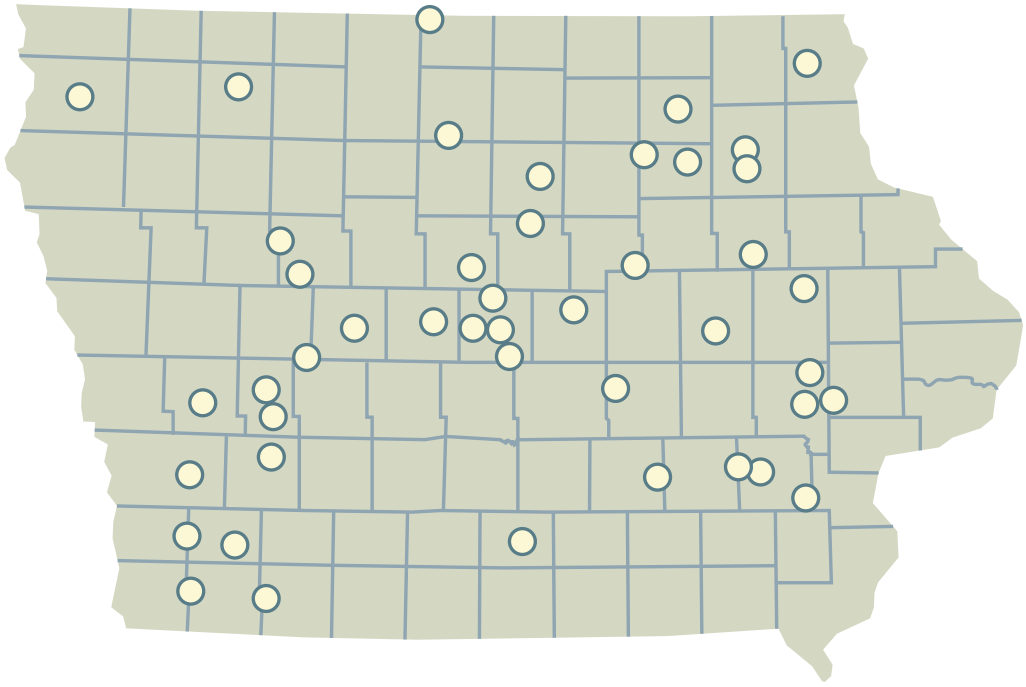
2017

Cooperators' Program

YEAR IN REVIEW

PRACTICAL FARMERS OF IOWA
COOPERATORS' PROGRAM

2017 FARMER-LED RESEARCH PROJECT LOCATIONS



In 2017, 51 farmers conducted 71 research projects.

Farmers in Practical Farmers' Cooperators' Program conduct on-farm research to better answer their most challenging farming questions. Since 1987 when the Cooperators' Program began, 222 different farmers have conducted 1,298 research trials on their farms. Knowledge from these research projects helps equip farmers to be more profitable, to be better environmental stewards, and ultimately, to make their farms and communities more resilient. This research has not only influenced other farmers – it has shaped some of the most important university research coming out of the state over the past few decades.

Contents

“

I want to achieve maximum growth and benefits [from my cover crop] without limiting corn yield. I hope others will gain confidence to add cover crops to their farm systems if we share practical management tips and lessons.

DICK SLOAN

Field Crops

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.

2017 RESEARCH

OAT VARIETY AND FUNGICIDE TRIALS

ISU Northeast Research Farm, ISU Northern Research Farm, Wayne Koehler

COVER CROP VARIETY TRIAL 2016-2017

Jeremy Gustafson, Chad Ingels, Clarke McGrath, Mark Peterson, Myron Rees, Bil Schrader, Paul Kassel

SPRING-SEEDED BRASSICA COVER CROPS

Jeremy Gustafson, Chad Ingels, Steve McGrew

WINTER CEREAL RYE COVER CROP EFFECT ON CASH CROP YIELD, YEAR 9 (WITH ILF)

Rick Juchems, Whiterock Conservancy, Rob Stout, Kelly Tobin, Jim Funcke

N FERTILIZER STRATEGIES FOR CORN FOLLOWING COVER CROP

Dick Sloan, Tim Sieren

ROLL-CRIMPING COVER CROPS AND SOYBEAN SEEDING DATE

Tim Sieren

ROLLING COVER CROPS AND SOYBEAN ROW-WIDTH

Jack Boyer, Scott Shriver

SPRING-SEEDED COVER CROPS AHEAD OF SOYBEANS

Jeremy Gustafson, Chris Teachout

UNDERSEEDED VS. MID-SUMMER-SEEDED GREEN MANURES FOR CORN

Doug Alert & Margaret Smith, Vic Madsen, David Weisberger, Mary Wiedenhoeft

CORN LEAF ARCHITECTURE FOR INTERSEEDED COVER CROPS

Jack Boyer, Jeremy Gustafson

ACCOMMODATING COVER CROPS WITH EARLY MATURING CORN AND SOYBEANS

Jon Bakehouse

CORN PLANTER SETTINGS

Tom Frantzen

TRIAL

N Fertilizer Strategies for Corn Following Cover Crop

COOPERATORS	TIM SIEREN, *Keota* // DICK SLOAN, *Rowley*

Finding a consistent cover crop other than rye has been tricky, and largely unsuccessful. Grass covers before corn, however, can come with pitfalls. Farmers like to reap as much cover crop growth in the spring as possible, because they know this brings benefits like erosion control, nutrient retention, and other soil health benefits (more growth = more potential for soil health benefits like soil organic matter). Can we grow high-yielding corn while also prioritizing cover crop spring growth? Nitrogen fertilizer strategies (i.e., at-planting) might be devised to do so.

Both cooperators were looking to produce more cover crop biomass in the spring and gain experience with planting corn shortly after terminating the cover crop. "It's not something a farmer would normally do," Sloan said, but that is why both cooperators saw reason for them to explore this subject.

> "This shows how important it is to have enough N available early [for the corn].
>
> TIM SIEREN

FINDINGS

Across both farms, terminating the cover crop near the time of corn planting (3 or 1 days before planting (DBP)) often resulted in a yield reduction compared to when the cover crop was terminated about 3 weeks prior to corn planting (21 or 19 DBP). Increasing N rates or varying the N strategy at the farms did not appear to overcome the yield reducing effects of terminating the cover crop near corn planting. The lone exception: where the cover crop was winter wheat+oats+winter barley+rapeseed (e.g., not rye). This cover crop produced less biomass — and perhaps less early-season N stress on the corn — than the cover crop that did include cereal rye.

Thus, the cover crop species make-up and/or the amount of cover crop growth could be a factor when terminating a cover crop just before planting corn. If using cereal rye as a cover crop ahead of corn, it is best to wait at least 10 days to plant corn after terminating the cereal rye.

TABLE 1 **Cover crops, N rates and corn yields as affected by cover crop termination at Dick Sloan's and Tim Sieren's in 2017.**

			Corn yield (bu/ac)		
Cooperator	**Cover crop**	**N rate (lb N/ac)**	**Cover crop terminated three weeks before planting**	**Cover crop terminated at planting**	**LSD (P ≤ 0.05)**
Sloan	Wheat+oats+barley+rapeseed	180	230 ab	222 b	11
		200	240 a	235 a	11
Sloan	Wheat+rye+barley	150	242 a	226 b	9
		170	247 a	233 b	9
Sieren	Rye	140	228 a	200 b	9

TRIAL

Accommodating Cover Crops with Early Maturing Corn and Soybeans

COOPERATORS	JON BAKEHOUSE, *Hastings*

In Iowa corn-soybean production systems, cover crops are typically aerially seeded into standing crops around the time of physiological maturity or drilled immediately following corn or soybean harvest. Previous on-farm research conducted by Jack Boyer has shown that seeding cover crops earlier in the fall can translate to greater fall and spring biomass. Earlier seeding also may present the opportunity for more diverse cover crop species selection.

With this in mind, farmer-cooperator Jon Bakehouse wanted to investigate how he could seed cover crops earlier than normal in a corn-soybean system and more successfully include a diverse array of cover crop species. To accomplish this, Jon planted early maturing varieties of corn (104- or 105-day) and soybean (1.0 group) in an attempt to harvest earlier in the fall and seed cover crops earlier in the fall.

Jon and Tina Bakehouse of Maple Edge Farm near Hastings in southwest Iowa.

FINDINGS

Planting early maturing varieties of corn and soybean generally did not result in yield drag compared to the late maturing varieties typically grown in southwest Iowa. The exception was in 2015 when the early maturing soybeans yielded less by 8 bu/ac.

Cover crop biomass produced tended not to differ between the early and late maturity corn-soybean systems. Seeding cover crops earlier in the fall, following the early maturing corn and soybean varieties, proved to be a challenge. “The cover crop could have been planted on Sept. 22 following the harvest of early maturing corn in 2015,” Jon says, but rain immediately after harvest prevented this. “Also, the early maturing soybean was ready for harvest by Sept. 28, and the cover could have been planted as well if soil conditions would have allowed,” he adds.

As a result of this two-year study, Bakehouse has reevaluated fall and spring management of cover crops. “Earlier planting in the fall naturally facilitates better spring growth, but I think having soil cover during spring rains is essential.” Bakehouse has come to calling this “letting the cereal rye run in the spring,” as he has become more comfortable with planting soybeans in mid-May into a tall, thick cover crop. The study also has him considering spring-seeded cover crops that grow for 40-50 days prior to planting the cash crop. This technique may provide the opportunity for a greater diversity of cover crops on the farm, which has long been a goal of Bakehouse’s.

TRIAL

Rolling Cover Crops and Soybean Row-Width

COOPERATORS	JACK BOYER, *Reinbeck* // SCOTT SHRIVER, *Jefferson*

Cereal rye cover crops have been demonstrated to provide weed management benefits when raising soybeans. But how can farmers best reduce weed pressure with cover crops? Does soybean row-width matter? Would rolling the cover down after terminating it help to build a mulch layer that will prevent weed emergence while also producing a good soybean crop? This study sought to answer those questions by comparing row width and rolling.

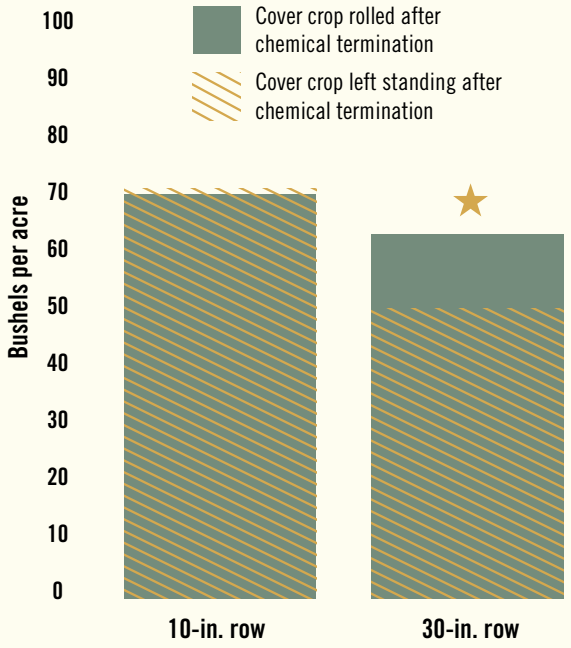
> **“In general, I did not see a benefit from rolling the rye when using my usual seeding method of drilling. I believe that this is partially due to the harrow behind the drill performing some of the same effects as rolling.**
>
> JACK BOYER

Soybeans in 30-in. rows at Jack Boyer’s farm on July 22. On the left, cover crop was not rolled after chemical termination, and on the right, cover crop was rolled after termination.

FINDINGS

Drilling soybeans on May 16 in 10-in. rows and not rolling the cover crop after chemical termination netted Boyer the greatest returns on investment from the cover crop (less passes across the field!). In-season weed control was achieved almost entirely with the heavy cover crop mulch (by May 20, there were 11,000 lb/ac of aboveground biomass)—after terminating the cover crop; Boyer did not need to spray again for weeds. The drill itself appeared to lay down much of the cover crop residue. On the other hand, not rolling the rye in the 30-in. rows resulted in reduced yields and some issues at harvest. “The rye was standing between the rows and had a tendency to bunch up and create a blockage [while combining],” Jack said. “In the 10-in. rows the drill apparently laid the rye down enough that it was not as much of a problem.”

FIG 1 **Soybean yields at Jack Boyer’s**



★ Where cover crop was left standing after chemical termination in 30-in row, soybeans yielded significantly less with 95% certainty as determined by the least significant difference (LSD).

TRIAL

Roll-Crimping Cover Crops and Soybean Seeding Date

COOPERATORS	TIM SIEREN, *Keota*

Fellow PFI member Levi Lyle lent his roller-crimper to Tim Sieren for this trial. Photo courtesy of Jason Johnson, USDA-NRCS.

A roller-crimper presents farmers the opportunity to mechanically terminate cover crops without chemicals or tillage. This method is dependent on a large amount of cover crop growth and the cover crop reaching the flowering stage before crimping. A roller-crimper is a large, metal cylinder with "chevron" pattern blades that simultaneously lays the cover crop flat on the ground and crushes the stem in several places. Successful termination of a cover crop with the roller-crimper is dependent on the cover crop being at the anthesis (flowering) stage at the time of rolling. For cereal rye, this flowering stage is likely to occur in late May in Iowa.

FINDINGS

Cover crop termination date had the strongest effect on soybeans. Soybeans yielded best when the cover crop was chemically terminated on May 5 and the soybeans were seeded on Apr. 24 or May 7.

Roll-crimp termination of the cover crop was a challenge and this was attributed to a thinned cover crop stand resulting from drilling soybeans on May 7 as well as a hail storm in mid-May before roll-crimping on May 30. Roll-crimped covers had to be sprayed in June to complete termination of the cereal rye.

TABLE 2 **Cover crop biomass at the time of termination and soybean yields at Tim Sieren's in 2017.**

Cover crop termination date	Cover crop termination method	Cover crop biomass (lb/ac)	Soybean seeding date	Soybean yield (bu/ac)
May 5	Spray	1,921 b	April 24	66 a
	Spray		May 7	67 a
May 30	Roll-crimp	10,011 a	May 7	58 b
	Roll-crimp		May 30	54 b
	LSD (0.05)	5,062	LSD (0.05)	7

By column, values followed by different letters are considered significantly different with 95% certainty as determined by the least significant difference (LSD).

“

No matter the trial, I’ve always learned valuable information by doing them, and generated more questions that make me want to try doing more with cover crops.

TIM SIEREN

Livestock

Practical Farmers' Livestock Program encompasses producers of all sizes and scales, from backyard chickens and bees to large-scale beef, hog and poultry operations. Many are grass-based livestock producers, practicing rotational grazing, forage stockpiling, cover crop grazing and many are actively transitioning row crop ground into perennial pastures comprised of cool and warm season forages.

2017 RESEARCH

ECONOMIC IMPACT OF GRAZING COVER CROPS IN COW-CALF OPERATIONS

Wesley Degner, *Lytton*

Bill Frederick, *Jefferson*

Mark Schleisman, *Lake City*

WINTER FEED MONITORING ON A GRASS-FED CATTLE FARM

Dave and Meg Schmidt, *Exira*

MONITORING BIRDS IN ROTATIONALLY GRAZED PASTURE

Bruce Carney, *Maxwell*

ONGOING RESEARCH

GRASS-FINISHED BEEF QUALITY

FORAGE-FED PORK QUALITY

FEEDING SMALL GRAINS TO SWINE

SUPPLEMENTING DAIRY CATTLE WITH APPLE CIDER VINEGAR

ECONOMIC AND SOIL HEALTH IMPACTS OF GRAZING COVER CROPS

TRIAL

Economic Impact of Grazing Cover Crops in Cow-Calf Operations

COOPERATORS	WESLEY DEGNER, *Lytton* // BILL FREDERICK, *Jefferson* // MARK SCHLEISMAN, *Lake City*

For the study, the cooperating farmers seeded cover crops, intending to graze the forage produced. Cattle grazed on cover crops in the fall, and some continued to graze into the winter and spring.

At the start of each cover crop grazing season, the farmers estimated how much feed their cattle would need based on animal weight and daily dry matter requirements. This value, minus any supplemental feed provided, was considered the amount of purchased feed farmers were able to offset by grazing cover crops.

The cooperators tracked all expenses throughout the study and entered the data into a spreadsheet that estimates the forage value of cover crops, found on Iowa State University's Ag Decision Maker website.

Dennis Degner and his son, Wesley, started grazing 85 acres of cereal rye on their farm near Lytton in 2015. After two years of research, they decided to plant 200 more acres of cover crops in the fall of 2017 for grazing. Photo courtesy of Lynn Betts.

FINDINGS

FIG 2 **Average net profit per acre over two years from grazing cover crops**

DEGNER	$10.85
FREDERICK	$10.64
SCHLEISMAN	$53.94

It's important to note that each farmer received cost-share payments ranging from $11 to $41 per acre, which are included in the above profits. Cost-share allows farmers to try unfamiliar practices and hone their skills while providing a financial buffer against mistakes.

> **My dad ran 200 cow-calf pairs on the same acres that we now run 360 pairs on. Because we can graze cover crops, we're producing more on the same amount of land.**
>
> MARK SCHLEISMAN

TRIAL

Winter Feed Monitoring on a Grass-Fed Cattle Farm

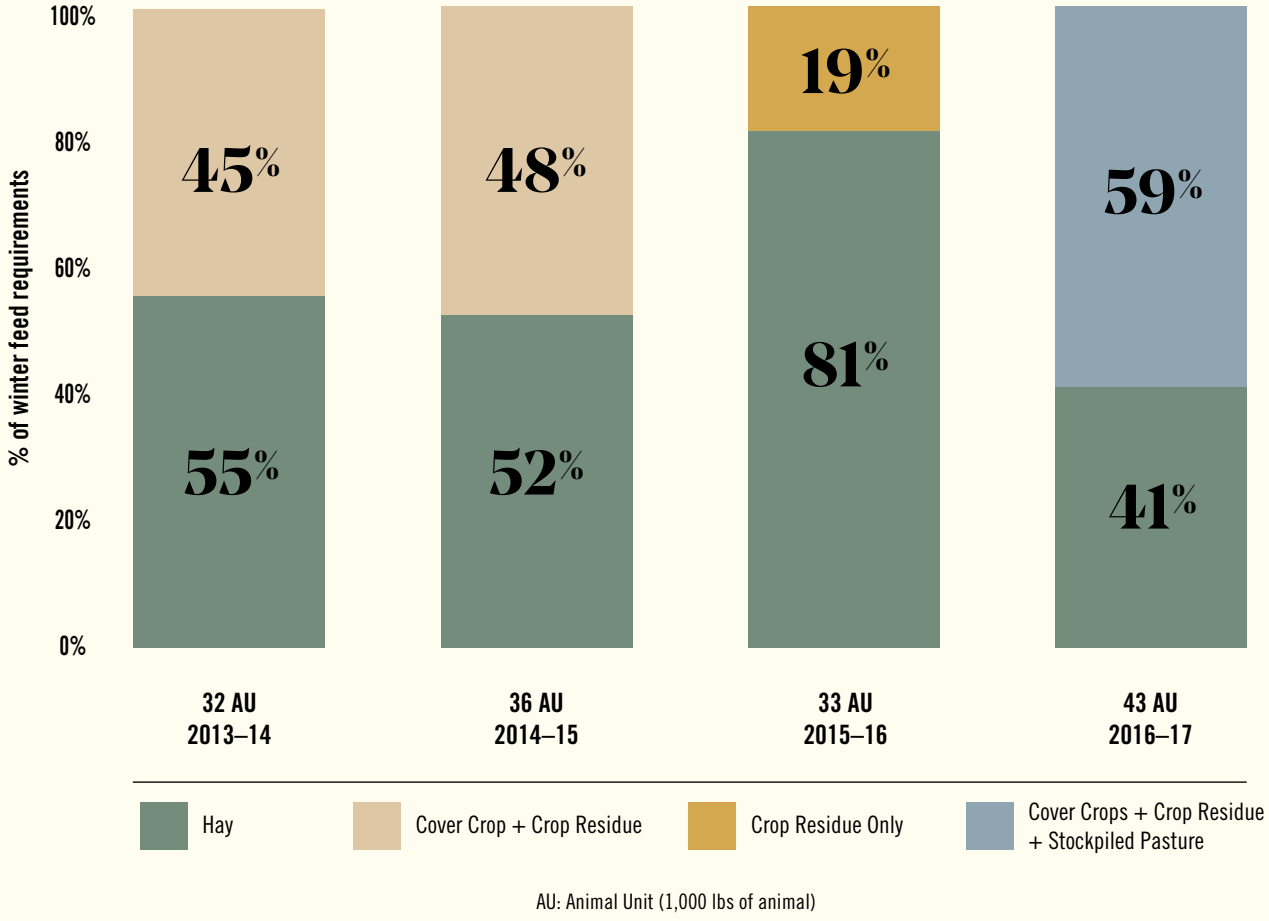
COOPERATORS	DAVE AND MEG SCHMIDT, *Exira*

Feeding the cowherd during the winter months is the greatest expense for cattle farmers because of the high cost of hay. From 2013-2017, Dave and Meg experimented with feeding cover crops, crop residue and stockpiled pastures to cut down on hay costs. They weighed the cattle and recorded their movements through pastures to track the amount feed consumed and associated expenses.

As a result of this research, they stockpiled about 37 acres of pasture for the 2017-2018, which they grazed from early October through December 27. "It takes a little extra planning because any stockpile-grazed pasture needs to catch up in the spring and shouldn't be grazed until June," Dave says.

FINDINGS

FIG 3 **Forage type consumed from November to April each year**



AU: Animal Unit (1,000 lbs of animal)

With the inclusion of stockpiled pasture as a winter feed source in 2016-2017, Dave and Meg were able to feed less hay to more animals while reaping greater profits.

TRIAL

Monitoring Birds in Rotationally Grazed Pasture

COOPERATORS	BRUCE CARNEY, *Maxwell*

While many environmentalists see cattle as bad for wildlife, a properly managed herd can have a positive impact on bird populations. Intensively managed, rotationally grazed cattle operations change the structure of bird habitat, creating areas with short and tall vegetation, which some birds need to thrive.

Prairies and pastures can complement one another to provide a diversity of bird habitat. To illustrate this, Practical Farmers of Iowa teamed up with Drake University to conduct bird counts in three areas: a restored prairie at Chichaqua Bottoms Greenbelt and pastures at Bruce Carney's farm, one growing perennial forages only and another interseeded with annual forage species. Drake University students Grace Baumgartner and Conner Willis conducted bird counts recording species and their abundance throughout the summers of 2016 and 2017 at these locations.

> "I learned that you don't have to have thousands of acres to conserve wildlife... smaller parcels of land, managed properly, can create favorable habitats and support birds.
>
> BRUCE CARNEY

FINDINGS

TABLE 3 **Bird species ranked from most abundant to least abundant in 2017**

1	Cliff Swallow	17	American Robin	33	American Crow
2	European Starling	18	Sandhill Crane	34	Great Blue Heron
3	Brown-Headed Cowbird	19	Common Grackel	35	Baltimore Oriole
4	Dickcissel	20	Henslow's Sparrow	36	Song Sparrow
5	Eastern Meadowlark	21	Ring-Necked Pheasant	37	Yellow-Headed Blackbird
6	Red-Winged Blackbird	22	Savannah Sparrow	38	Bald Eagle
7	Barn Swallow	23	Tree Swallow	39	Blue Jay
8	Mourning Dove	24	Field Sparrow	40	Cedar Waxwing
9	American Goldfinch	25	House Wren	41	Northern Harrier
10	Bobolink	26	Mallard	42	Gray Gatbird
11	Sedge Wren	27	Turkey Vulture	43	Red-Tailed Hawk
12	Grasshopper sparrow	28	Eastern Kingbird	44	Rose-Breasted Grosbeak
13	Canada Goose	29	Vesper Sparrow	45	House Sparrow
14	Rock Pigeon	30	Gray Partridge	46	Lincoln's Sparrow
15	Common Yellowthroat	31	Le Conte's Sparrow	47	Northern Cardinal
16	Killdeer	32	Nelson's Sparrow	48	Orchard Oriole

A total of 48 species were present in at least one of the three treatment areas. Species of conservation interest in this study are highlighted.

Horticulture

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.

2017 RESEARCH

SUMMER LETTUCE VARIETY TRIAL

Jill Beebout, *Chariton*
Carmen Black, *Solon*
Kate Edwards, *Iowa City*
Rob Faux, *Tripoli*
Alice McGary, *Ames*
Jordan Scheibel, *Grinnell*

HIGH TUNNEL TOMATO VARIETY TRIAL

Tim Landgraf, *Kanawha*
Lee Matteson & Rose Schick, *Nevada*
Mark Quee, *West Branch*

CHERRY TOMATO ENTERPRISE BUDGETS

Ann Franzenburg, *Van Horne*
Emma Johnson, *Central City*

SHEEP GRAZING COVER CROP BEFORE FALL BRASSICA

Mark Quee, *West Branch*
Carmen Black, *Solon*

ANNUAL WILDFLOWER AND HERB MIX FOR POLLINATORS

Jill Beebout, *Chariton*
Rob Faux, *Tripoli*
Alice McGary, *Ames*

SUMMER BROCCOLI VARIETY TRIAL, 2013-2017

Rob Faux, *Tripoli*

WHOLE FARM FINANCIAL PROJECT, 2015-2016

TRIAL

Enterprise Budget for Cherry Tomatoes

COOPERATORS	ANN FRANZENBURG, *Van Horne* // EMMA JOHNSON, *Central City*

Cherry tomatoes are popular at markets and grocery stores, but have high labor costs. Enterprise budgets help farmers know if a specific crop or set of crops are net earners. In previous years' enterprise budget work on cucumbers, Franzenburg and Johnson both found the results were useful to their bottom line and improved farmer-to-farmer conversations about production and marketing. Mostly, it helped them focus on finding and correcting labor inefficiencies.

University extension programs offer enterprise budget examples for tomatoes, but not many for cherry tomatoes. While these studies are valuable, producers still have questions about the differences in their variety choices and management decisions on each farm, and were skeptical of the high net returns shown by some university studies. The breakdown of labor by task in this study was of particular interest. "We were really concerned about the amount of labor for cherry tomatoes; especially the time spent harvesting," said Johnson.

> **"My mom does a lot of the harvesting, and she is a machine. Other people would not work as efficiently; she picks a flat — about 20 pounds — in an hour.**
>
> EMMA JOHNSON

FINDINGS

- Labor was the largest expense for both Franzenburg and Johnson, accounting for 62% and 68% of their total expenses, respectively.
- Harvesting and packing was the most time-consuming task on both farms, accounting for 74% of labor-hours for Franzenburg and 62% of labor-hours for Johnson.
- Both farms had profitable cherry tomato crops, netting $1.31/lb for Franzenburg and $1.54/lb for Johnson.

FIG 4 **Labor Time**

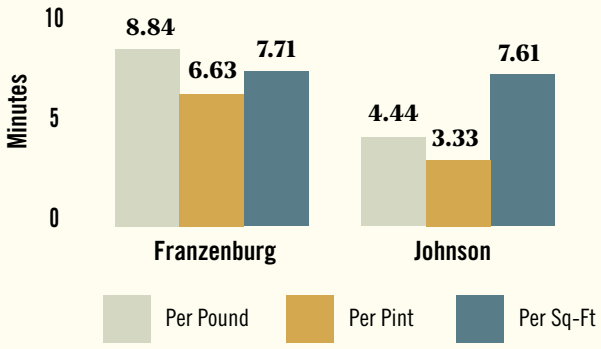
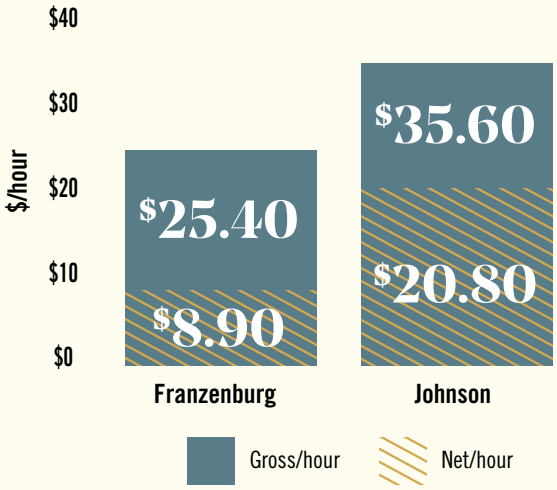


FIG 5 **Gross Revenue and Net Income per Labor-Hour**



TRIAL

Summer Lettuce Variety Trial

COOPERATORS	JILL BEEBOUT, *Chariton* // CARMEN BLACK, *Solon* // KATE EDWARDS, *Iowa City* // ROB FAUX, *Tripoli* // ALICE MCGARY, *Ames* // JORDAN SCHEIBEL, *Grinnell*

For diversified vegetable farmers with CSAs, leafy greens need to go in the box every week. For farmers at market, the demand for head lettuce is constant. But for all farmers, there is a time during July and August when greens are difficult to grow – they bolt quickly, sending their energy, and sugars, toward reproduction. Even if greens might appear marketable, they may taste bitter.

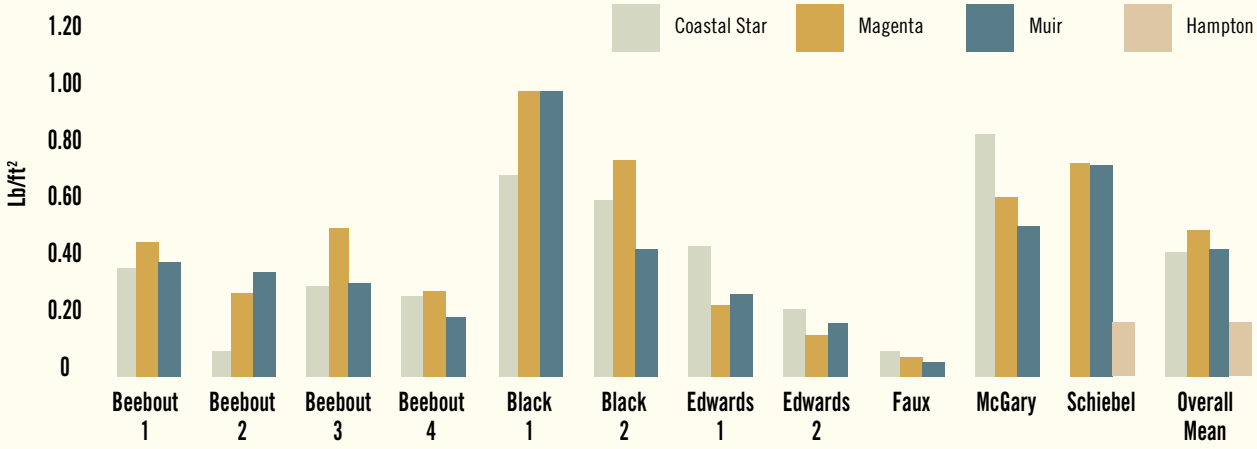
To meet the desires of their customers, farmers are interested in finding varieties of head lettuce most tolerant to the heat of summer that taste acceptable, and work in their production system. Salanova, the innovative small-headed varieties from Johnny's Seeds, are preferred by many growers for their ease of harvest and use in baby-leaf salad mix. However, Salanova is expensive, so in this trial, farmers compared yield and quality of larger, full head lettuce varieties.

> "This trial fundamentally changed the way we think about summer lettuce. It encouraged us to experiment with varieties we hadn't used before, and we had success. These varieties filled a void in our CSA and market offerings.
>
> JILL BEEBOUT

FINDINGS

- Magenta had the highest yields on three of the six farms, and was much more heat tolerant than Coastal Star.
- Coastal Star produced sizeable heads – particularly in earlier successions – but tended to bolt quickly.
- Farmers found they could grow quality summer head lettuce using these varieties, though specific preferences differed by farm.

FIG 6 **Summer lettuce yield by farm, succession**



TRIAL

Brassica Yield Following Grazed and Un-Grazed Cover Crops

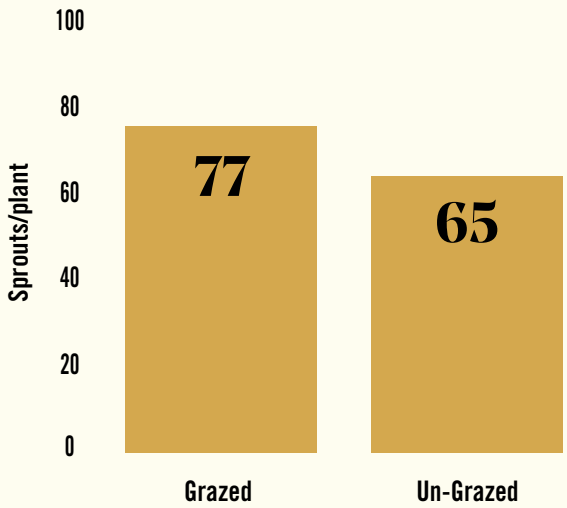
COOPERATORS	CARMEN BLACK, *Solon* // MARK QUEE, *West Branch*

Carmen Black and Mark Quee both use cover crops in their crop rotations, and allow their sheep to graze on vegetable fields during fallow years. But they — and other vegetable farmers — are interested in utilizing their vegetable production beds in non-fallow years for animal forage, too: because fall crops are seeded in July, there's time in the spring to establish and graze a cover crop.

For this trial, instead of terminating the cover crop by mowing and tillage, Black and Quee let their sheep graze the cover crop prior to seeding. Each farmer then measured the yield of the fall brassica crop (Brussels sprouts for Black and broccoli for Quee) that followed the grazed and un-grazed cover crops.

FINDINGS

FIG 7 **Brussels sprouts per plant at Carmen Black's**



Sprouts per plant were no different between the grazed and ungrazed treatments with 90% certainty as determined by the least significant difference (LSD).

- There were no statistical differences in brassica yield by treatment (grazed vs. un-grazed cover crop).
- Though Black had more than 3 tons/ac of aboveground biomass, the sheep trampled more than they foraged because the oats were too fibrous to be palatable.
- Black is interested in grazing more spring-seeded cover crops based on trial results; Quee plans to stay with his current system of grazing in fallow years and in the early spring and late fall.

> "This trial motivated me to put in an early season cover crop, which I've never done before. The cover crop looked really good, and I plan to continue seeding cover crops in March. This project helped me think through how I want to use the sheep on my vegetable fields, and what will be most feasible."
>
> CARMEN BLACK

TRIAL

Tomato in High Tunnel, Variety Trial

COOPERATORS	TIM LANDGRAF, *Kanawha* // LEE MATTESON & ROSE SCHICK, *Nevada* // MARK QUEE, *West Branch*

Growing tomatoes in the high tunnel gives farmers an early jump on the tomato market, and can help protect the plants from some environmental stressors. For this trial, three farmers selected two of three tomato varieties (Big Beef, Big Dena or Rebelski) to compare in their high tunnels. These varieties were selected based on positive farmer experience, the varietal similarities, and the availability of organic and untreated seed, donated by Johnny's Seeds.

FINDINGS

FIG 8 **Cumulative yield at Tim Landgraf's**

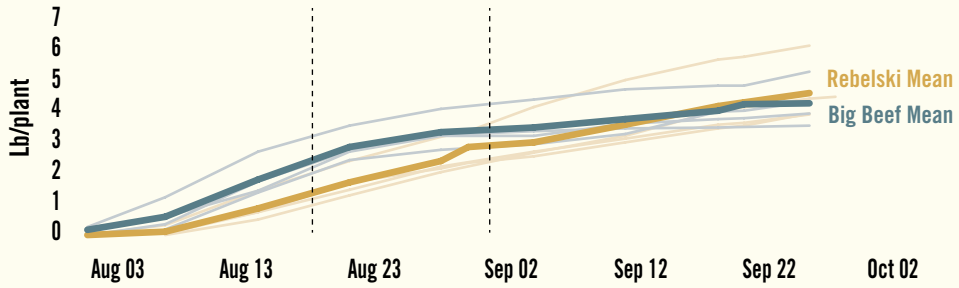


FIG 9 **Cumulative yield at Mark Quee's**

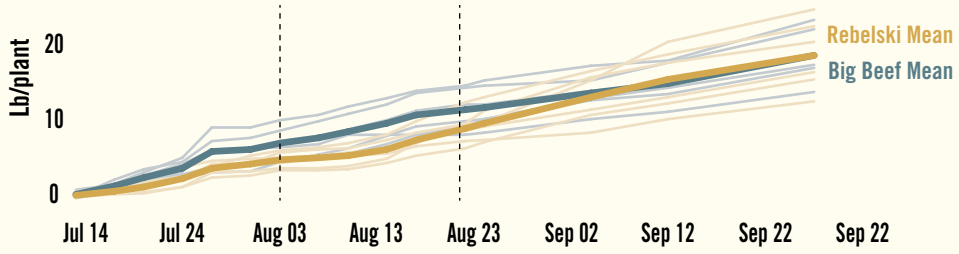
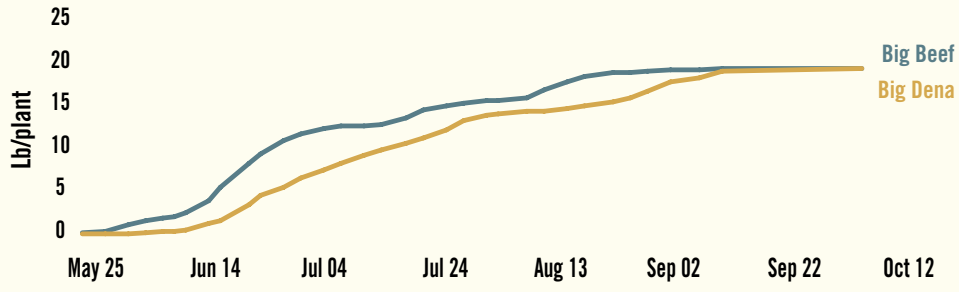


FIG 10 **Cumulative yield at Matteson/Schick's**



Cumulative yield shown in lb/plant at each farm. Bold lines are the average values for each variety; light lines are individual plot values. The last date is the final yield. The dotted vertical lines indicate the time period during which average yields of Rebelski and Big Beef were statistically different with 90% certainty. Final yield, however, in lb/plant were not statistically different on any of the farms. Statistical analysis could not be performed at Matteson/Schick due to bulk harvest.

- No farm showed statistical differences in overall yield (lb/ft²) among varieties.
- Landgraf and Quee had statistical differences in size and number of tomatoes, with Rebelski having more and smaller fruits than Big Beef.
- All farms will continue to use Big Beef as a high tunnel variety, and Matteson/Schick will also continue to use Big Dena, which held its size later into the season.

According to Schick, Big Beef is more popular at the farmers' market and starts sooner, but, its production tends to drop off throughout the year. Big Dena seemed to have two flushes, and the harvest started later. "We are considering using Big Dena as a variety to keep later into the fall because the size holds up and it has a later flush of fruit," says Schick.

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