

2014-2015 ANNUAL REPORT COVER CROP SURVEY

A Synopsis of the information collected during the 2014-2015 Cover Crop Survey

JULY 2015



ABSTRACT

This document summarizes information collected from more than 1,200 farmers across the United States who completed an online survey on cover crops in early 2015. A large majority of respondents (84%) planted cover crops; 16% have not. The report sheds light on farmers' motivations for planting cover crops, their expectations of the benefits of the practice, users' concerns about cover crops and barriers to adoption among non-users.

For the third year in a row, this survey charted a statistically significant increase in corn and soybean yields following cover crops. Corn yields rose 3.7 bushels per acre, or 2.1%, following cover crops, while soybean yields increased a mean of 2.2 bushels per acre, or 4.2%.

Acreage of cover crops also continues to climb steadily higher. The total reported acreage of cover crops planted by surveyed farmers in 2014 was 20% higher than in 2013, despite lower commodity prices.

This year's survey revealed an increase over last year's in the number of respondents planting brassicas and cover crop mixes. In addition to hinting at a growing sophistication among cover crop users, the data on the most-planted cover crop species—led strongly by cereal rye, but also including a range of grasses, brassicas and legumes—will help seed producers and dealers focus their development, training and promotional efforts.

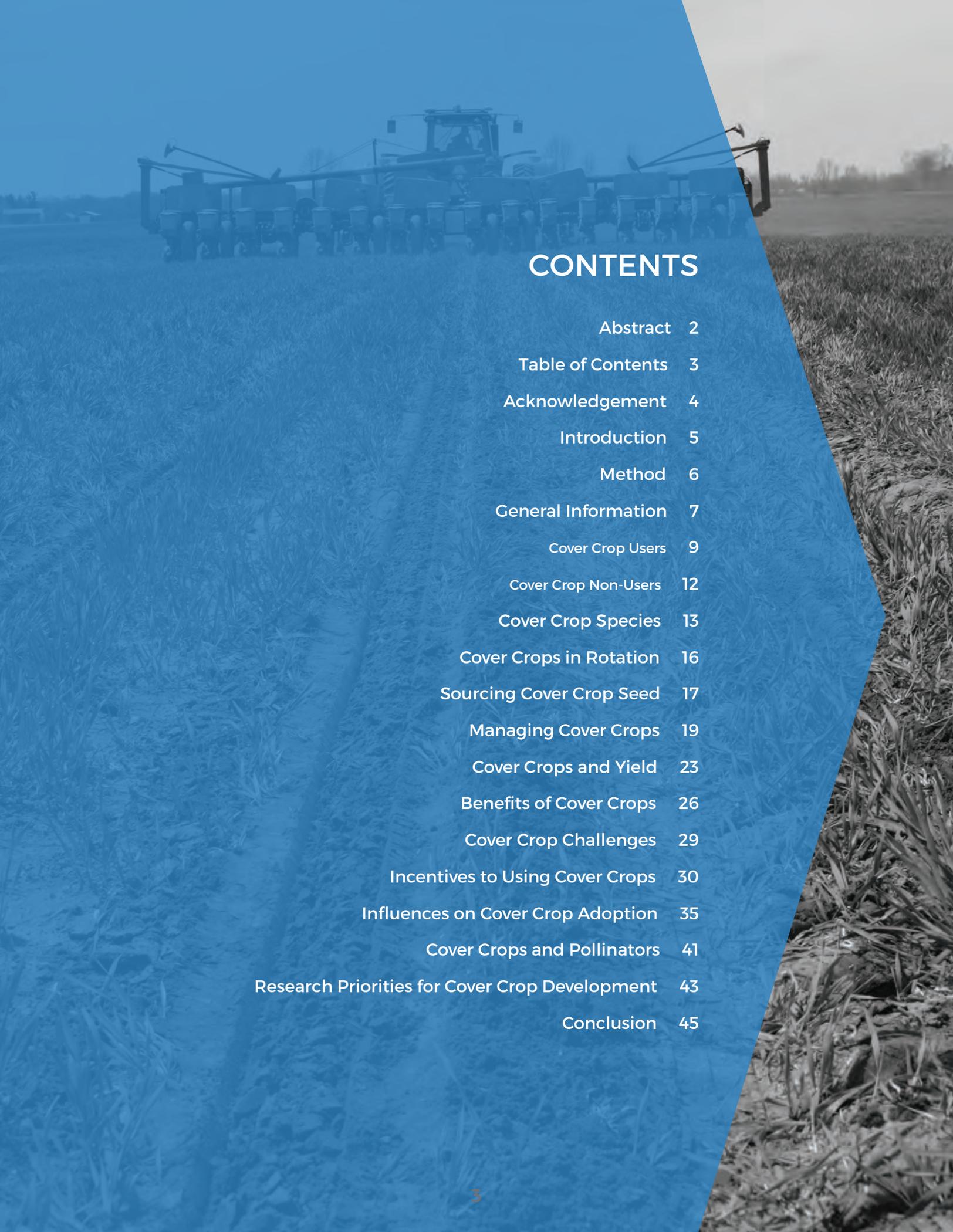
Details on where cover crop users source their seed, and where they would like to buy cover crop seed in the future, points to growth opportunities for cover crop seed specialists, and challenges for ag retailers and commodity crop seed dealers eager to enter or expand in the growing cover crop market.

Among the most interesting observations are the differences in motivation to plant cover crops between current cover crop users and non-users. Insight into the motivations and influences that non-users say could inspire them to adopt cover crops can provide invaluable direction to policymakers, advisors and communicators.

Ninety-two percent of the farmers who do not currently plant cover crops say economic incentives would somewhat or always influence cover crop adoption. Similarly, while about half (46 percent) of cover crop users say they would be motivated to plant more cover crops if the practice reduced their crop insurance premiums, that number jumps up to 70 percent of non-users who said reduced crop insurance premiums could or would influence them to plant cover crops.

A significant finding—through a new question in this year's survey—is that almost three-quarters of the cover crop users said the market outlook for cash crop prices would have little to no impact on their decision to plant cover crops. That challenges assumptions that cover crop acreage is closely tied to commodity prices.

Finally, insight from both users and non-users on the developments they would like to see in cover crops could help set a positive, productive research agenda for the years to come.



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ACKNOWLEDGEMENT

This report is the third in a series of annual cover crop survey reports that started by evaluating farmers' use of cover crops during the 2012 cropping season.

There are many people who deserve a thank you for their contributions to this survey and report. First and foremost are the farmers and others who have contributed their information to this survey. Without the input from farmers, both those using cover crops and those who have not used them, this survey would not contain the robust insights and learning opportunities that it continues to produce. There are several detailed questions associated with this survey, and we appreciate the time that all participants have taken to provide thoughtful answers and contribute personal insights and anecdotes. The partners on this survey are eternally grateful to all those who are willing to contribute to the information and knowledge base in this survey.

As always, Dr. Rob Myers with the North Central Sustainable Agriculture Research and Education (SARE) program deserves the lion's share of the credit for making this survey happen. Without the guidance and vision of Dr. Myers and his commitment to the promotion and education of soil health, cover crops and conservation farming systems, this survey would not be what it is today. His vision on how to use the information to educate everyone from farmers to policymakers has multiplied the usefulness of this survey and the information that comes out of it many times over.

This year, SARE and the Conservation Technology Information Center (CTIC) welcomed the American Seed Trade Association (ASTA) to the list of partners who contributed to this survey. Jane DeMarchi, who represented ASTA on the planning committee for this survey, did a fantastic job of collecting information from key members of her organization and using that insight to improve the variety of questions asked in this year's survey. The contributions from Ms. DeMarchi and her colleagues at ASTA most certainly improved the quality and variety of questions that were included in this survey.

Penton once again partnered with CTIC, SARE and ASTA on this year's survey. Through the company's renowned *Corn and Soybean Digest*, Kurt Lawton and Scott Grau helped distribute the survey link to a wide range of farmers across the agricultural United States. Their relationship with their readers most certainly contributed to the great response to this year's survey.

Dr. Wally Tyner and Myriam Bounaffaa from Purdue University were instrumental in performing the statistical analysis of the raw data gathered from this year's respondents. Their analysis and insight contributed greatly to the accuracy and reliability of the numbers in this survey.

Also from Purdue University, Dr. Linda Prokopy used her vast knowledge and experience with surveys to help us craft questions that would provide the best and most accurate information. Her expertise guided the development of questions that delivered insightful responses.

Steve Werblow is once again the author of this report. Steve's ability to review and synthesize information and his ability to put that information into words has helped information from this survey reach multiple audiences across many sectors of agriculture.

The Conservation Technology Information Center (CTIC) also deserves credit for this survey. Convening the planning group, collecting and crafting the questions, distributing the survey link, collecting and analyzing the data, and troubleshooting problems with the online survey instrument are all necessary tasks that contribute to the success of the survey and enhance the ability of survey users to accurately and easily report their information.

Ultimately, there are many people who contributed to this survey and report. Unfortunately, I cannot list each and every person who contributed, as the list would be too long. For all who contributed, I offer you a sincere thank you for the contribution of your time, knowledge and expertise to this project. This survey and report would not be what it is without the contributions of so many dedicated and qualified people. Thank you!

Chad Watts, Project Director
Conservation Technology Information Center
West Lafayette, Indiana
June 2015

INTRODUCTION

For the third year in a row, a nationwide survey of U.S. farmers reveals the expansion of cover crop acres on cropland. A growing number of farmers and crop advisors recognize the benefits of planting grasses, legumes, brassicas and other seasonal crops—or a mixture of species—to protect soil from erosion, increase organic matter and build healthier soils between cash crops.

In March and April, 2015, the Sustainable Agriculture Research and Education (SARE) program and the Conservation Technology Information Center (CTIC) invited farmers across the United States to take an online survey at QuestionPro.com about their use of and thoughts on cover crops. More than 2,472 people answered at least some of the survey questions. Of that group, 1,229 respondents—representing 47 states—completed the entire survey.

The survey was quite detailed; respondents who completed the survey spent an average of 16 minutes answering the questions. The survey instrument was designed to follow up on two previous years of farmer questionnaires on cover crops.

Though there may have been overlap between the respondent pools in 2013-2014 and 2012-2013, the respondent pools were not exactly the same set of farmers. Therefore, there are some limitations to how data from previous surveys may be combined with or compared to results of this one. However, the data in this report contribute significantly to our understanding of the growing interest in cover crops, as well as the appeal and barriers to adoption.

Information from this survey is available online at: www.sare.org/covercropsurvey



Using cover crops and reducing soil disturbance can improve soil biota.

METHOD

The 2014-2015 SARE/CTIC Cover Crop Survey instrument was developed by SARE and CTIC in cooperation with researchers from Purdue University and posted online via QuestionPro.com. Invitations to participate in the survey were distributed nationwide via email to a broad farmer base, including:

- More than 50,000 farmers from the subscriber lists of Penton Farm Progress publications, via email blasts from the publisher;
- Participants in CTIC activities including the Center's popular Conservation in Action tours and demonstration plot tours;
- Steering committees of the Indian Creek Watershed Project and the Conservation Agriculture Systems Alliance (CASA);
- Email addresses collected from various lists of farmers and farm advisors;
- Respondents inspired to participate after reading press releases on the survey published in a variety of farm media, websites and organizational email blasts.
- Respondents in earlier SARE/CTIC Cover Crop Surveys.

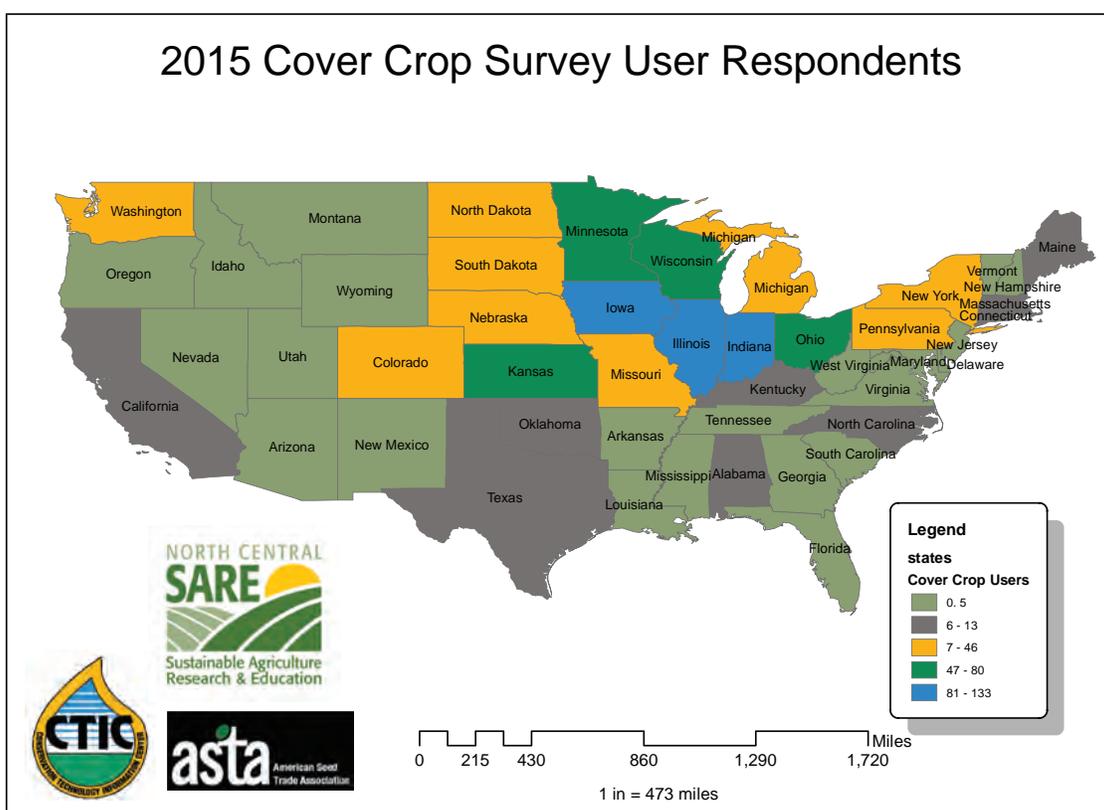
After indicating whether they had planted cover crops in the past five years, respondents were split into two groups—users and non-users of cover crops. Often, some respondents to these kinds of surveys begin the process simply to view the questions that are being asked. To maintain the purity of our data and use only data provided by farmers, all non-farmers were directed to a location where they could download the questions and did not have to pass through all the survey questions. This minimized the chances of using data that does not reflect on-farm perspective. As with previous SARE/CTIC Cover Crop Surveys, the respondent pool skewed toward cover crop users, which means the questionnaire yielded richer data on users' practices and opinions, but represents a significant over-reporting of cover crop use compared to the general population of farmers.

Of 2,472 people who began the survey, 1,229 completed the questionnaire. We believe there were a variety of reasons that the survey was not completed by all who started it, including time to finish the survey, relevance of some of the questions, and occasional software issues. Although every survey method has challenges, the results of the survey provide an excellent and detailed look at the hopes, concerns and approaches of a wide range of cover crop users, as well as respondents who do not employ cover crops. These results can help guide a wide range of activities that promote the adoption of cover crops, from strategic planning to crop development, technology transfer and promotion.

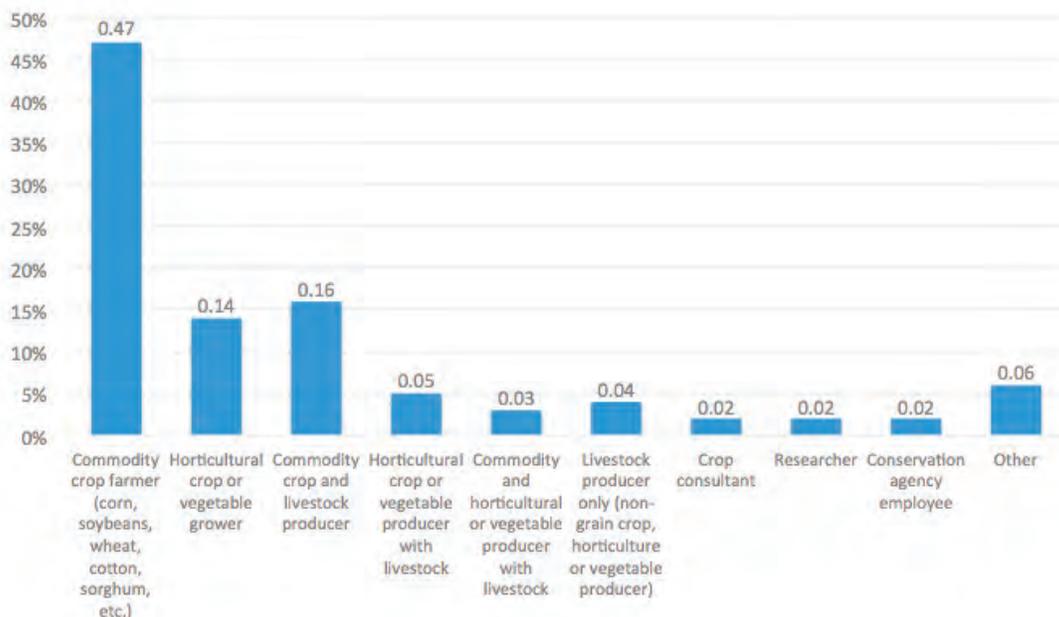
GENERAL INFORMATION

Respondents to the survey represented 47 U.S. states—all but Delaware, Nevada and Wyoming. States with the highest numbers of respondents were Iowa, Illinois and Indiana. Minnesota, Wisconsin, Kansas and Ohio represented the states in the second-highest tier of responses.

More than half of the respondents farmed crops only with 47% describing themselves as commodity crop producers in a question in which commodity crops were listed as “corn, soybeans, wheat, cotton, sorghum, etc.” and an additional 14% describing themselves as horticultural crop or vegetable growers. Respondents with livestock included livestock-only producers (4%), producers of both commodity crops and livestock (16%), horticultural/vegetable farmers with livestock (5%) and producers of commodity and horticulture/vegetable crops with livestock (3%).



HOW WOULD YOU CHARACTERIZE YOURSELF?



Asked about specific crops planted on their farm, cover crop users provided the following details: 75% (of 1,151) reported planting corn, 68% (of 1,136) said they planted soybeans, 7% of 1,116 planted sorghum, 34% of 1,122 planted wheat and 1% of 1,122 respondents planted cotton.



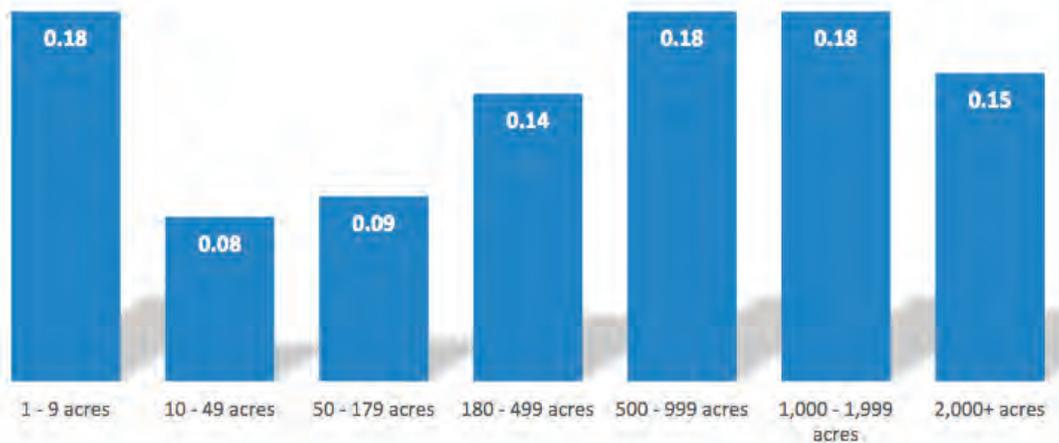
A soil pit shows the true soil health benefits of using cover crops.

Cover Crop Users

Asked whether they had ever used cover crops on their farm, 84% of 1,702 respondents answering the question reported that they had. Just 16% said they did not use cover crops. Based upon the answer to this question, respondents were channeled into “user” and “non-user” strings of questions. The balance did not answer the question and likely did not proceed with the rest of the survey.

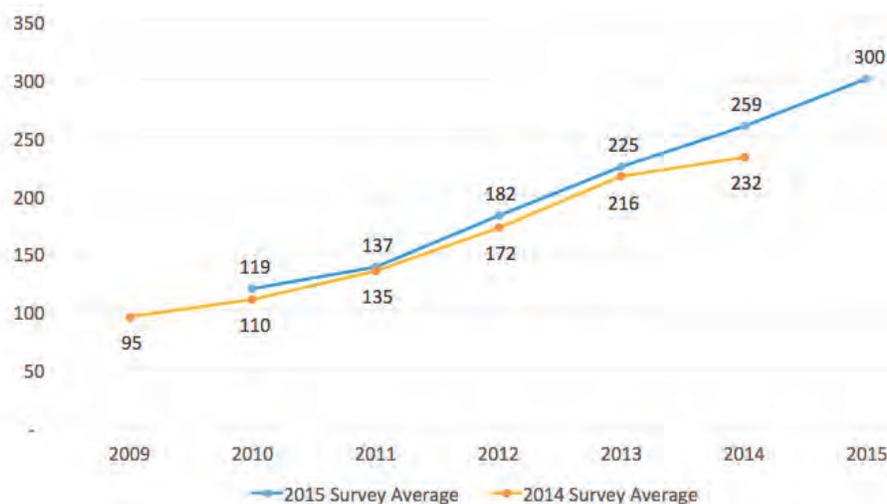
The mean amount of experience with cover crops among cover crop users in this survey was 7.33 years, based on 1,366 responses to the question.

COVER CROP USERS: ACRES FARMED IN 2014



Of 1,388 cover crop users who provided data on the number of acres they farmed during the 2014 cropping season, a narrow majority—51%—reported farming 500 acres or more. The largest segments of respondents, 18% each, fell into the 500-to-999-acre and 1,000-to-1,999-acre and 1-to-9-acre categories. An additional 14% farmed 180 to 499 acres in 2014.

AVERAGE COVER CROP ACREAGE PER RESPONDENT



Asked to report on the acres of cover crops they had planted in previous years and how many acres they expected to plant in 2015, cover crop users in this survey projected a mean cover crop average of 300 acres. Those farmers also reported planting a mean of 259 acres in cover crops in 2014 and a mean of 225 acres in 2013—a steady and rapid increase in cover crops on their farms over the past several years.

In fact, the average number of acres planted to cover crops by cover crop users in this year’s study nearly tripled between 2010 and 2015, rising from 119 to 300 acres. Reported cover crop acreage from 2010 to 2013 in the most recent survey very closely tracked results of the 2014 SARE/CTIC Cover Crop Survey.

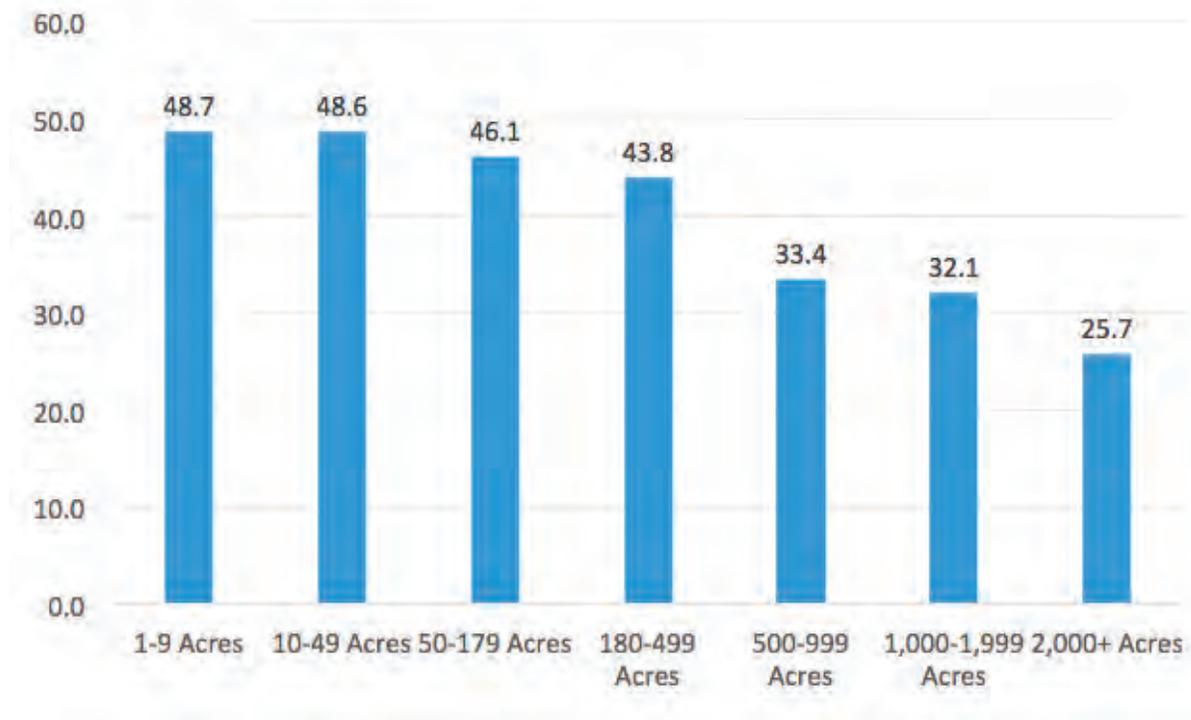
Comparing the current survey with last year’s survey data, the mean area that the 2015 respondents reported planting to cover crops in 2014 was 259, 15% higher than the 232 acres reported as the intended acreage to be planted in 2013 by respondents to the 2013-2014 survey. It is interesting to note that the larger the farm, the lower the proportion of acreage planted to cover crops.

Because of both a rise in acreage per farm and additional farmers using cover crops for the first time in 2014, total reported acreage rose among survey participants by 20.8% in 2014 versus 2013 (326,441 acres vs. 270,308 acres). The total acreage of cover crops reported per year in the most recent survey was somewhat lower than the 2013-14 survey because fewer farmers reported their acreage this year. However, the pattern in year-over-year increase is very similar for both surveys.

TOTAL COVER CROPS REPORTED BY YEAR



% OF FARMED ACRES WHERE COVER CROPS ARE USED



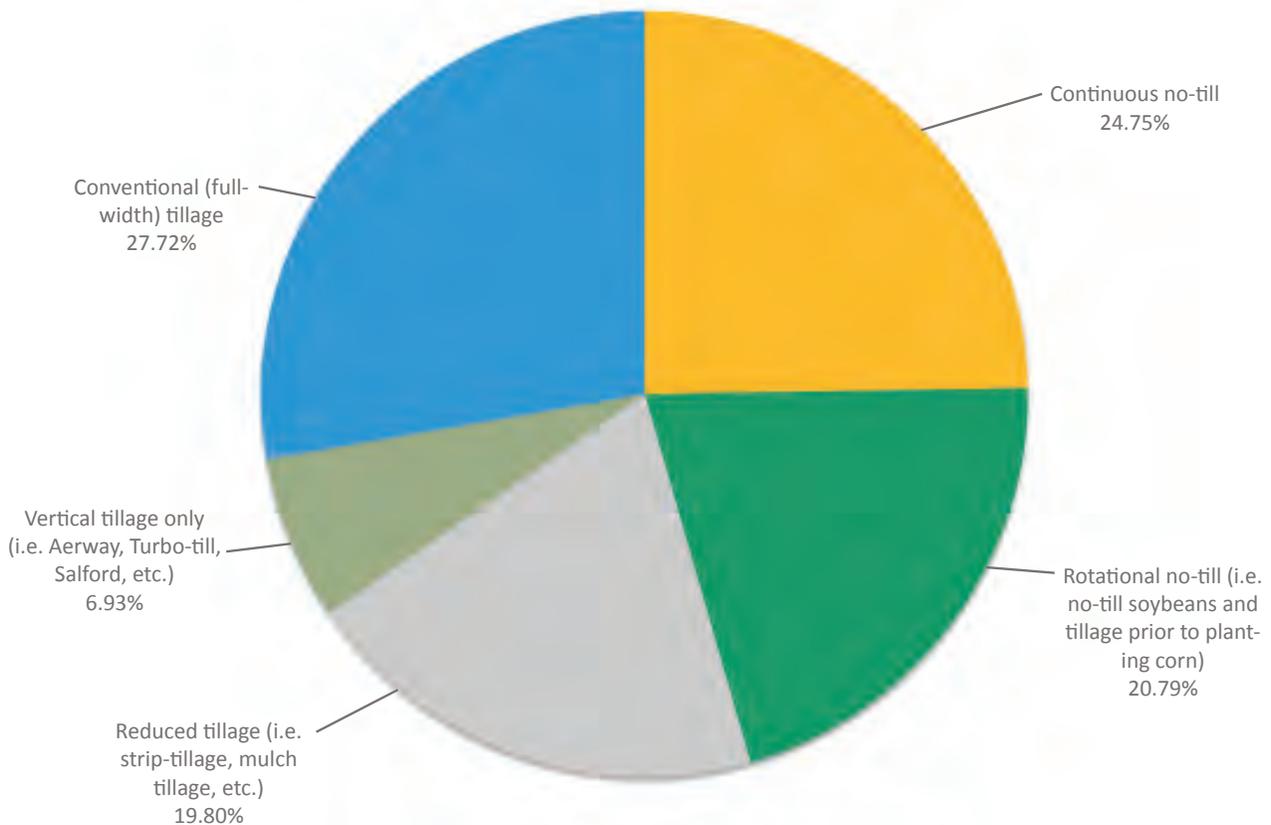
Annual Ryegrass used as cover crop on a farm in Michigan.

Cover Crop Non-Users

The largest portion—27%—of non-users in the 2015 survey reported farming 500 to 999 acres and the second-largest group, 22%, farming 1,000 to 1,999 acres. In fact, 60% of the 272 non-users who responded to the acreage question farm more than 500 acres.

The vast majority of the non-users responding to the survey employ some means of conservation tillage. Nearly 25% of the 238 non-users practice continuous no-till, 21% use no-till in rotation, 20% report using reduced tillage methods and 7% use only vertical tillage. Conventional, full-width tillage is employed by 28%.

WHAT TILLAGE PRACTICE DO YOU USE THE MOST ON YOUR FARM? (NON-USERS)



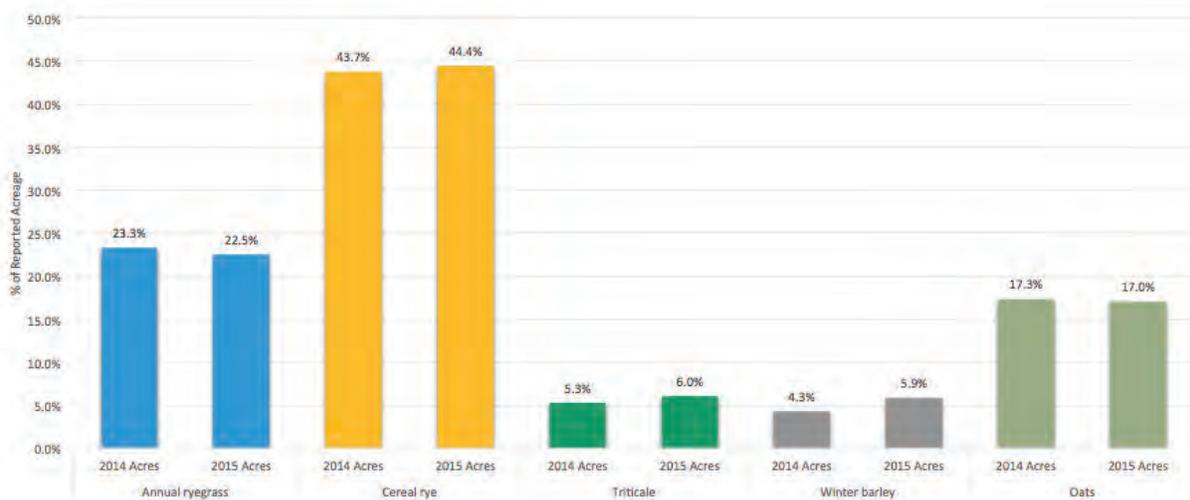
Cover Crop Species

Farmers plant a wide range of cover crop species based on an array of variables, from suitability to local conditions to ease of management, specific effects on soil properties, and others.

Cereal grains and grasses were the most popular cover crops, planted by 84% of the 1,287 cover crop users who answered this question. Cereal rye was by far the leading species of cover crops, accounting for approximately 44% of the total 2014 cover crops reported in the survey. Respondents predicted that they would also plant 44% of their cover crop acreage to cereal rye in 2015.

Annual ryegrass covered about half that acreage to capture a distant second place, with 23% of the total cover crop acres planted in 2014 and the same percentage projected for 2015. Among cereals and grasses, oats were third most popular, covering 17% of respondents' farmland in 2014, with the same proportion slated for planting in 2015. Triticale and winter barley were also noted on the list of the top five cereals and grasses.

ANNUAL GRASS AND CEREAL GRAIN USE



Of 1,302 cover crop users who answered a question about planting brassica cover crops, 61% replied that they had planted a brassica cover in 2014 and/or intended to do so in the 2015 cropping season.

Of the brassicas planted or planned on, radish represented by far the greatest number of acres in 2014 and 2015 (33% and 32%, respectively), while rapeseed and turnips were neck-and-neck for second place, with rapeseed on 14.5% of the acreage, turnips on 12% of the acreage in 2014 and a projection of 19% of the 2015 acreage in rapeseed and 15% in turnips.

PERCENTAGE OF REPORTED CROPLAND ACRES WHERE BRASSICAS WERE USED AS COVER CROPS

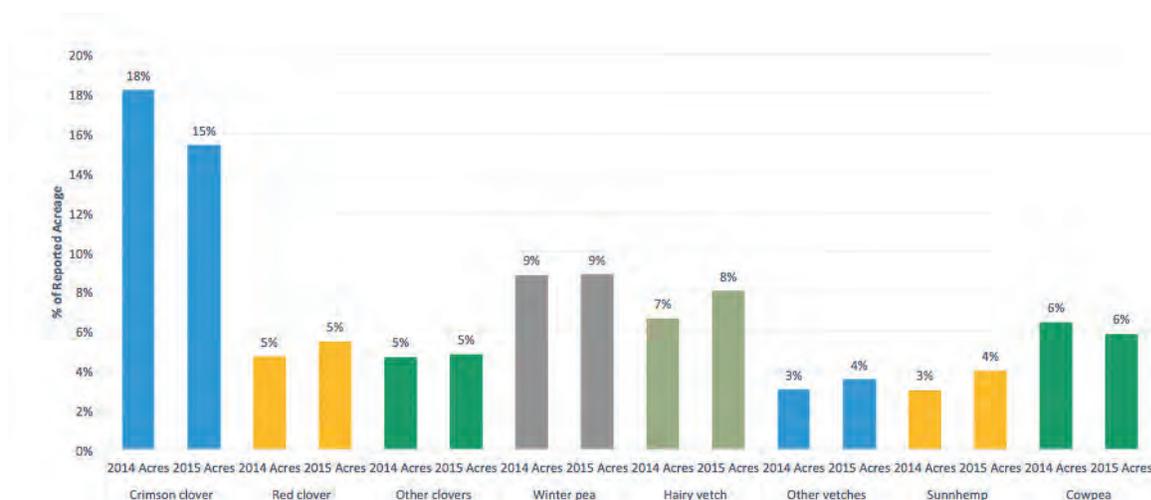


Of 1,251 respondents who answered a question about planting legume cover crops, 57% said they did. Of the legumes, crimson clover was the leading species, with 18% of the acres planted in 2015 and slightly less – 15% - projected for 2015. It is interesting to note that the projected planting of crimson clover was the only cover crop species in the survey to reflect a slight decrease in 2015 compared to 2014.

By contrast, respondents expected to increase their acreage of hairy vetch from 7% of the 2014 acres to 8% of the acreage projected for 2015, and to boost their sunn hemp acres from 3% to 4% in that period.

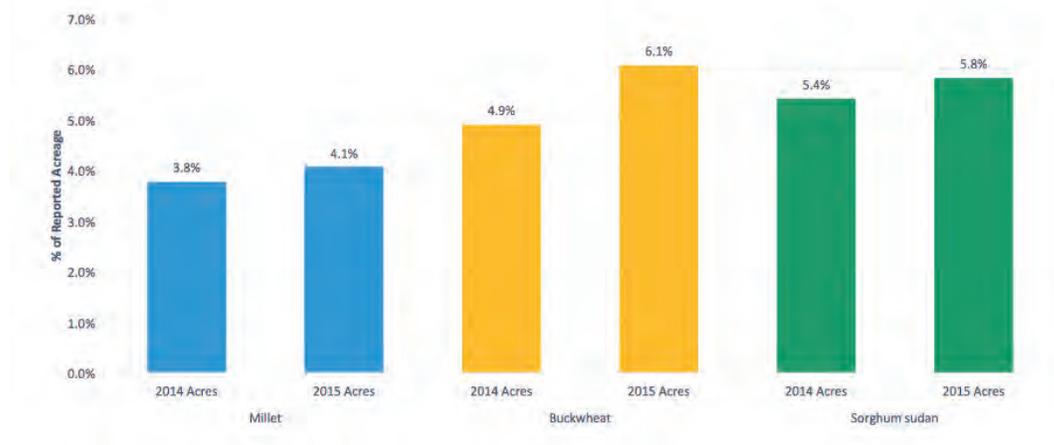
Winter peas (9% of the acres in 2014 and 2015), cowpea (6% both years), red clover (projected to remain steady at 5% of the acreage in 2014 and 2015) and “other clovers” also made the legume list.

PERCENTAGE OF REPORTED ACREAGE DEDICATED TO LEGUME USE



Non-legume summer annuals, including buckwheat, sorghum sudan and millet, were planted by 33% of 1,240 respondents.

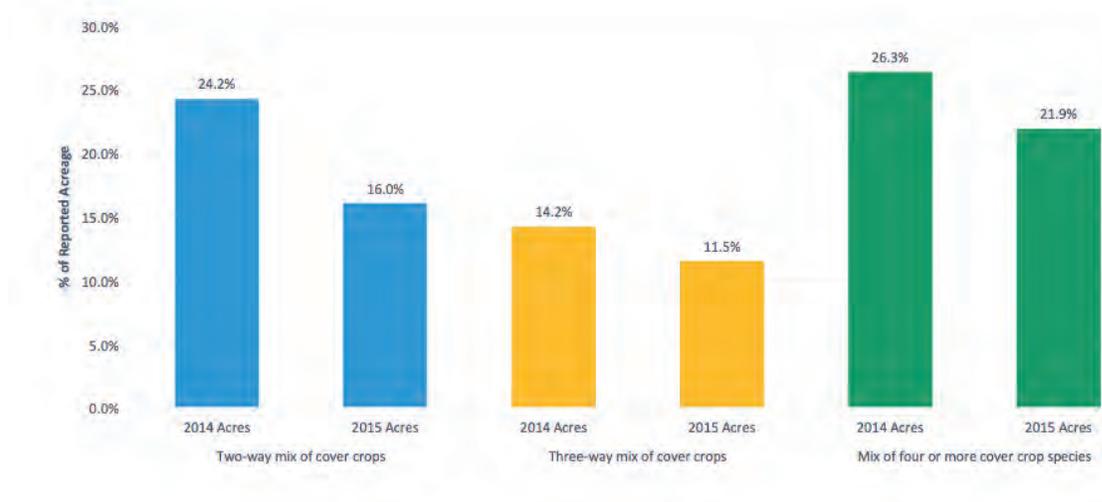
PERCENTAGE OF REPORTED ACREAGE DEDICATED TO SUMMER ANNUAL USE



Cover crop mixes were extremely popular. Of 1,233 respondents who answered a question about planting mixes in 2014 or 2015, 67% said they had or would. Mixes of four or more species of cover crop were most popular, accounting for 62,255 acres (26.3%) of respondents' land in 2014 and projected to cover 81,685 acres (21.9%) in 2015—a notable acreage increase of 31%.

Two-way mixes held a steady second place with 57,253 acres in 2014 and 59,708 acres projected for 2015, while three-way mixes accounted for 33,505 acres in 2014 and 42,959 acres expected for 2015.

REPORTED ACRES THAT ARE DEDICATED TO COVER CROP MIXES



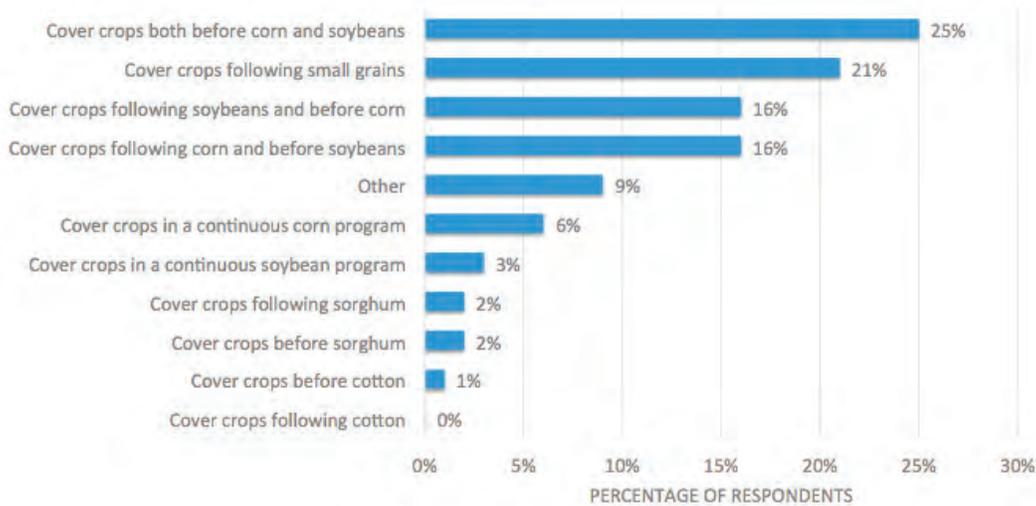
It is interesting to note that respondents in this year's SARE/CTIC Cover Crop Survey were more inclined to plant brassicas and cover crop mixes than their counterparts in last year's survey. This year, 61% planted brassicas compared to 55% last year, and 67% planted cover crop mixes of two or more species, vs. 60% of last year's respondents.

Cover Crops in Rotation

Row crop producers who reported using cover crops were asked where cover crops fit into their rotations. The largest percentage—25% of the 1,544 respondents to this question—reported planting cover crops before both corn and soybeans. Cover crops following small grains was a close second place, accounting for 21% of the responses.

Equal numbers of respondents—16% each—reported planting cover crops after soybeans/before corn and after corn/before soybeans. Cover crops in a continuous corn program tallied 16% of the responses, while 3% of the farmers reported using cover crops in continuous soybeans. Sorghum and cotton garnered fewer responses; “other” accounted for 9% of the tally.

WHERE DO COVER CROPS FIT INTO YOUR ROTATION? (ROW CROP PRODUCERS)



Of 264 vegetable/horticulture crop producers who responded to a question about the timing of cover crops, 71% reported planting cover crops after they harvested their cash crops, while 29% said they planted cover crops before harvesting their cash crops. Row crop growers exhibited a similar ratio: 68% (of 720) planted cover crops after harvesting their cash crops, while 32% seeded cover crops while their cash crops were still in the field.

Sourcing Cover Crop Seed

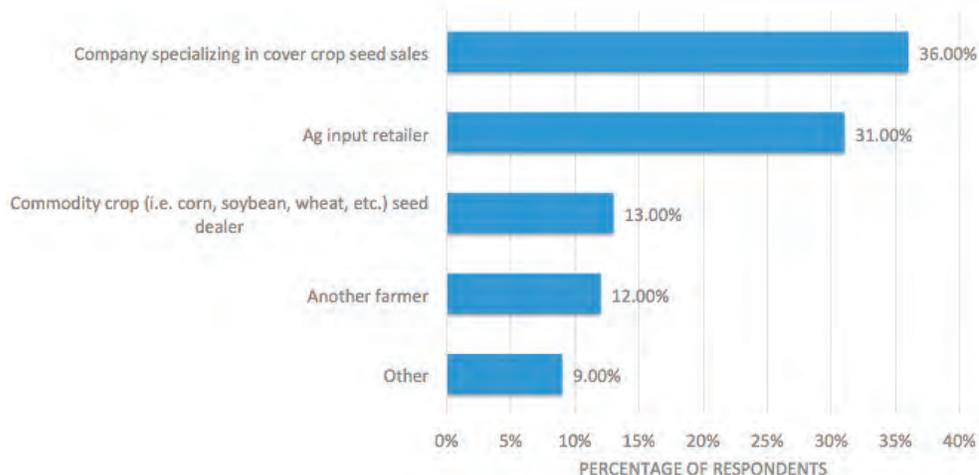
Understanding where farmers source their cover crop seed is important to developing strategies for sharing information, making new seed available and predicting the ease or challenges of sourcing seed.

The most popular source of cover crop seed among 1,350 cover crop users in the survey was “company specializing in cover crop seed sales,” a selection made by 36% of the farmers. Ag retailers were a cover crop seed source for 31% of the respondents. Less popular were commodity crop seed dealers—the providers of seed for corn, soybean and wheat crops, for instance—with 13%, another farmer with 12% and “other” with 9%.

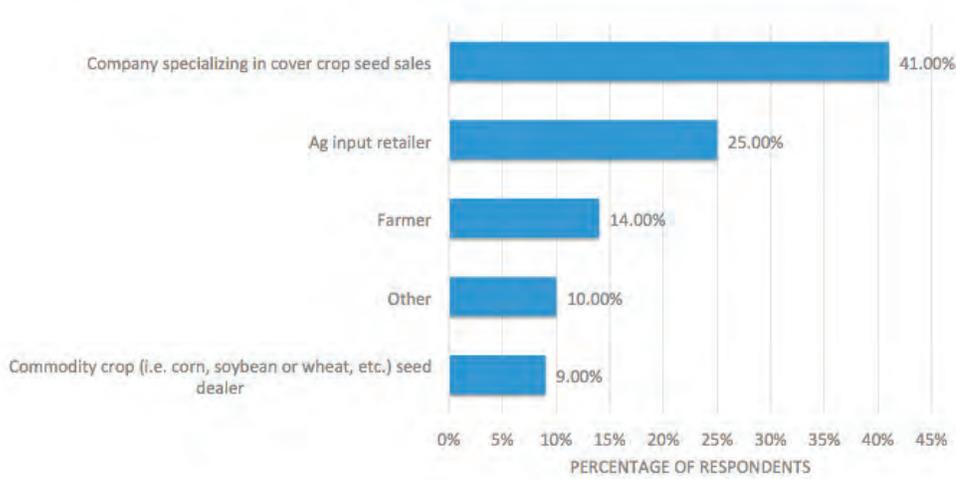
Asked where they would like to source cover crop seed in the future, the survey’s results predict a rise in market share among cover crop seed specialists, at the cost of ag retailers and commodity crop seed dealers. Of 1,038 cover crop users who answered the question, 41% said they would like to buy cover crop seed from a company that specializes in cover crop seed sales. Ag retailers’ share dropped from 31% to 25%, and commodity crop seed dealers fell from 13% to 9.5%.

That hints at exciting business opportunities for cover crop seed specialists and challenges for ag retailers and conventional seed channels in serving the growing cover crop market. However, one reviewer of the data questioned whether this result will accurately predict buying behavior, as respondents chose the least convenient—but best-sounding—option.

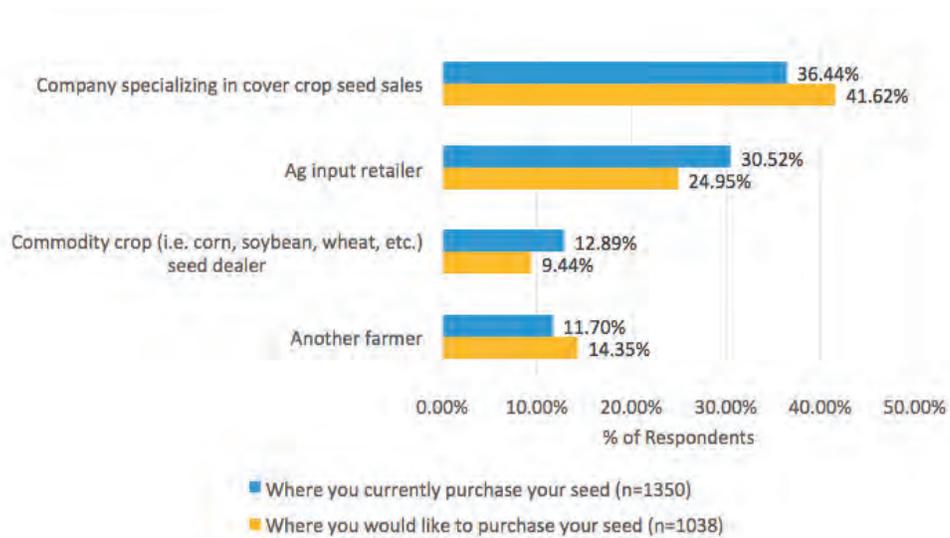
WHERE DO YOU CURRENTLY PURCHASE YOUR COVER CROP SEED? PLEASE CHOOSE ALL THAT APPLY



WHERE WOULD YOU LIKE TO PURCHASE MOST OF YOUR COVER CROP SEED FROM IN THE FUTURE?



SOURCING COVER CROP SEED



Cover crop users were also asked which information on cover crop seed tags was most important. Germination led the list with 30%; noxious weed content (29%) and purity (28%) were close behind. Only 9% said they do not consider the information on the seed tag, indicating that the large majority of respondents are very quality conscious about their seed.

Managing Cover Crops

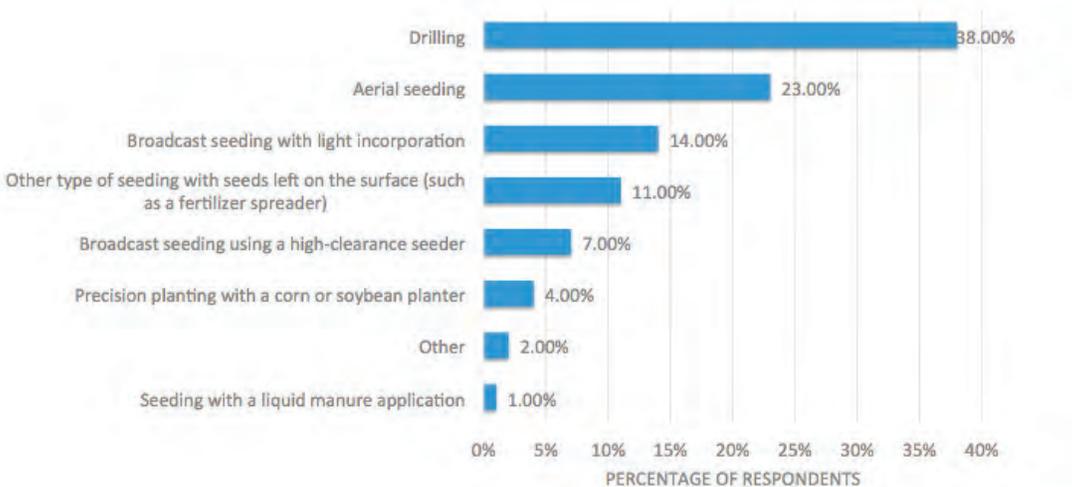
A series of questions explored the methods of planting and terminating cover crops. Data from these questions were analyzed in two groups—row crop producers and vegetable/horticulture crop producers—to minimize the chances that differences in tillage and other crop management systems between the two widely differing types of crops would skew the results. Respondents were allowed to select more than one answer; the results below reflect the percentage of times each answer was selected among the total number of responses. As a result, the “n” value is the number of responses, not the number of respondents.

Row crop producers were most likely to drill their cover crop seed (38% of 1,288 responses), while broadcast seeding with light incorporation—which was used by 14% of the row crop farmers—was most popular among vegetable and horticulture crop growers (45% of 387 responses). Among the vegetable/horticulture producers, drilling cover crop seed was the third most used choice, with 16% of the responses.

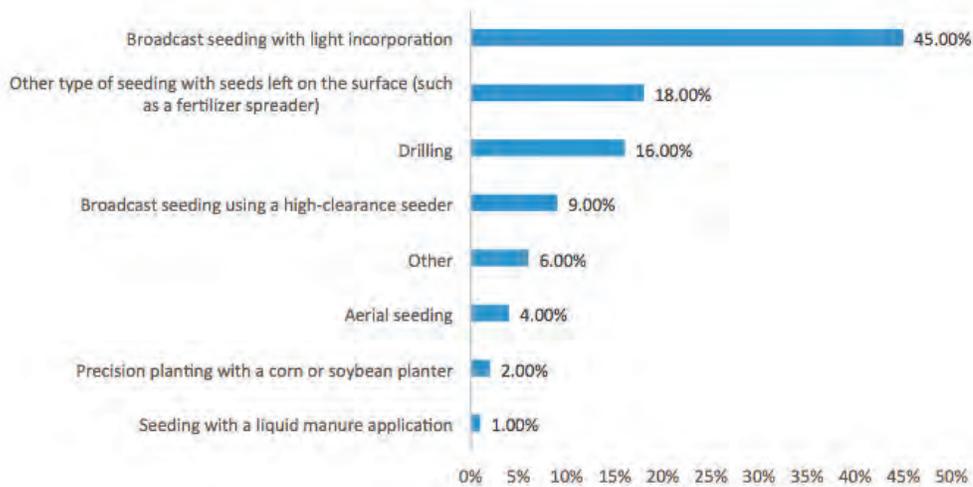
Aerial seeding was the second most popular means of planting cover crops among row crop producers, with 23% of the responses. By contrast, just 4% of the vegetable/horticulture growers flew on their cover crop seed. Instead, 9% of the vegetable/horticulture respondents reported broadcasting cover crop seed with a high-clearance seeder and 18% used some other surface-seeding technique such as a fertilizer spreader.

Among 1,105 cover crop users, 70% planted and established their own cover crops. Another 20% hired an aerial applicator to seed their cover crops, 6% contracted with an ag retailer, and 4% reported “other.”

WHICH OF THE FOLLOWING METHODS DID YOU USE TO PLANT YOUR COVER CROPS? (ROW CROP PRODUCERS)



WHICH OF THE FOLLOWING METHODS DID YOU USE TO PLANT YOUR COVER CROPS? (VEGETABLE/HORTICULTURE CROP PRODUCERS)

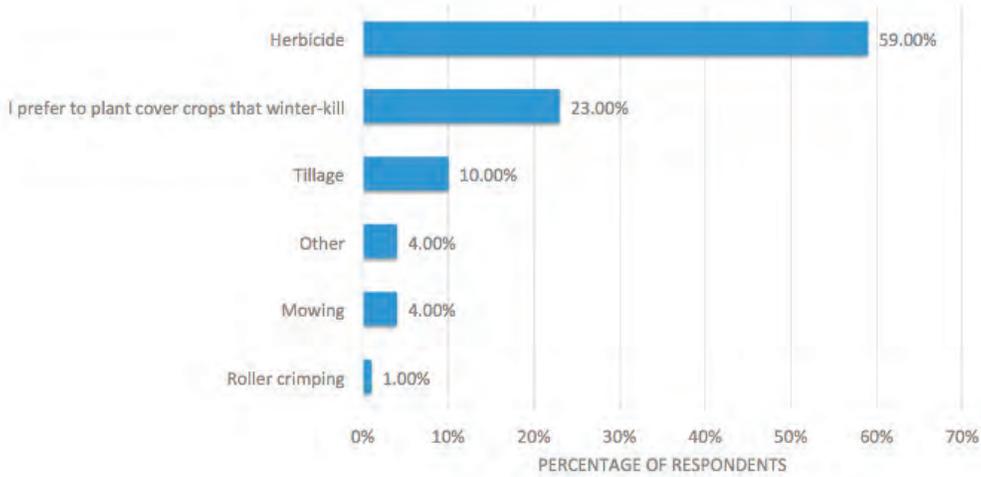


Termination of cover crops also differed between row crop and vegetable/horticulture groups. A significant majority of row crop producers—59% of 934 respondents—named herbicides as their primary method of terminating their most recent cover crop. Among row crop producers, 23% said they relied on winter kill as their principal means of termination, and 24% use winter kill as an additional (non-primary) way to terminate cover crops.

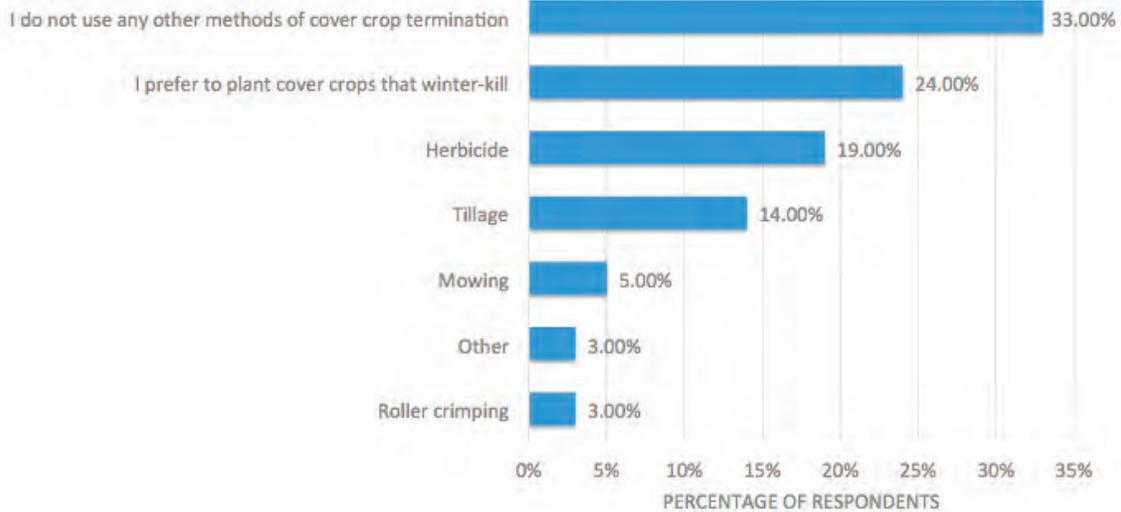
Non-chemical means of termination are more popular with vegetable/horticultural crop producers than they are with row crop farmers. Nearly half of the vegetable/horticulture producers—49% of 269 farmers who answered the question—employed tillage as the primary means of terminating their last cover crop. Twenty percent plant cover crops that winter kill, and 19% mowed their most recent cover crop to terminate it. By contrast, just 4% of the row crop respondents mowed their cover crop as the primary means of termination.

Listing methods of terminating cover crops used to a lesser degree, 28% of the vegetable/horticulture crop producers reported mowing, 25% relied on winter kill and 20% used tillage.

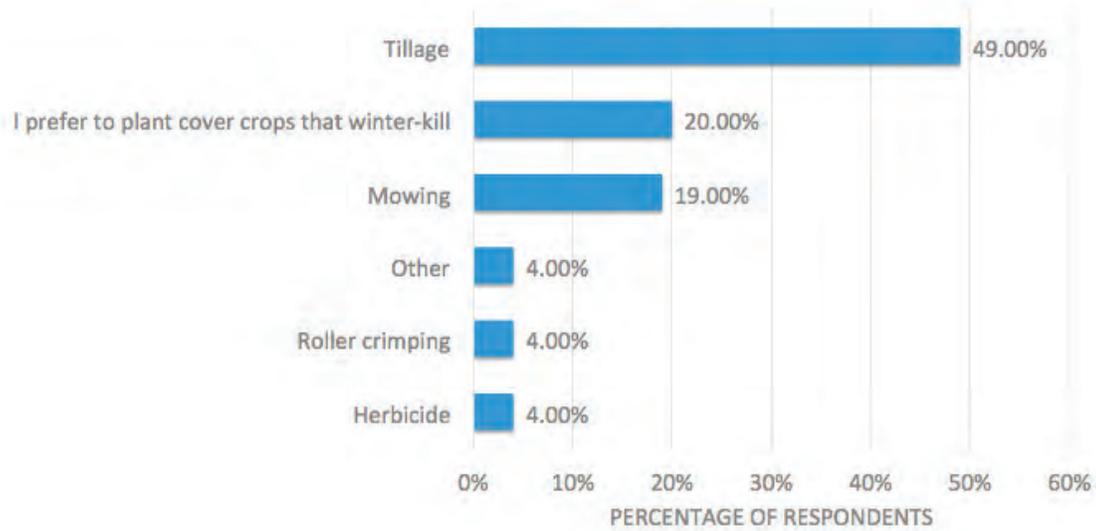
**WHAT IS THE PRIMARY COVER CROP TERMINATION METHOD YOU USED ON YOUR MOST RECENT COVER CROP?
(ROW CROP PRODUCERS)**



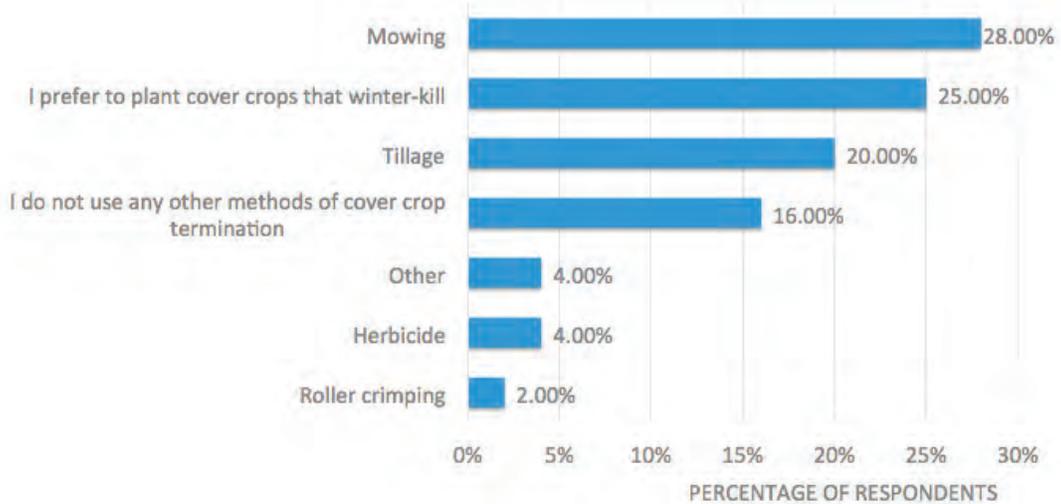
**DO YOU USE ANY OTHER METHODS OF COVER CROP TERMINATION TO A LESSER DEGREE?
(ROW CROP PRODUCERS)**



**WHAT IS THE PRIMARY COVER CROP TERMINATION METHOD YOU USED ON YOUR MOST RECENT COVER CROP?
(VEGETABLE/HORTICULTURE CROP PRODUCERS)**



**DO YOU USE ANY OTHER METHODS OF COVER CROP TERMINATION TO A LESSER DEGREE?
(VEGETABLE/HORTICULTURE CROP PRODUCERS)**



Cover Crops and Yield

For the third year in a row, SARE/CTIC Cover Crop Survey results revealed a yield benefit to the use of cover crops in corn and soybeans.

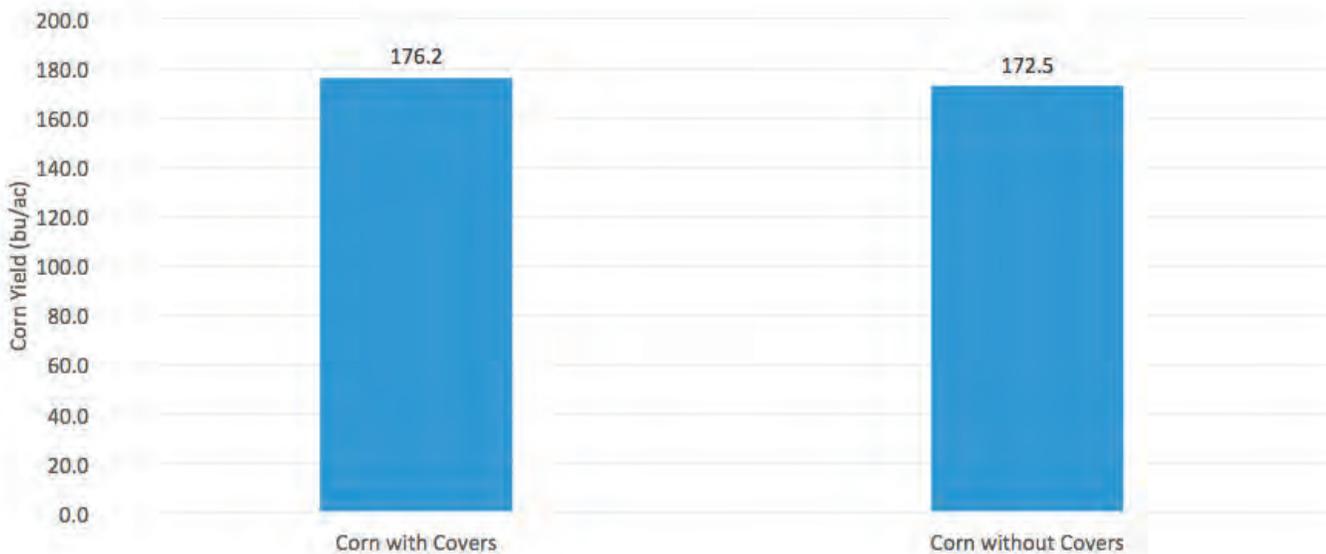
In corn, a mean national yield advantage of 3.7 bushels per acre—a 2.1% increase—was reported on fields that had been planted to cover crops, compared to similar fields that had not been cover cropped.

Data on the 2014 season reported by 401 farmers provided the corn yield figures. Farmers reported a mean corn yield of 172.5 bushels per acre on fields that had not been planted to cover crops in 2013 and a mean yield of 176.2 bushels per acre on fields that had been cover cropped the winter before planting.

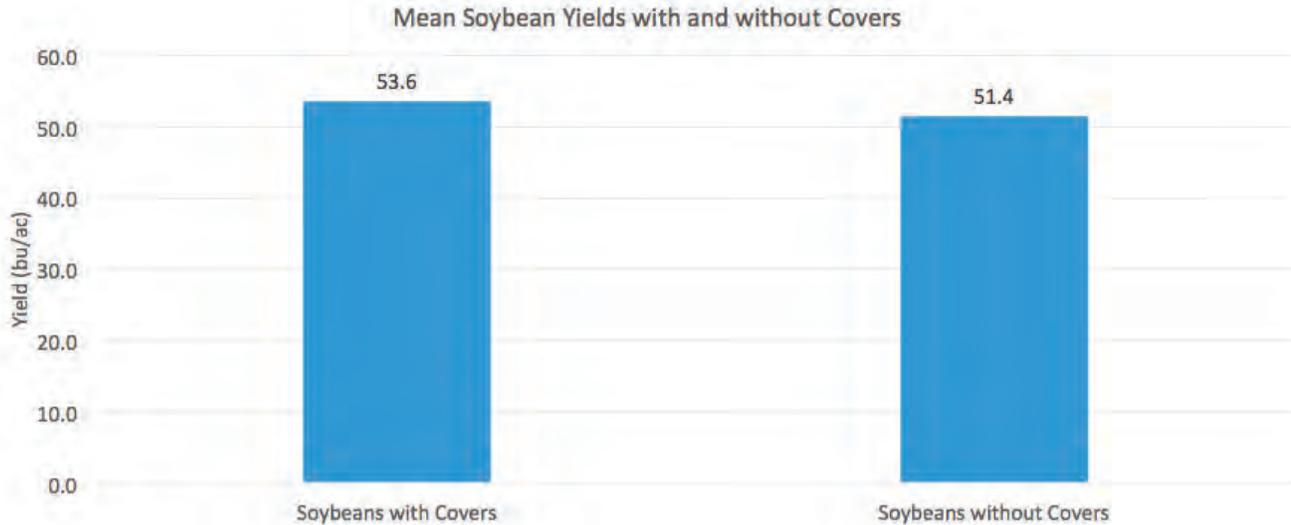
For soybeans, the use of cover crops in 2014 corresponded to a mean 2.2-bushel (4.2%) yield increase nationally during the 2014 growing season, based on analysis of data reported from 362 farms. Mean soybean yields in the analysis were 51.4 bushels per acre on fields without cover crops and 53.6 bushels per acre following cover crops.

Those yield benefits are in line with results from previous SARE/CTIC Cover Crop Survey results. Last year's survey found a 4.98 bushel (3.2%) average increase in corn yields and 2.0 bushel (4.3%) mean boost in soybean yields following cover crops. The first survey, conducted in 2012-2013, charted an average increase of 11.1 bushels of corn (9%) per acre and 4.9 bushels of soybeans (10%) for the 2012 crop season. Data indicate that yield impact from cover crops may be more dramatic when cash crop growing conditions are more challenging—for instance, drought conditions in 2012 may have made the moisture-enhancing benefits of cover crops more vital.

MEAN CORN YIELD WITH AND WITHOUT COVERS



MEAN SOYBEAN YIELDS WITH AND WITHOUT COVERS



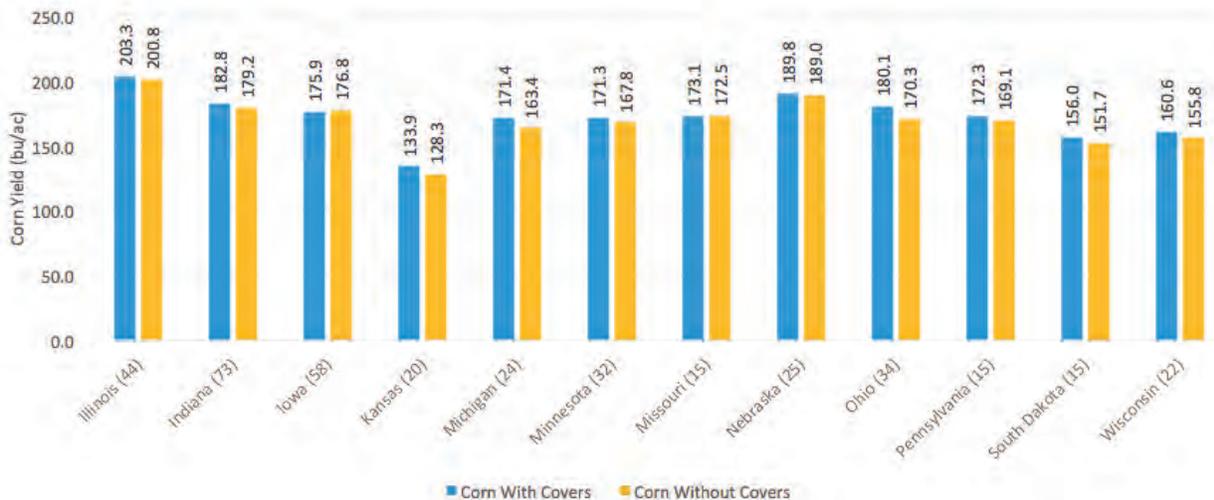
To help ensure the highest validity of data, analysts removed answers that were clearly space holders (for instance, yield estimates of zero or extremely high values such as 1,000). In the same process used in the analysis of data from the 2013-2014 SARE/CTIC Cover Crop Survey, the top and bottom 1% were “trimmed off” the data set to minimize the impact of outliers, and the mean calculated from the remaining values. As a result, the yield advantages are considered statistically significant.

Data were analyzed by Myriam Bounaffaa at Purdue University, under the guidance of Dr. Wallace Tyner.

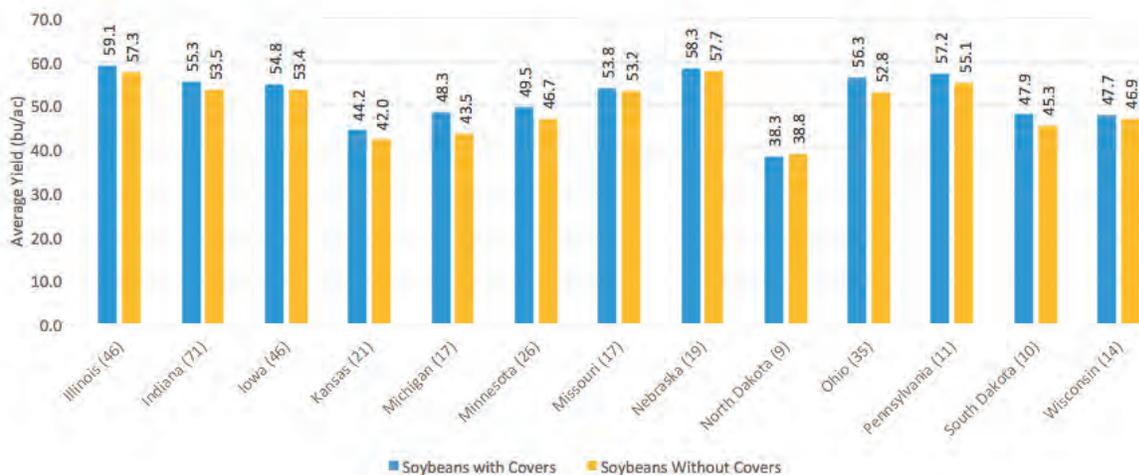
The Purdue analysis also isolated data for Midwest states. In the Midwest (which included Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota and Wisconsin), cover crops were associated with yield increases of 3.49 bushels per acre in corn and 1.90 bushels per acre in soybeans.

Every Midwestern state except Iowa, Missouri, and North Dakota experienced a numerical yield advantage in corn following cover crops, though the yield differences in data pools from certain states are not statistically significant because of the relatively small size of the data pools.

MEAN CORN YIELDS BY STATE



MEAN SOYBEAN YIELDS BY STATE WITH AND WITHOUT COVERS



Though some data were collected in an effort to explore the yield impact of cover crops on wheat, sorghum and cotton, sample sizes were too small to permit the detection of statistically significant relationships.

Cover crops deliver a wide range of benefits, from erosion control to soil building, reducing hardpan and plow pans, the retention of nutrients in the upper profile of the soil, and others. However, an increase in yield is extremely important to many growers—particularly, as noted in the next section, farmers not already using cover crops—and helps deliver a quicker return on investment in the cost and management of cover crops.

Benefits of Cover Crops

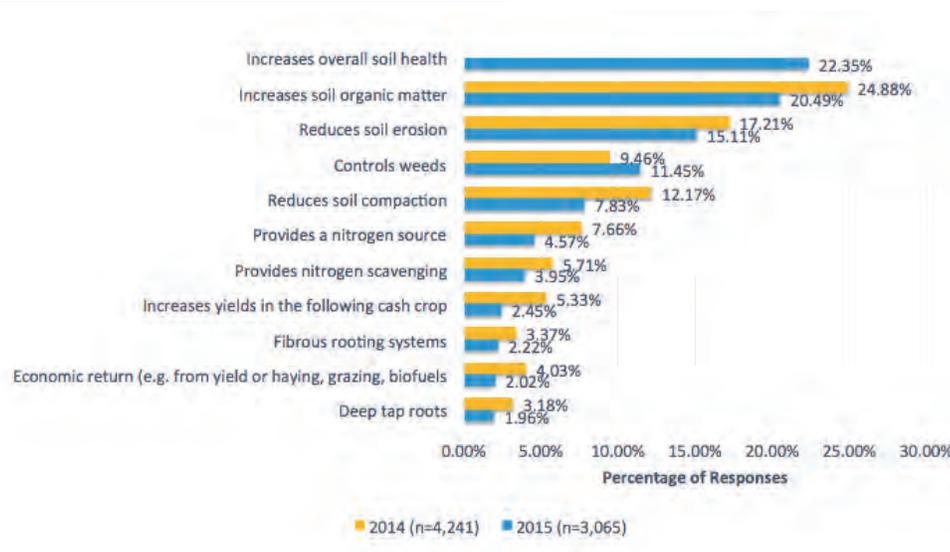
Soil scientists and agronomists tend to cite long lists of benefits of cover crops, which can include erosion control, improvement of soil structure and tilth, increasing soil organic matter, reducing weed pressure in the subsequent cash crop, capturing nitrogen before it leaches out of the root zone, cycling other plant nutrients, and many others depending on cover crop species, soil and weather conditions, and a range of other variables.

A major objective of this survey was to ascertain what farmers believe the benefits of cover crops to be, as well as what they perceive as the challenges or costs of cover crops. Such insight can guide the development of educational and promotional programs, crop development efforts and incentives.

Asked to indicate the top benefits of cover crops, cover crop users who produce commodity crops offered a total of 3,065 answers covering a wide range of responses. The leading benefit in this year's survey, noted in 22.4% of the responses, was that cover crops increase overall soil health. Looking at the graph below, which compares responses from the 2013-2014 survey and the 2015 survey, it is important to note that the "overall soil health" option was introduced this year.

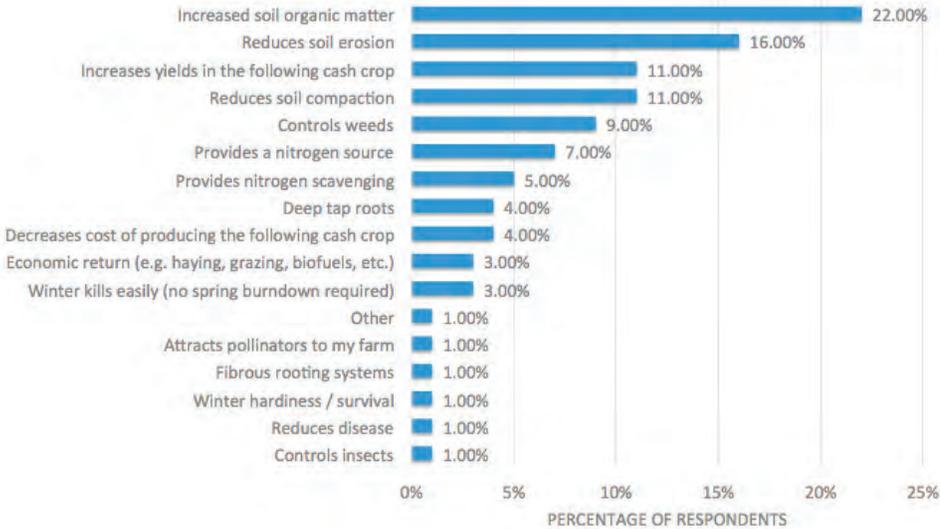
A similar response, "increases soil organic matter," was cited in 20.5% of this year's answers and 25% of last years; "reduces soil erosion" came next both years. The most significant difference between 2014 and 2015 responses was "controls weeds," which was a more popular choice this year than last.

COVER CROP BENEFITS (COVER CROP USERS)



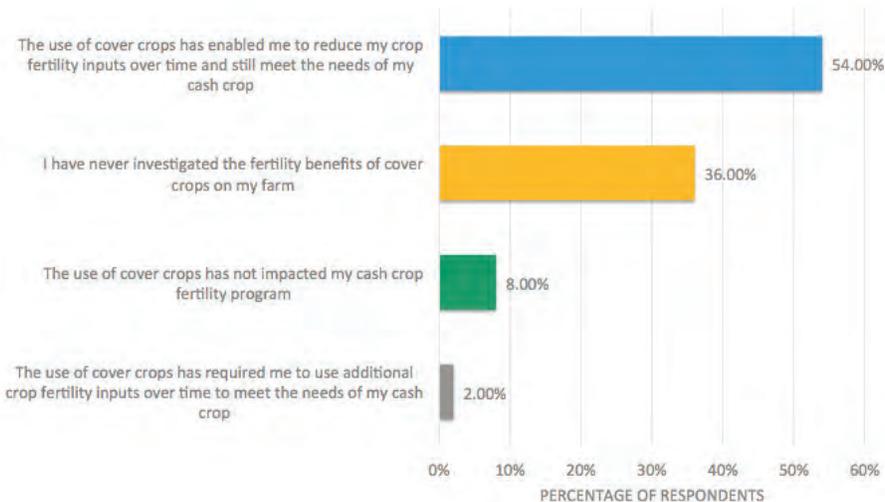
Non-users of cover crops were asked to select the top three benefits they would look for in a cover crop. The non-users offered 693 responses, which fell in similar order to those provided by cover crop users, with the notable exception that "increases yields in the following cash crop" was markedly more important to the non-users--who identified that as a key benefit in 11% of their replies, making it third place in the non-user ranking, while it appeared just 2.5% of the time in the list of benefits provided by cover crop users.

WHAT ARE THE TOP 3 BENEFITS YOU WOULD LOOK FOR IN A COVER CROP? (NON-USERS)



Vegetable and horticulture crop producers were asked to characterize how they use cover crops, which offered insight into the perceived benefits of cover crops to this unique subset of farmers. Of 173 growers who answered the question, 54% reported that cover crops enabled them to reduce cash crop fertility needs. Two percent reported that they had to increase fertilizer use to meet the needs of cash crops in a cover crop system, 8% said cover crops did not affect cash crop fertility programs and 36% said they have not investigated the impact of their cover crops on their cash crop fertility needs.

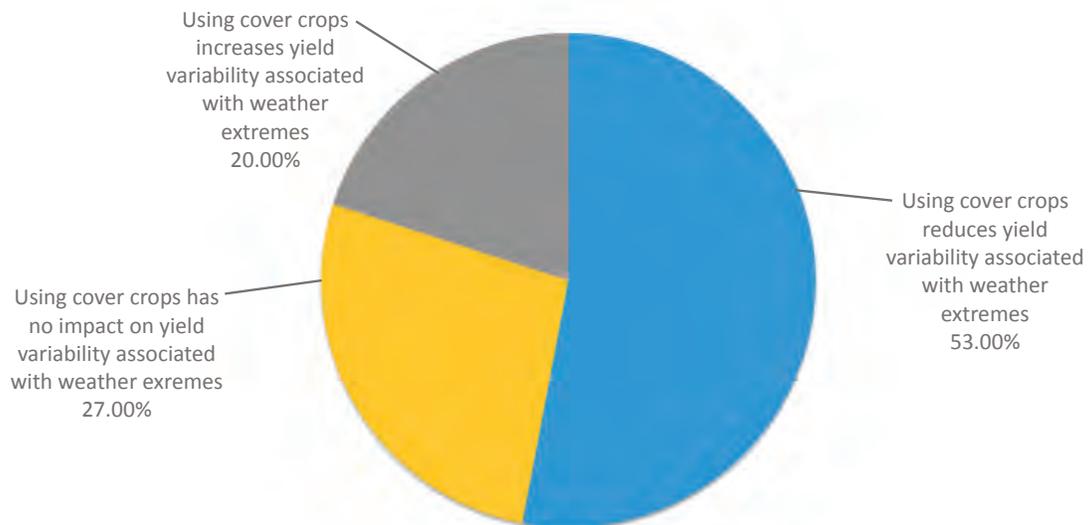
WHICH OF THE FOLLOWING BEST CHARACTERIZES YOUR USE OF COVER CROPS? (VEGETABLE AND HORTICULTURE CROP PRODUCERS)



The frequency of extreme weather conditions inspired a question exploring whether cover crop users believe cover crops have helped them thrive in the face of extreme weather. Of 1,044 respondents to the question, 53% agreed with the statement “using cover crops reduces yield variability associated with weather extremes.” Twenty percent said they believe using cover crops

increases yield variability associated with weather extremes, and 27% said they have observed no impact from cover crops on extreme weather-related yield variability.

BASED ON YOUR EXPERIENCE, WHICH OF THE FOLLOWING STATEMENTS BEST CHARACTERIZES YOUR VIEW ON COVER CROPS AND WEATHER EXTREMES?



It will be interesting to explore in future research whether the perception that cover crops increase yield variability associated with extreme weather is the result of management decisions—such as species selection or termination date—that could be modified to achieve better results, reflect deeply held assumptions about the relationships between cover crops and cash crops, or stem from high degrees of yield variability or great extremity of weather events observed by the respondents. As noted earlier, there were significant differences in average crop yields nationwide between droughty 2012 and the subsequent growing seasons.



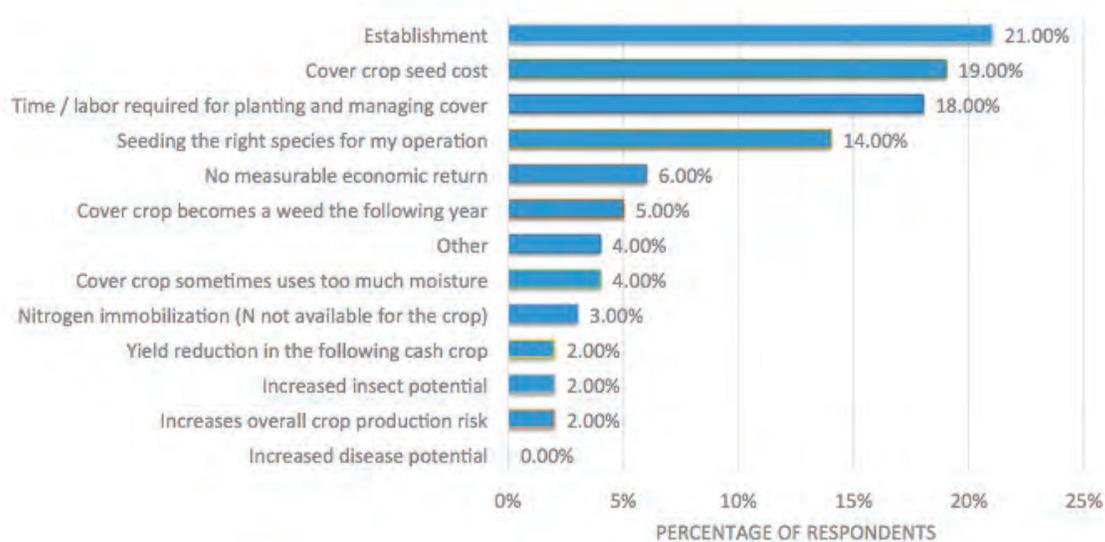
An emerging radish sprouting in heavy crop residue

Cover Crop Challenges

Cover crops offer significant benefits, but also create challenges on the farm. Growers' perceptions of those challenges, and their success at managing them, are integral to the success and increased adoption of cover cropping.

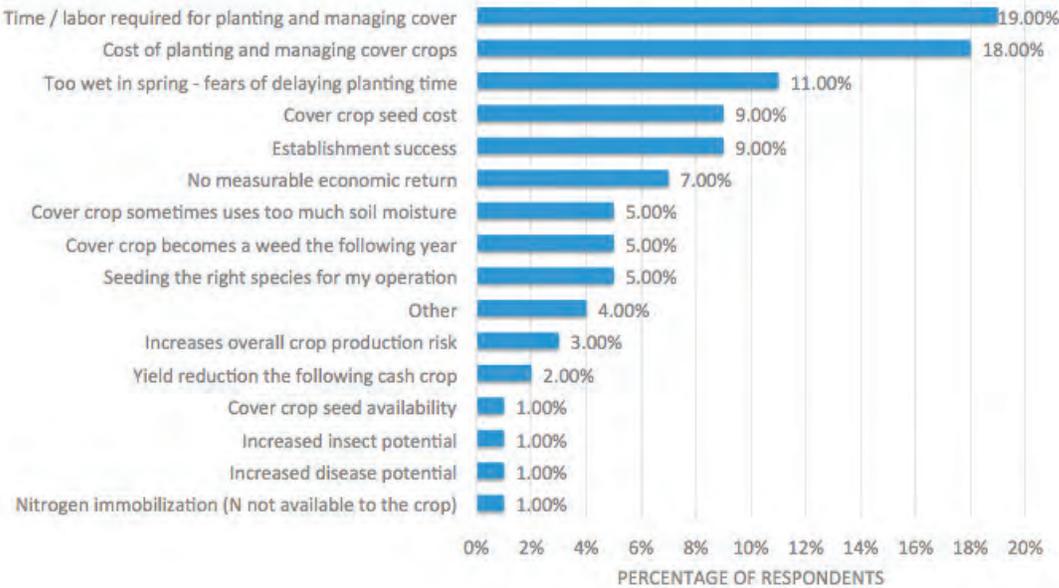
Asked to select their three biggest challenges with cover crops from a list, cover crop users identified cover crop establishment (21% of 2,814 respondents), cover crop seed cost (19%), time/labor required to plant and manage cover crops (18%) and “seeding the right species for my operation” (14%) as the four most popular responses. Additional choices, including cover crops using too much moisture, becoming weeds the following year, increasing insect pressure and increasing yield variability garnered fewer than 10% of the votes each.

WHAT ARE YOUR BIGGEST CHALLENGES WITH USING COVER CROPS? PLEASE SELECT YOUR TOP THREE CHALLENGES. (COVER CROP USERS)



Time/labor (19%) and establishment/management cost (18%) led the list of barriers to cover crop adoption listed by 691 non-users. Other challenges selected by significant numbers of non-users included “too wet in spring; fears of delaying planting time” (11%), cover crop seed cost (9%) and establishment success (9%).

WHAT ARE THE THREE MOST IMPORTANT FACTORS THAT PREVENT YOU FROM USING COVER CROPS ON YOUR FARM? (NON-USERS)



Incentives to Using Cover Crops

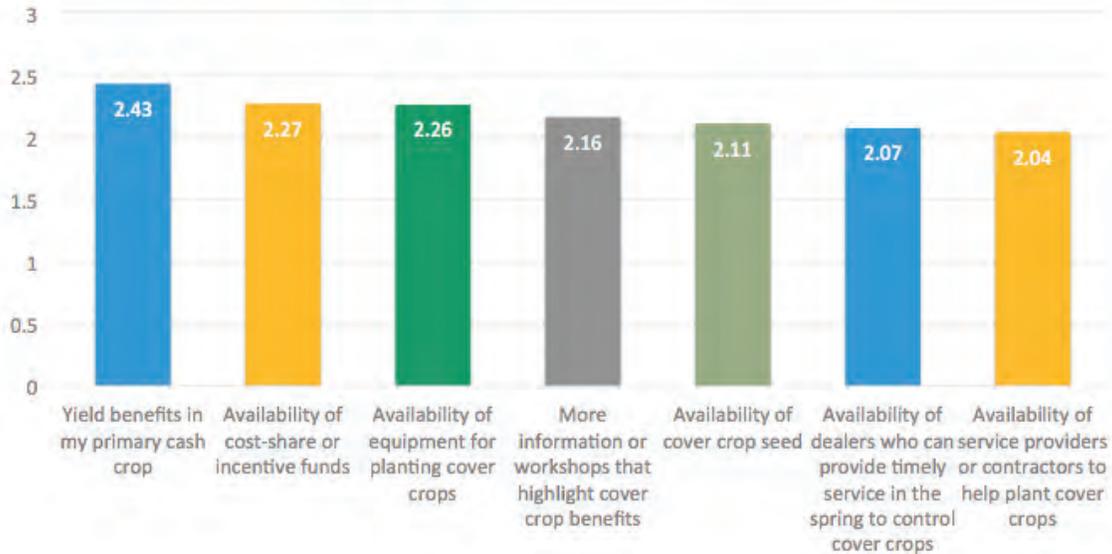
Asked to rate the degree of several incentives would have on influencing them to incorporate cover crops into their operations, non-users rated yield benefits in their primary cash crop as most influential, followed in order by the availability of cost share/incentive funds, availability of equipment for planting cover crops, and more information or workshops that highlight cover crops.

The availability of seed and service were also noted.



Winter peas used as cover crop can fix nitrogen for the ensuing cash crop to use.

HOW WOULD THE FOLLOWING INFLUENCE YOUR WILLINGNESS TO INCORPORATE COVER CROPS INTO YOUR OPERATION? (NON-USERS)

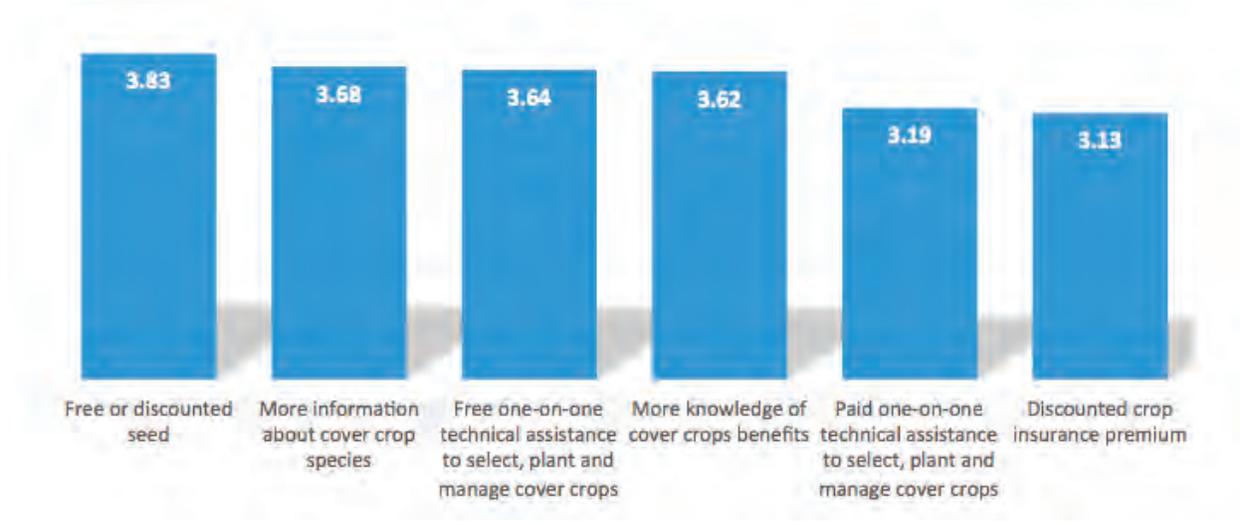


Though the availability of cost share funds was listed as the second-most influential incentive to influence non-users to try cover cropping, 59% of 1,089 cover crop users reported that they have never received cost-share assistance or incentive payments to plant cover crops on their farm. Eleven percent said they used to receive financial assistance but now self-fund their cover crop planting, 21% said they periodically receive financial assistance to plant cover crops, and just 9% declared that they have only planted cover crops using cost-share or incentive payments.

These results are similar to those observed in last year's SARE/CTIC Cover Crop Survey, where 63% had never used cost-share assistance or incentive payments to plant cover crops, and 8% said they only planted cover crops when receiving financial assistance. Clearly, communicating about cover crops to later adopters requires different strategies and emphasis than talking to innovators who adopted the practice years earlier.

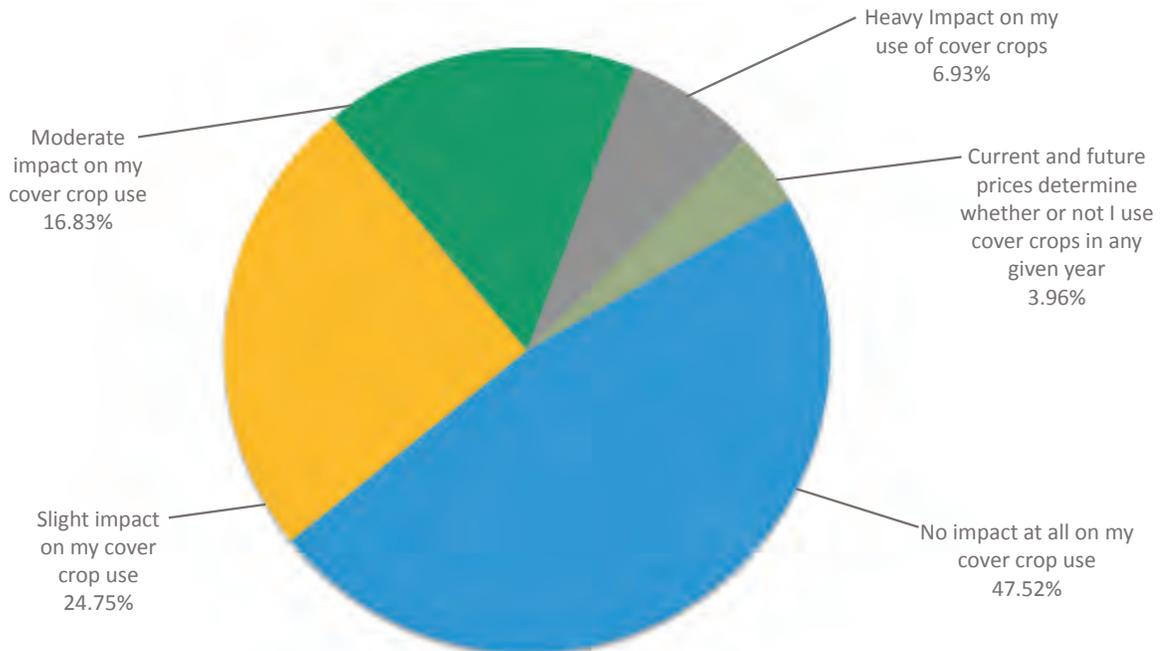
The current survey also posed a second question on influences using a different set of choices.

WHAT WOULD CONVINCe YOU TO PLANT COVER CROPS ON YOUR FARM? PLEASE RATE THE IMPORTANCE OF EACH OF THE FOLLOWING. (THE HIGHER THE RATING, THE GREATER THE INFLUENCE.)

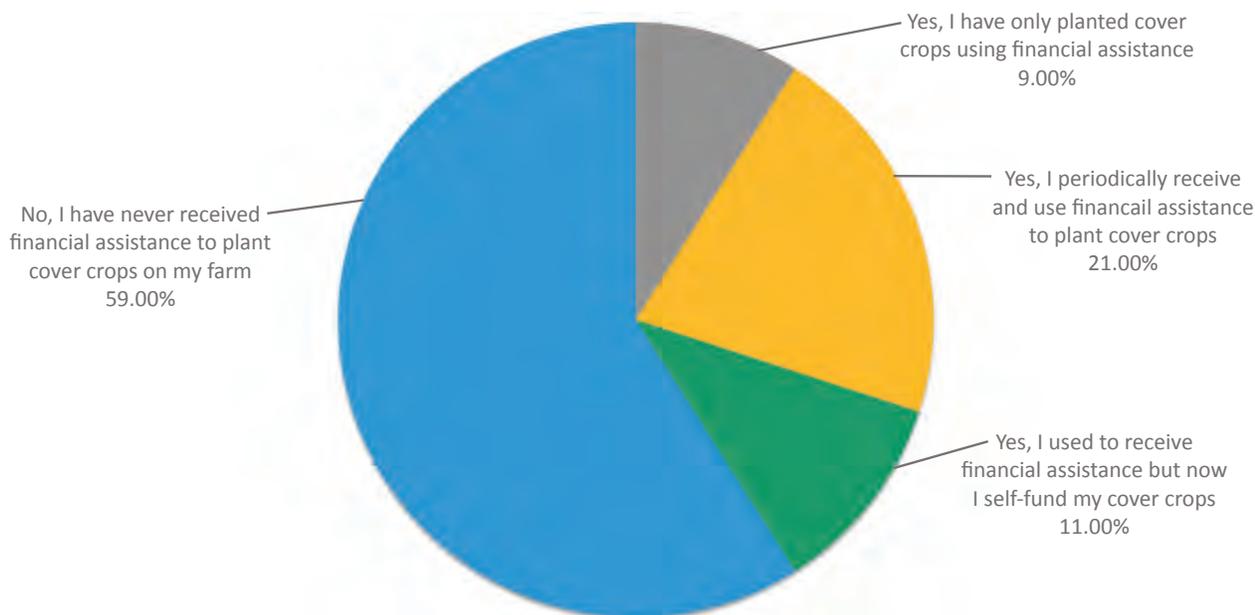


A striking finding in this survey is that nearly three-quarters of 1,070 cover crop users who answered a question on the impact of cash crop prices on their cover cropping intentions reported that commodity prices had little to no effect on their decision to plant cover crops. That bodes well for the future of cover crops even during down cycles in crop prices.

WHAT IMPACT DOES THE MARKET OUTLOOK FOR FUTURE CASH CROP PRICES HAVE ON YOUR USE OF COVER CROPS? (COVER CROP USERS)



HAVE YOU RECEIVED COST-SHARE ASSISTANCE OR INCENTIVE PAYMENTS TO PLANT COVER CROPS? (COVER CROP USERS)



As noted in last year's report, the greatest value of cost-share or incentive payments is in the encouragement they provide to the groups in the middle—farmers who started using cover crops with incentive programs and kept investing in them with their own funds, and the significant number of growers who periodically take advantage of incentives to defray the cost of planting cover crops. Those incentives thus influence many farmers, helping expand cover crop acreage.

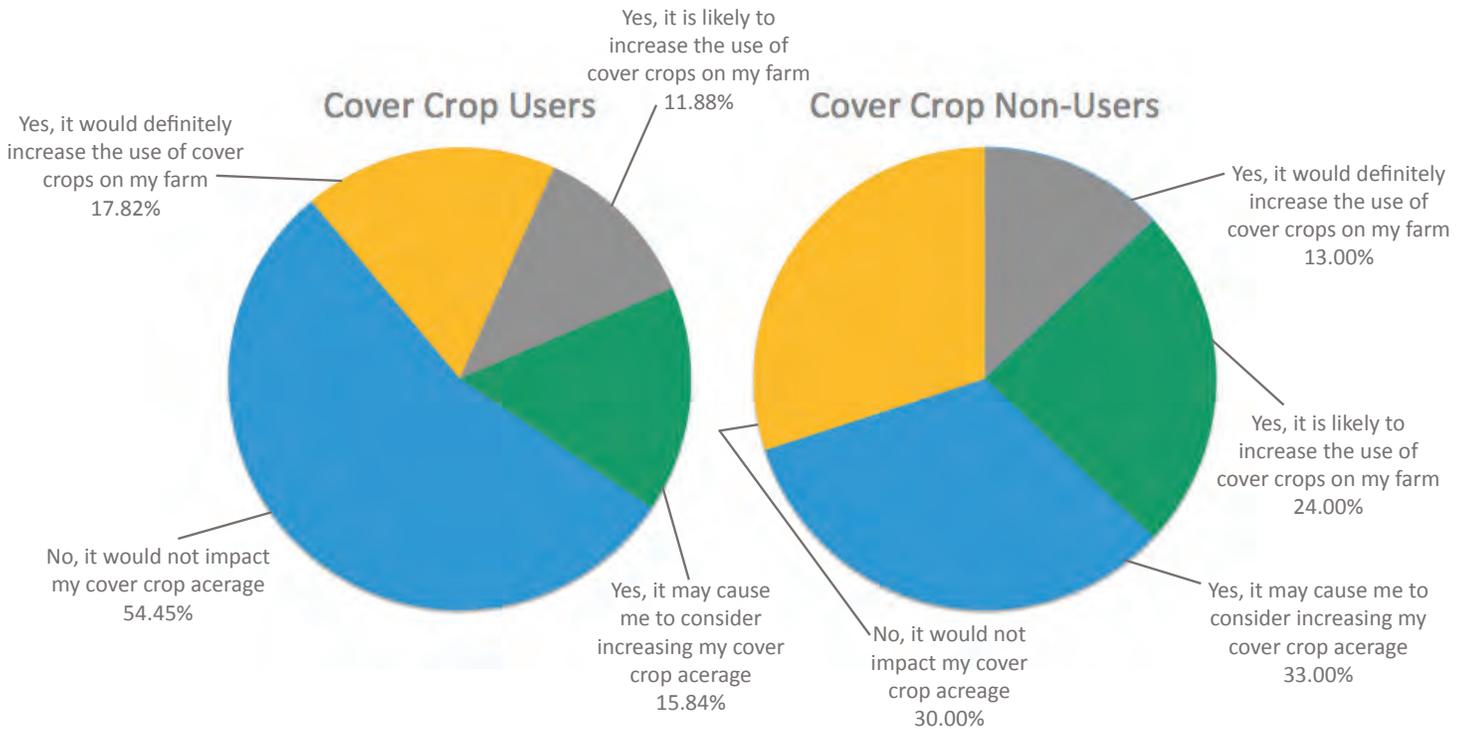
That assumption appears to be supported by data from a question asked of non-users who were asked “what would convince you to plant cover crops on your farm?” The highest-rated answer was “free or discounted seed.” Further responses to that question will be discussed in the section on influences on cover crop adoption.

Reducing crop insurance premiums for farmers who plant cover crops is sometimes considered as a possible incentive. In this year's survey, both cover crop users and non-users were asked about the impact on their cover cropping plans of a reduction in crop insurance premiums.

It is interesting to note that about half—55.5% of 1,076 respondents—who already use cover crops reported that reduced crop insurance premiums would not impact their cover crop acreage. Meanwhile, 15.8% said they might consider increasing cover crop acreage to get a reduction in crop insurance premiums, 11.9% said they would likely increase their acreage as a result, and 17.8% said they would definitely increase the use of cover crops on their farm.

Among 242 non-users who answered the question, the pattern was much different, with about 70% of the farmers not yet using cover crops saying a discount in crop insurance premium could factor into their use of cover crops. More specifically, 37% said they would likely or definitely start using cover crops on their farms if crop insurance premiums were reduced to encourage the practice and another 33% said they may consider planting cover crops as a result. Just 30% of the non-users said a reduction in crop insurance premiums would have no effect on their cover crop acreage.

WOULD REDUCED CROP INSURANCE PREMIUMS IMPACT THE NUMBER OF ACRES OF COVER CROPS?



Based on these results, it appears that reducing cover crop premiums could have a significant effect on increasing cover crop acreage among users of cover crops and, perhaps even more significantly, among farmers who currently do not plant cover crops.



Turnips used as cover crops can help to break up surface compaction and help trap nutrients.

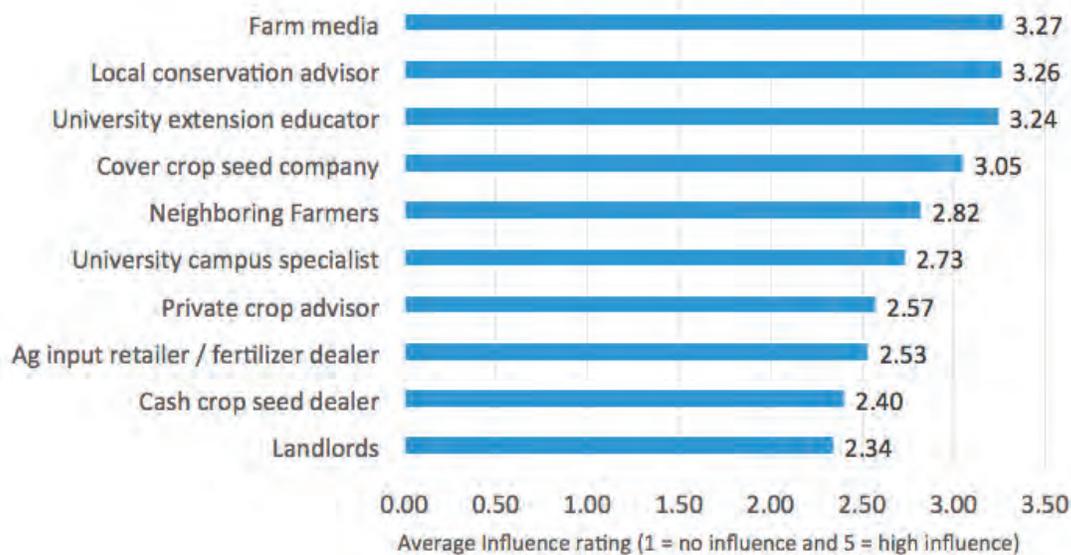
Influences on Cover Crop Adoption

In developing programs to educate farmers and their advisors about cover crops and to promote their adoption, it is vital to understand the factors and information sources that influence farmers to consider the practice.

Asked to rate the level of influence of a variety of information sources on their decisions on cover crop purchases, more than 1,000 cover crop users ranked three key sources at the top, with almost equal ratings—farm media, local conservation advisors (identified in the question as USDA or local conservation district representatives) and university extension educators.

Cover crop seed companies came next, followed by neighboring farmers, and university campus specialists. Private crop advisors and ag retailers were similarly rated towards the bottom of the list, with cash crop seed dealers and landlords taking up the last places.

PLEASE INDICATE HOW INFLUENTIAL THE FOLLOWING GROUPS AND INDIVIDUALS ARE WHEN YOU MAKE DECISIONS ABOUT COVER CROP PURCHASES (COVER CROP USERS)



Assessing the degree of influence of individual sources sheds additional light. Notably, more than 26% of the cover crop users report that they have no contact with a private crop advisor and 20% report no contact with landlords. Only 8% of this group says neighboring farmers have a strong influence on their decisions; in fact, 46% say neighbors have no influence.

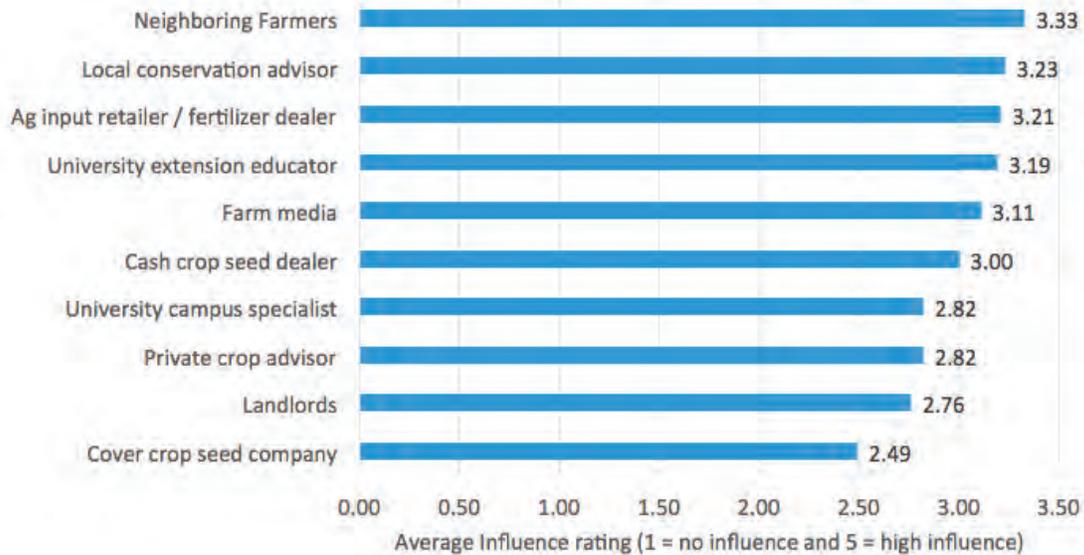
The user audience is drawn most heavily to academic and technically oriented sources, which tally up the highest combinations of strong and moderate influence scores. Members of this group are also more likely than non-users to have some contact with extension personnel and cover crop seed company sources.

It is interesting to note that non-users put the greatest stock in advice from neighboring farmers, followed closely by local conservation advisors and ag retailers. They are less inclined than cover crop users to see farm media as a top influence, and weigh the influence of their cash crop seed

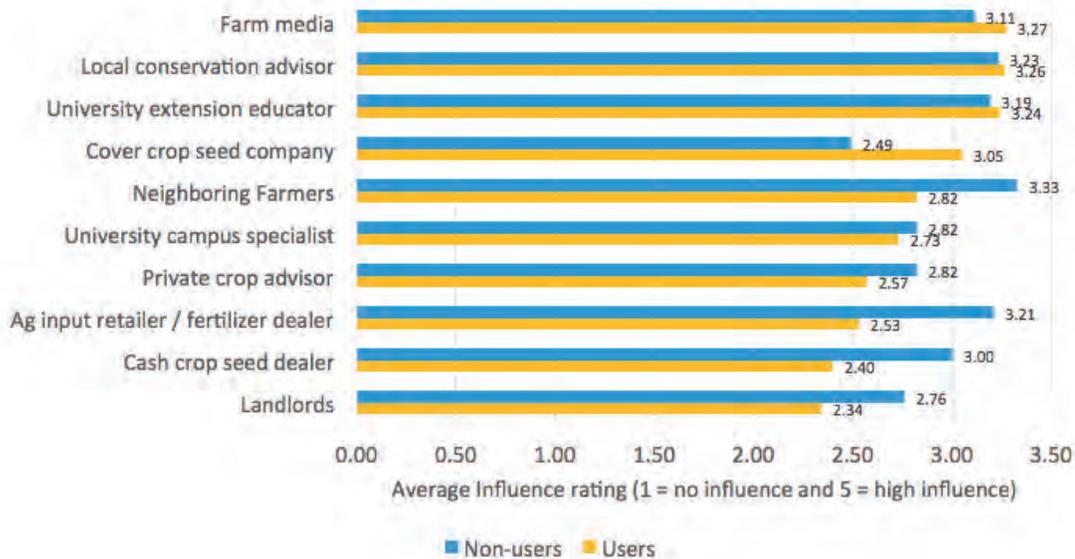
dealers and landlords more heavily than cover crop users do.

That presents a communications challenge, a type of inertia in which information about—and enthusiasm for—cover crops must spread among large groups of farmers and landlords in order to most effectively influence today’s non-users.

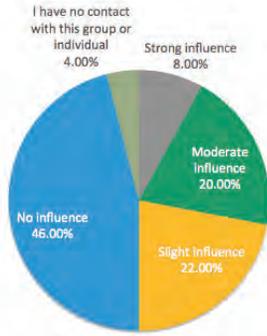
PLEASE INDICATE HOW INFLUENTIAL THE FOLLOWING GROUPS AND INDIVIDUALS ARE WHEN YOU MAKE DECISIONS ABOUT COVER CROP PURCHASES (NON-USERS)



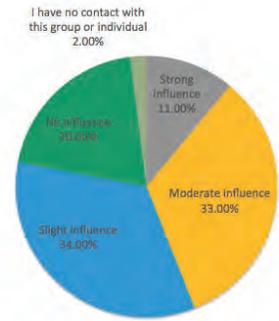
INFLUENCE OF GROUPS ON COVER CROP PURCHASES AND ON-FARM PURCHASES (COVER CROP USERS VS. NON-USERS)



NEIGHBORING FARMERS (USERS)



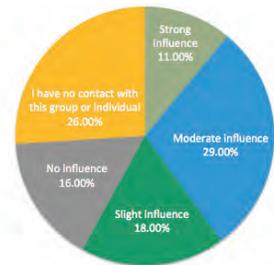
NEIGHBORING FARMERS (NON-USERS)



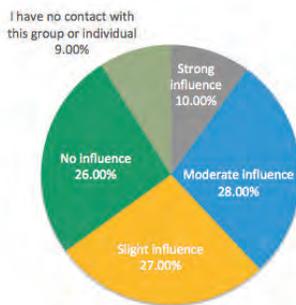
PRIVATE CROP ADVISOR (USERS)



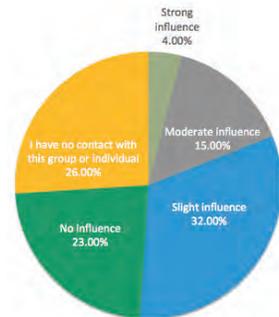
PRIVATE CROP ADVISOR (NON-USERS)



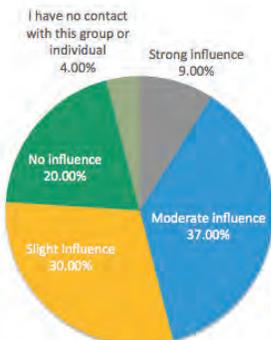
COVER CROP SEED COMPANY (USERS)



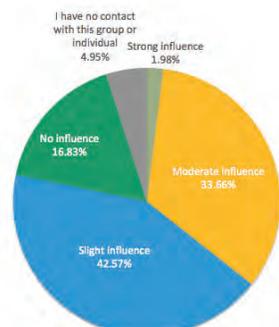
COVER CROP SEED COMPANY (NON-USERS)



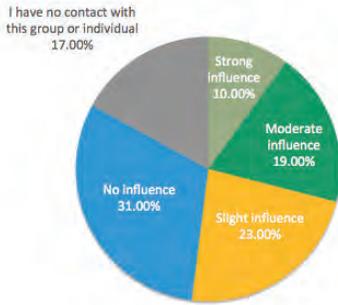
FARM MEDIA (USERS)



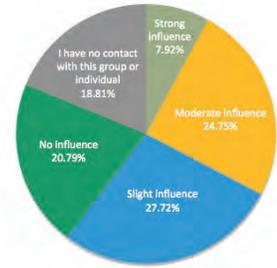
FARM MEDIA (NON-USERS)



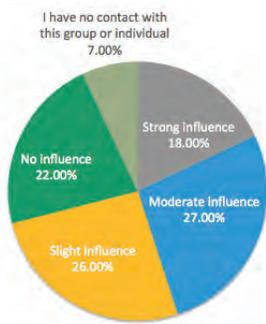
UNIVERSITY CAMPUS SPECIALIST (USERS)



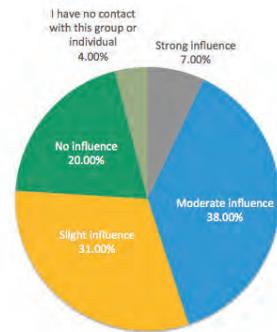
UNIVERSITY CAMPUS SPECIALIST (NON-USERS)



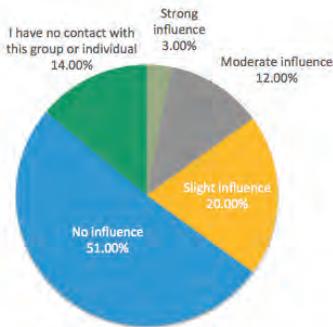
LOCAL CONSERVATION ADVISOR (USERS)



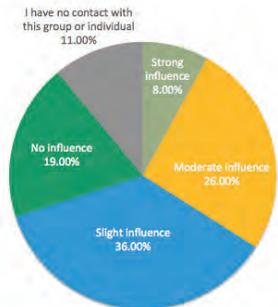
LOCAL CONSERVATION ADVISOR (NON-USERS)



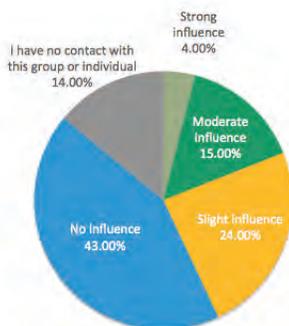
CASH CROP SEED DEALER (USERS)



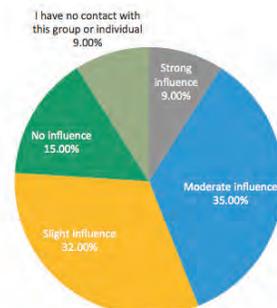
CASH CROP SEED DEALER (NON-USERS)



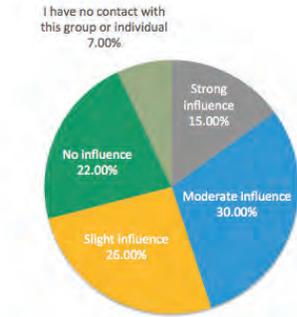
AG RETAILER/FERTILIZER DEALER (USERS)



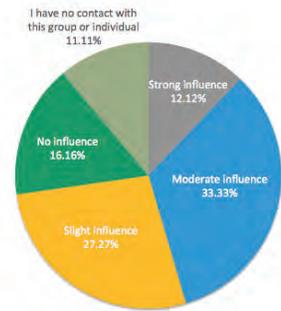
AG RETAILER/FERTILIZER DEALER (NON-USERS)



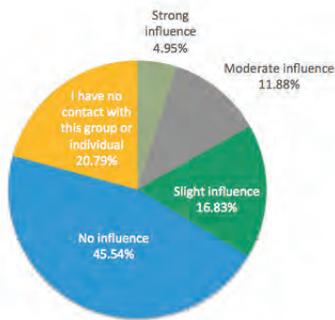
UNIVERSITY EXTENSION EDUCATOR (USERS)



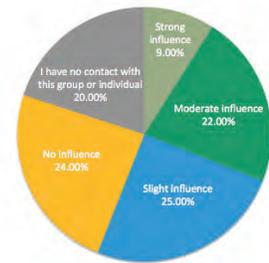
UNIVERSITY EXTENSION EDUCATOR (NON-USERS)



LANDLORDS (USERS)

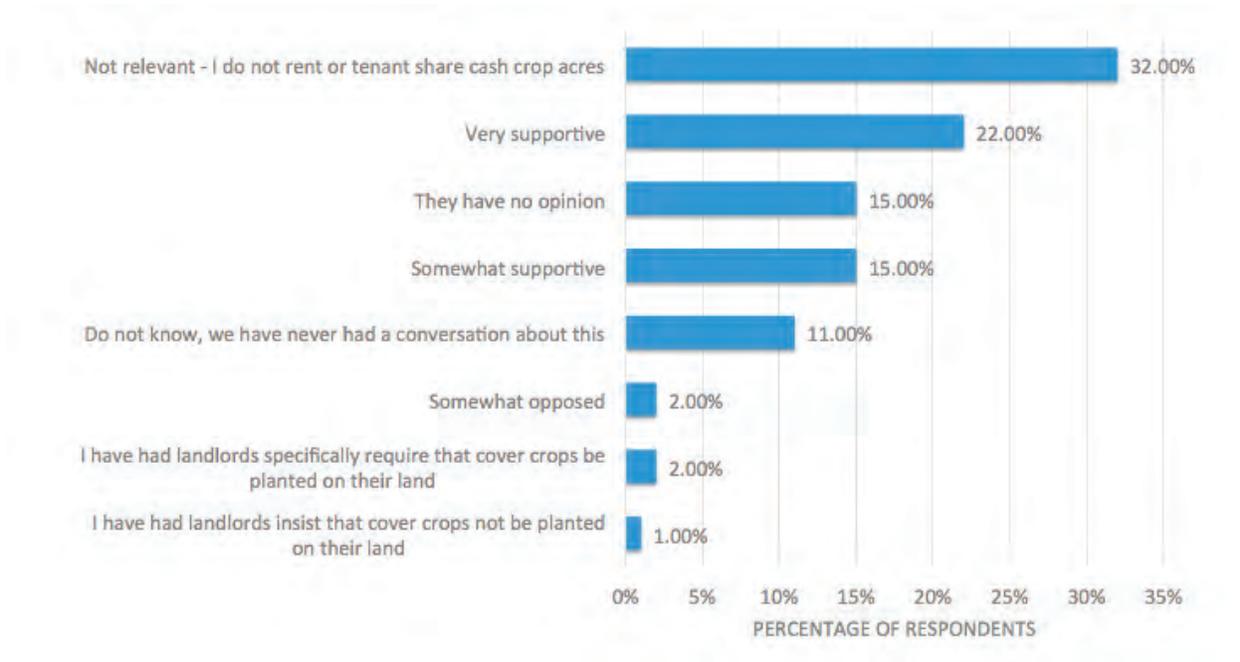


LANDLORDS (NON-USERS)



When asked about landlords, nearly one-third—32%—of the 1,140 respondents do not rent land; 22% said their landlords are very supportive of cover crops, 15% say their landlords have no opinion, another 15% report that their landlords are somewhat supportive, and only 3% said their landlords are somewhat opposed or insist that cover crops not be planted on their land.

**IF YOU RENT OR TENANT-SHARE CASH CROP ACRES,
HOW SUPPORTIVE ARE YOUR LANDLORDS OF
THE USE OF COVER CROPS ON THEIR LAND?
(COVER CROP USERS)**



Non-users were asked to rate the importance of an array of factors in convincing them to plant cover crops on their farms. As noted earlier in this paper, free or discounted seed received the highest rating among non-user respondents in the survey.

This audience is also hungry for information—“more information about cover crop species,” “free one-on-one technical assistance” and “more knowledge of cover crops benefits” all scored quite close to each other.

Receiving slightly lower ratings were “paid one-on-one technical assistance” and “discounted crop insurance premium.”

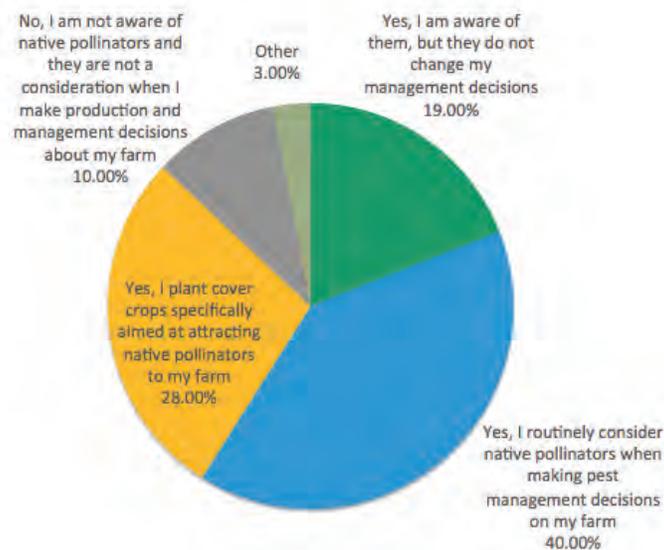
While some factors were ranked more influential than others on cover crop planting decisions, it is notable that all the options were rated as having a fair degree of importance. The important lesson for agencies and advisors should be that a variety of strategies--including education, new research results, appropriate technical assistance, low-cost seed, and, in some cases, financial incentives--will be necessary to encourage more farmers to adopt cover crops.

Cover Crops and Pollinators

Many cover crops, including long-flowering species such as clovers, vetch and buckwheat—can provide important foraging resources and habitat for pollinators and other beneficial insects. For the second year, the SARE/CTIC Cover Crop Survey explored the interactions among farmers, native pollinators, managed honeybees and cover crops.

Cover crop users tend to be quite aware of native pollinators: 28% say they plant cover crops specifically aimed at attracting native pollinators to their farm; 40% of 294 respondents reported that they routinely consider native pollinators when making pest management decisions on their farm; and 19% acknowledge that they are aware of native pollinators but do not change their management decisions based on them. Only 10% say they are not aware of native pollinators and that they are not a consideration when making management decisions.

ARE YOU AWARE OF OR CONCERNED ABOUT NATIVE POLLINATORS THAT MAY BE ON YOUR FARM?



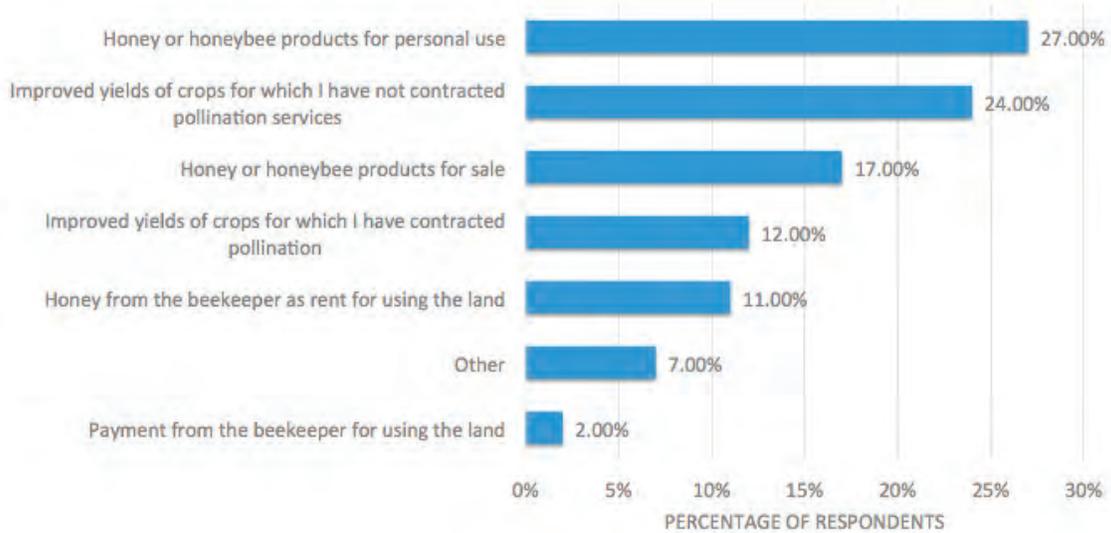
Awareness reaches to the appeal of cover crops to managed honeybees. Twenty-eight percent of 1,044 respondents said they had experience working with honeybees or beekeepers on their farm. Thirty-eight percent of 292 respondents said beekeepers had approached them to discuss management practices aimed at protecting bees or hives.

Slightly fewer than 300 users went on to discuss their experience with bees and beekeepers. About half—49.5%—of 298 farmers said they have been asked by someone else to place hives on their farms; 26% are beekeepers themselves, keeping their own bees on their farms; and 24% do not have beehives on their farms.

A group of 313 respondents replied to a question about the benefits of having managed honeybees on their farms. Honey and honeybee products for personal use were the top choice, with 27% of the responses; 17% reported that honey and bee products for sale were the key benefit, and receiving honey as rent for using the land was the number-five benefit with 11% of the tally. Free pollination—“improved yields of crops for which I have not contracted pollination services”—was

second in rank, with 24% of the responses. Payment from the beekeeper was noted by only 2% of the respondents.

WHAT BENEFITS DO YOU CONSIDER YOU GAIN FROM HAVING MANAGED HONEYBEES ON YOUR FARM?



Buckwheat used as a cover crop can be a component of a good pollinator habitat.

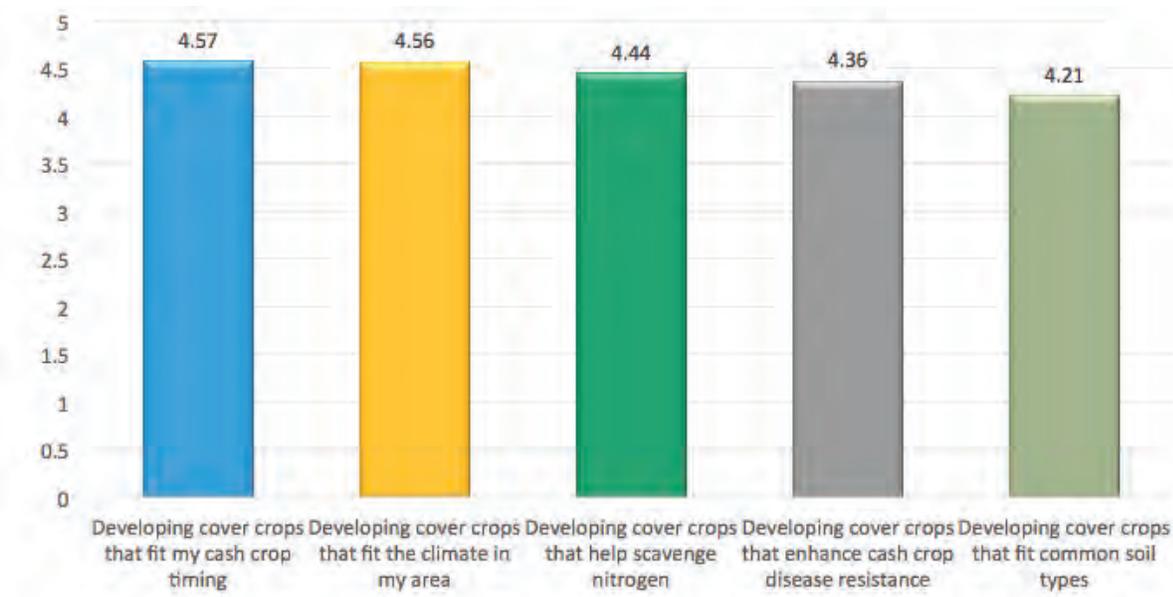
Research Priorities for Cover Crop Development

The 2015 survey offers direction on development priorities for future cover crops. Asked to rate the importance of several research topics, approximately 1,160 cover crop users rated “developing cover crops that fit my cash crop timing” and “developing cover crops that fit the climate in my area” highest.

Cover crops that help scavenge nitrogen was rated in the middle of the pack, while cover crops that enhance disease or insect management in cash crops and cover crops that fit common soil types rounded out the top five priorities.

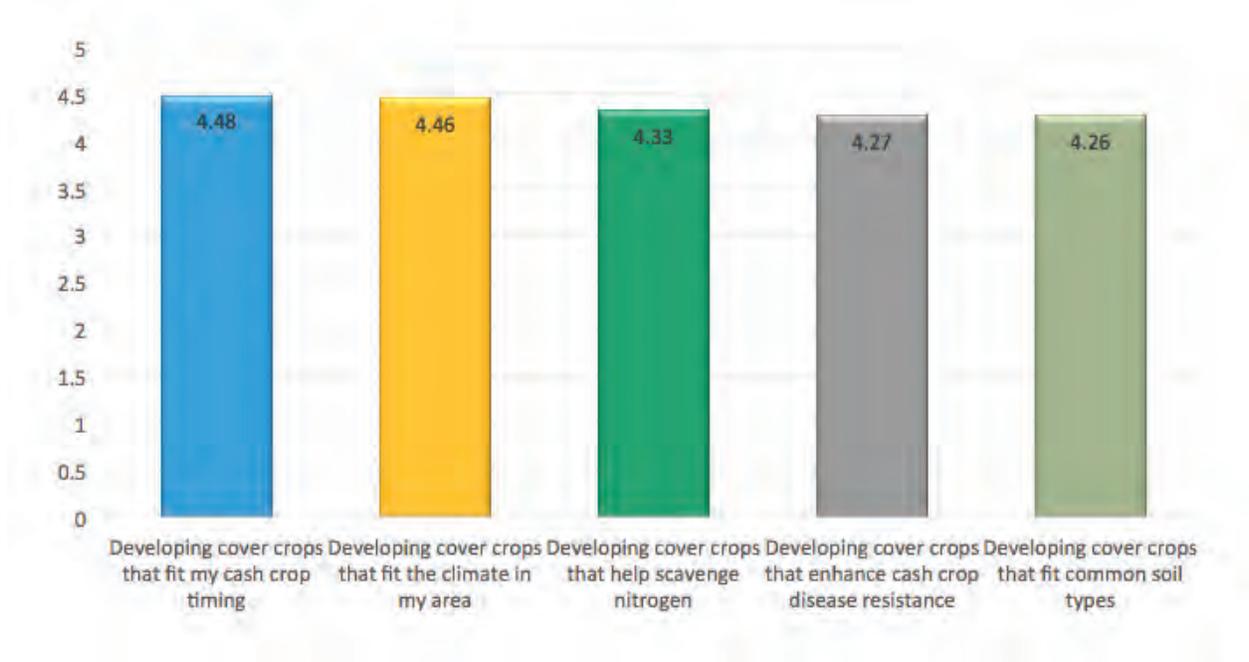
Considering the greatest challenges identified by cover crop users elsewhere in the survey— establishment, cover crop seed cost and the time and labor required for managing cover crops— most of these research priorities focus on fine-tuning cover crops rather than addressing the basic challenges. This could indicate that cover crop users recognize and accept the economic and agronomic challenges of establishing cover crops, and are now seeking to make cover crops fit more smoothly into their operations.

AVERAGE IMPORTANCE OF EACH RESEARCH TOPIC



Given the same set of choices as the cover crop users were, non-users put the same factors at the top of their priority list, by an even larger margin. Clearly, believing that cover crops fit their operations is vital to inspiring the non-user audience to try cover crops.

NEW RESEARCH IS CONSTANTLY BEING DONE ON COVER CROPS. PLEASE RATE THE IMPORTANCE OF EACH OF THE FOLLOWING POTENTIAL AREAS OF RESEARCH. (THE HIGHER THE RATING, THE GREATER THE IMPORTANCE.) (NON-USERS)



Cahaba vetch is an example of a legume cover crop.

Conclusion

Insight from more than 1,200 farmers around the country in the 2014-2015 SARE/CTIC Cover Crop Survey will help advance and focus efforts to encourage the adoption of cover crops. This third annual survey charts important trends—including yield benefits for cash crops following cover crops as well as a steady, rapid increase in cover crop acreage among users—and sheds light on the motivators and obstacles that influence the rate of adoption of the practice.

Increasingly, significant differences can be observed between users and non-users of cover crops. Users cite benefits such as increasing overall soil health, increasing soil organic matter, reducing erosion and compaction, and others as key benefits of the practice; increased yields in the subsequent cash crop garnered just 5% of the responses to land in the 8th slot. Non-users ranked increased yields as the number-three benefit they would seek from cover crops. Such a dichotomy in priorities warrants different communications strategies when addressing these two groups of farmers.

Communication and education strategies could also be guided by this survey's insight into the influencers who motivate decisions on cover crops. Users tend to weigh technical sources, including Extension experts and farm media, more highly than non-users—who rely more on neighboring farmers and local advisors—do.

This survey also revealed that current cover crop users do not rely heavily on cost-share or incentive payments to plant cover crops. However, economic incentives could be powerful enticements to current non-users, who report that free or discounted seed would be the most compelling incentive to try cover crops, and are more likely to respond to reductions in crop insurance premiums.

A significant finding among cover crop users is that nearly 75% of them said that commodity prices have little to no impact on their decision to plant cover crops—a finding that challenges the conventional wisdom that predicts drops in cover crop usage in commodity down cycles.

Last, the survey reveals key directions for further research in cover crop development, particularly in fine-tuning cover crops for ease of management in specific conditions.

In sum, the 2014-2015 survey provides perspective straight from the farm that can help farmers, crop advisors, conservation specialists, ag retailers and policymakers guide the productive use of cover crops across the country and across many cropping systems.