



Attitudes Toward Cover Crops in Iowa: Benefits and Barriers

Introduction

Cover crops are plants that are used to protect soils during the period between the harvest and establishment of crops such as corn and soybeans. Iowa State University Extension and Outreach has worked for many years with partner agencies and organizations to conduct research on and promote cover crops as a means to maintain and increase soil productivity, while reducing agriculture’s environmental impacts. Involved in this research and promotion have been the Iowa Department of Agriculture and Land Stewardship, the Iowa Department of Natural Resources, Iowa Learning Farms, the National Laboratory for Agriculture and the Environment, the Leopold Center for Sustainable Agriculture, and Practical Farmers of Iowa. The research and on-farm experience has shown that cover crops can play an important part in maintaining and improving soil productivity and water quality by reducing soil erosion, limiting nitrogen leaching, suppressing weeds, and increasing organic matter.

Despite these potential benefits, few Iowa farmers use cover crops. To learn more about farmer opinions regarding cover crops, the 2010 Iowa Farm and Rural Life Poll included a series

of questions about the potential environmental and agronomic benefits of cover crops, barriers to and facilitators of cover crop use, and interest in learning more about them. This report presents the results of analysis of those data.

Methods and Report Organization

The 2010 Farm Poll survey questionnaires were mailed in January and February 2010 to 2,224 farmers. Usable surveys were received from 1,360 farmers for a response rate of 61 percent. On average, Farm Poll participants were 64 years old. Most Farm Poll participants draw a significant proportion of their overall household income from farming. Forty-eight percent of participants reported that farm income made up more than half of their 2009 household income, and an additional 19 percent earned between 26 and 50 percent of their household income from the farm operation.

This report is organized into three sections. The first presents analysis of responses to questions on the potential *environmental and agronomic impacts* of cover crops. The second examines farmer responses regarding *possible barriers to and facilitators of cover crop use*. The third presents results for a question assessing *farmer interest in learning more about cover crops*.

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Each section first reports the results for the sample as a whole. It then presents results from comparisons of responses by the following key farmer characteristics.

- *Farm size* measured by gross farm sales. Farmers were categorized according to the size of their farm operation in 2009. Following the standard USDA farm typology, small farms were defined as having earned less than \$250,000 in gross sales and large farms as earning \$250,000 or more. Comparisons by farm size are conducted to examine whether larger-scale farmers differ in their perspectives on cover crops.
- Whether or not the farmers had *planted corn and/or soybeans in 2009*. This variable is employed because cover crops are promoted to protect the soil between harvest and planting of these predominant row crops in Iowa.

- Whether or not farmers generally plant crops on land that is classified as *highly erodible land (HEL)*. This variable is used because cover crops are promoted for erosion control on HEL.
- Farmer *knowledge about cover crops*, as measured by percent of respondents who agreed or disagreed with the statement, “I don’t know enough about cover crops to use them.”
- Prior *experience with cover crops*. Farmers were asked whether or not they had planted cover crops in the last five years. These comparisons were conducted to assess how prior experience might affect the way farmers think about cover crops.

Only differences that were determined to be statistically significant¹ are reported.

The distributions for the comparison variables are reported in table 1. Seventy-five percent

Table 1. Descriptive statistics for comparison variables

	Percent
Gross farm sales, 2009	
Less than \$250,000.....	75
\$250,000 or more	25
Planted corn or soybeans, 2009	
Yes	79
No	21
Generally crops highly erodible land	
Yes	40
No	60
Knowledge of cover crops	
Strongly agree, agree, or uncertain about the statement, “Don’t know enough about cover crops to use them”	68
Strongly disagree or disagree with the statement, “Don’t know enough about cover crops to use them”	32
Experience with cover crops	
Had planted within last five years	12
Had not planted within last five years.....	88

¹Statistical significance is the probability that differences between group averages are due to chance. Unless otherwise indicated, the threshold level of significance used in this report is .05, meaning that there is a five percent or less probability that differences are due to chance.

of respondents reported less than \$250,000 in 2009 gross farm sales. Seventy-nine percent had planted corn and/or soybeans in 2009. Forty percent reported that they generally plant crops on land that is considered highly erodible. Twelve percent reported having planted cover crops at some point in the five years prior to the survey.

Environmental and Agronomic Impacts of Cover Crops

Three statements measured farmer beliefs regarding the potential environmental and agronomic benefits of cover crops. Most farmers believe that cover crops can address key natural resource concerns. Over 80 percent of farmers agreed that cover crops can reduce soil erosion significantly, compared to only four percent who disagreed (table 2). Farmers also perceived that cover crops can benefit productivity: 63 percent agreed with the statement, “Cover crops can improve soil productivity,” whereas only four percent disagreed. Fifty-eight percent of farmers agreed that cover crops reduce nitrogen and phosphorus losses, while only six percent disagreed.

Comparison Groups

Farm size

Several important differences in beliefs about the agroecological impacts of cover crops were identified through comparisons by farm size. Operators of small farms (farms that generated less than \$250,000 in gross sales) were more likely to agree with all three statements than

operators of larger farms (figure 1). Eighty-four percent of small farm operators agreed that cover crops can reduce soil erosion significantly, compared to 78 percent of large farm operators. Sixty-five percent of small farmers agreed with the statement, “Cover crops can improve soil productivity,” compared to 58 percent of larger-scale farmers. Small farm operators were also more likely to agree that cover crops can reduce nitrogen and phosphorus losses, with 60 percent in agreement compared to 54 percent of large farmers. While these differences were relatively small, they were consistent across questions, indicating that smaller-scale farmers tend to associate cover crops with environmental benefits somewhat more than larger farmers do.

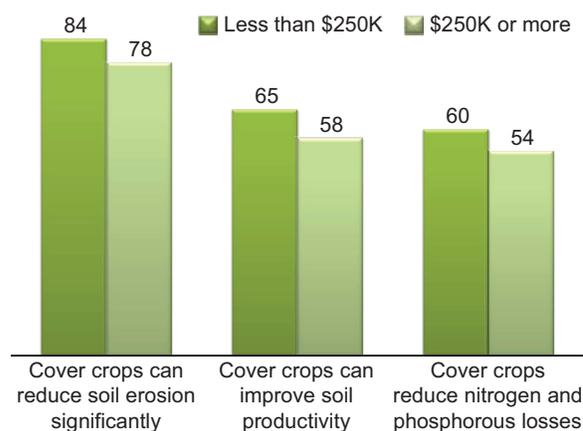


Figure 1. Percent agree or strongly agree, by gross farm sales

Corn and soybean production

Comparisons by whether or not respondents planted corn or soybeans in 2009 indicated that farmers who planted those row crops were less likely to perceive that cover crops have positive environmental and agronomic impacts

Table 2. Beliefs about the environmental and agronomic impacts of cover crops

	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
	— Percentage —				
Cover crops can reduce soil erosion significantly ..	1	3	14	68	15
Cover crops can improve soil productivity.....	1	3	33	55	8
Cover crops reduce nitrogen and phosphorus losses.....	1	6	35	49	9

than those who did not. Eighty-one percent of farmers who planted corn or soybeans agreed that cover crops can reduce soil erosion significantly, compared to 86 percent of farmers who did not (figure 2). Similarly, 62 percent of corn and/or soybean growers agreed that cover crops can improve soil productivity, compared to 67 percent of farmers who had not planted those row crops. Finally, while 57 percent of corn/soybean farmers agreed that cover crops reduce nitrogen and phosphorus losses, 62 percent of other farmers agreed with that statement.

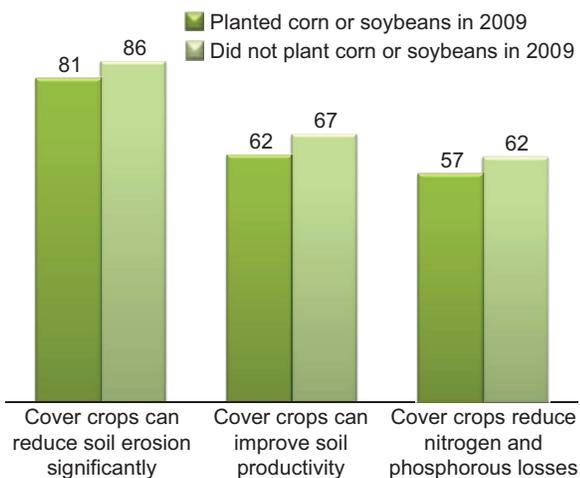


Figure 2. Percent agree or strongly agree, by planted corn or soybeans in 2009

Highly erodible land

Farmer responses on the potential environmental and agronomic benefits of cover crops did not vary by whether or not they generally crop highly erodible land.

Knowledge of cover crops

Farmers who were less confident in their knowledge of cover crops were somewhat less likely to agree that cover crops can result in positive agronomic and environmental impacts. Eighty percent of farmers who agreed with or were uncertain about the statement, “I don’t know enough about cover crops to use them,” believed that cover crops can reduce soil erosion significantly, compared to 88 percent of those who did not agree (figure 3). Likewise,

farmers who were less knowledgeable were substantially less likely to agree that cover crops can improve soil productivity (53 percent vs 68 percent) or reduce nitrogen and phosphorus losses (57 percent vs 76 percent).

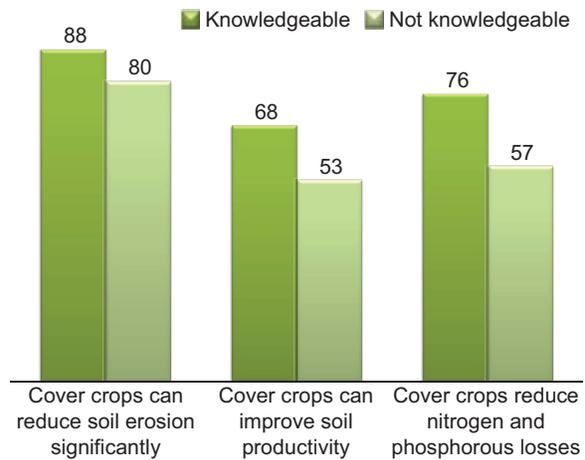


Figure 3. Percent agree or strongly agree, by knowledge of cover crop use

Previous experience with cover crops

The 12 percent of farmers who had employed cover crops in their farm operations tended to provide more favorable assessments of cover crops than those who had not. Ninety percent of the farmers who had planted cover crops at some point during the previous five years agreed or strongly agreed that they can reduce soil erosion significantly, compared to 82 percent of farmers who had not planted cover crops (figure 4). The difference between cover crop users and non-users was more pronounced on the item regarding soil productivity: 82 percent of farmers who had planted cover crops in the previous five years agreed that they have positive impacts on soil productivity, while only 61 percent of non-users were in agreement. Assessments of cover crops’ ability to reduce nitrogen and phosphorus loss were similarly divergent: 74 percent of cover crop users agreed or strongly agreed that cover crops can diminish nutrient loss, compared to just 56 percent of non-users.

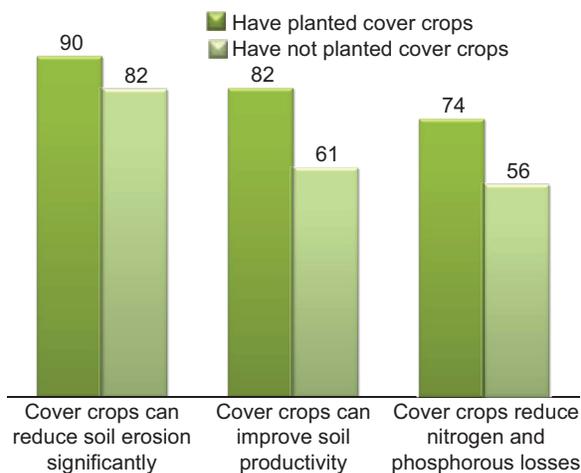


Figure 4. Percent agree or strongly agree, by previous cover crop use

Barriers to and Facilitators of Cover Crop Use

Factors that are thought to facilitate or impede use of cover crops include perceived climate-related barriers, farmer capacity to use them, and supportive policy. Six questions were included in the Farm Poll to assess the degree to which such factors might serve to hinder or help the spread of cover crop adoption in Iowa.

While most farmers generally agreed on the agronomic and environmental benefits of cover crops, there was less consensus regarding factors that might help or hinder

their adoption. Levels of uncertainty were higher than 30 percent for all questions, and topped 50 percent for two items (table 3). Like the previous section, this section first presents results for the full sample and then for the comparisons for which statistically significant differences were found between groups.

In general, farmers appear to believe that climate-related factors present substantial barriers to cover crop use. Sixty-one percent of farmers either agreed or strongly agreed with the statement, “There is rarely enough time between harvest and winter to justify the use of cover crops” (table 3). Similarly, 38 percent agreed that cover crops can interfere with spring planting, although the percentage of farmers who indicated uncertainty on that item was considerable at 46 percent. Thirty-one percent agreed that they would be more likely to use cover crops if shorter-season crop varieties yielded as much as longer-season ones, 13 percent disagreed, and 55 percent were uncertain.

Results also indicate that absence of key elements of capacity—knowledge and equipment—are substantial barriers to cover crop use. Two-thirds of farmers either agreed that they lack sufficient knowledge of cover crops to use them (35 percent) or were uncertain (33 percent) (table 3). About 40

Table 3. Barriers and facilitators of cover crop use, all respondents

	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
— Percentage —					
There is rarely enough time between harvest and winter to justify the use of cover crops	1	7	31	48	13
Cover crops can delay spring planting	2	15	46	34	4
If shorter-season crop varieties yielded the same as longer-season, I would be more likely to plant cover crops.....	1	12	55	29	2
I don’t know enough about cover crops to use them.....	5	27	33	33	2
I don’t have the necessary equipment for cover crops	4	25	31	36	4
If 50 percent cost-share were available for cover crop establishment, I would plant them.....	3	15	54	22	6

percent agreed that they did not have the necessary equipment for cover crops, and 31 percent were uncertain.

A single policy-related item sought to measure whether or not farmers would consider planting cover crops if 50 percent cost-share were available. Only 28 percent of farmers agreed that cost-share would induce them to plant cover crops (table 3). On the other hand, 54 percent indicated that they were unsure, and just 18 percent indicated that they would not plant cover crops if cost-share were available to help offset costs.

Comparison Groups

Farm size

Comparisons by farm size found significant differences on four of the six variables. Differences were found for all three of the climate-related variables. The most notable contrast was found in responses regarding timing: nearly 80 percent of farmers who reported more than \$250,000 in gross farm income either agreed or strongly agreed there was not enough time between harvest and winter to plant cover crops, compared to just 56 percent of farmers with less than \$250,000 in revenue (figure 5). Farmers who made over \$250,000 in gross farm income were also more likely to agree or strongly agree that cover crops could delay spring planting (49 percent) than were smaller-scale farmers (35 percent). Finally, larger-scale farmers were slightly more likely to agree that they would plant cover crops if shorter-season crop varieties yielded the same as longer season varieties (33 percent vs 32 percent). The only other difference detected was for one of the capacity variables. Farmers who generated more than \$250,000 in gross farm sales were less likely to agree that they lack the necessary equipment for cover crops (34 percent), compared to farmers with less than \$250,000 (42 percent).

Corn and soybean production

Comparisons by whether or not farmers had planted corn or soybeans in 2009 found

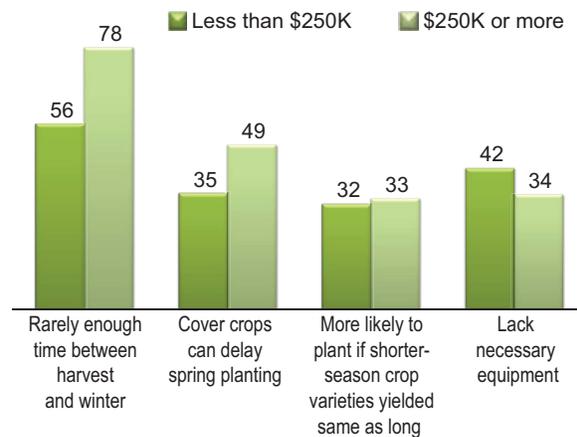


Figure 5. Percent agree or strongly agree, by gross farm sales

significant differences on five of the six variables examined. Again, differences were found for all three climate-related variables. Farmers who had planted corn or soybeans in 2009 were much more likely to agree that there is not enough time between harvest and winter to plant cover crops (68 percent) than those who had not (34 percent) (figure 6). Corn and soybean farmers were also more likely to agree that cover crops could delay spring planting (41 percent) than those who had not planted corn or soy (25 percent). Additionally, those farmers who had planted corn or soybeans were more likely to agree with the statement, “I would be more likely to plant cover crops if shorter-season crop varieties yielded the same as longer-season crops,” than those farmers who had not planted corn or soybeans (34 percent vs 24 percent).

Differences were found for both capacity-related variables. Farmers who had planted corn or soybeans were more likely to agree that they lack sufficient knowledge about cover crops (37 percent) compared to those who had not planted those crops (29 percent). On the other hand, farmers who had planted corn or soybeans were less likely to agree that they do not have the equipment necessary to plant cover crops (39 percent) than those who had not (44 percent).

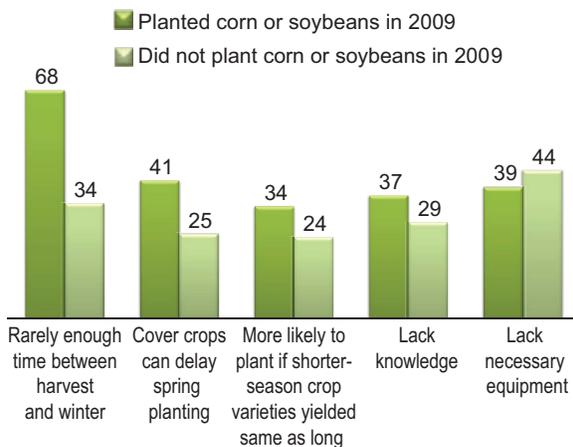


Figure 6. Percent agree or strongly agree, by planted corn or soybeans in 2009

Highly-erodible land

Of particular interest were comparisons between farmers who indicated that they generally plant crops on highly erodible land (HEL) and those who do not, because cover crops are considered to be especially effective for controlling soil erosion on such land. Significant differences were found on four of the six variables examined. Differences were found for two of the three climate-related variables. Almost 69 percent of farmers who generally crop highly erodible land agreed that there was not enough time between harvest and winter to plant cover crops, compared to 56 percent who do not farm highly erodible land (figure 7). Likewise, 34 percent of farmers who crop highly erodible land agreed that they would be more likely to use cover crops if shorter-season crop varieties produced yields similar to longer-season varieties, compared to 29 percent who do not crop highly erodible land.

In terms of capacity, farmers who generally plant crops on highly erodible land were less likely to indicate that they lacked the knowledge or equipment necessary to plant cover crops. Thirty-two percent of farmers who plant HEL to crops agreed that they do not know enough about cover crops to use them, compared to 37 percent of farmers who do not crop highly erodible land. Similarly, 35 percent of farmers who crop HEL agreed that they do not have the

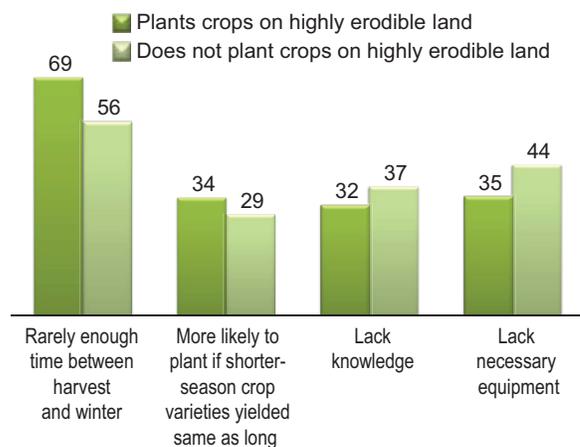


Figure 7. Percent agree or strongly agree, by crops on highly erodible land

necessary equipment for cover crops, compared to 44 percent of those who do not farm HEL.

Knowledge of cover crops

Farmers who were more confident in their knowledge about cover crops were slightly more likely to agree that there is not enough time between harvest and winter to justify use of cover crops (62 percent vs 60 percent) (figure 8). They were also slightly more likely to agree that cover crops could delay spring planting (39 percent vs 37 percent).

On the other hand, farmers with greater knowledge of cover crops were also *much more likely to disagree* that there is rarely enough time for cover crops (19 percent vs 4 percent) or that they could delay spring planting (34 percent vs 9 percent) (figure 9). They were also more likely to agree that if shorter-season crop

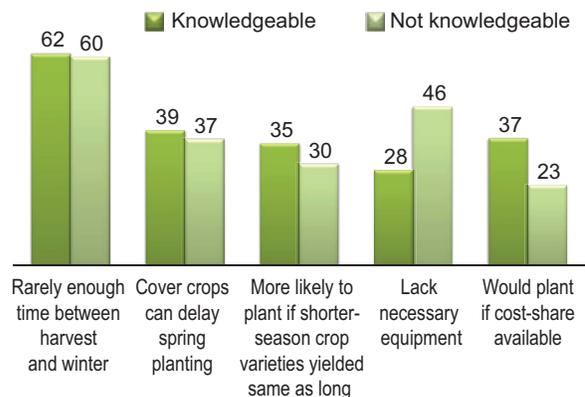


Figure 8. Percent agree or strongly agree, by knowledge of cover crops

varieties yielded the same as longer, they would be more apt to use cover crops (35 percent vs 30 percent) (figure 8). In other words, farmers who were more confident in their knowledge of cover crops were less likely to view Iowa's climatic conditions as an impediment than farmers who were less knowledgeable. Nevertheless, climate-related barriers were important to both groups.

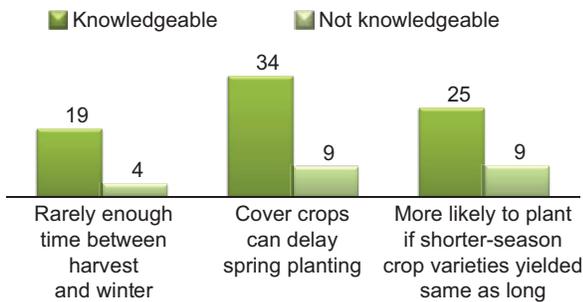


Figure 9. Percent disagree or strongly disagree, by knowledge of cover crops

Knowledge-related differences were also found for the equipment and cost-share related questions. Among farmers who agreed with or were uncertain about the statement, “I don’t know enough about cover crops to use them,” 46 percent indicated that they do not have the necessary equipment to use cover crops, compared to only 28 percent of those who disagreed with that statement (figure 8). Finally, 37 percent of farmers who did not cite knowledge barriers to cover crop use indicated that they would be more likely to plant cover crops if 50 percent cost share were available, compared to 23 percent for those who did view lack of knowledge as a barrier.

Previous experience with cover crops

As might be expected, farmers who had planted cover crops within the last five years had substantially different perspectives regarding potential barriers and facilitators of cover crop use. Significant differences were found on all six of the variables examined. On the whole, farmers who had planted cover crops in the past were less likely to agree that climatic factors serve as barriers to cover crop use.

Among farmers who had recently used cover crops, 43 percent agreed or strongly agreed there is rarely enough time between harvest and winter to plant cover crops, compared to 64 percent of farmers who had not used cover crops (figure 10). Thirty percent of farmers who had planted cover crops agreed that cover crops could delay spring planting, compared to 39 percent of farmers who did not have experience with cover crops. In response to the statement, “If shorter-season crop varieties yielded the same as longer-season crop varieties, I would be more likely to plant cover crops,” 43 percent of farmers with cover crop experience agreed, compared to 30 percent of farmers who had not planted them.

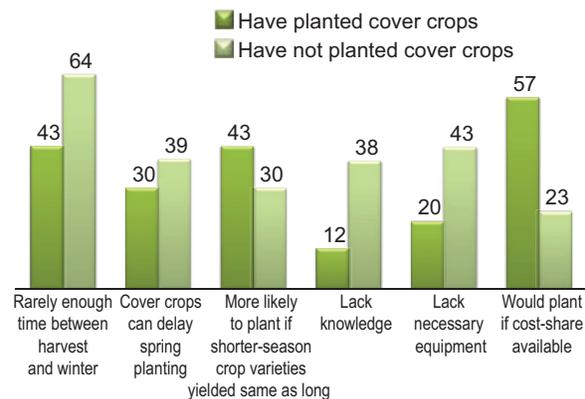


Figure 10. Percent agree or strongly agree, by previous crop use

Farmers who had planted cover crops in the past five years were also less likely to cite capacity-related barriers to cover crop use. Only 12 percent of farmers who had planted cover crops agreed that they did not know enough to use them, compared to 38 percent of those farmers who had not planted them (figure 10). Similarly, only 20 percent agreed that they lacked the necessary equipment to plant cover crops, compared to 43 percent of farmers who had not planted cover crops. Notably, farmers who had planted cover crops in the last five years were much more likely to agree that cost-share would influence their use of cover crops. Fifty-seven percent of those farmers agreed that they would plant cover

crops if 50 percent cost-share were available, compared to 23 percent of farmers who had not planted cover crops.

Interest in Learning about Cover Crops

Lastly, farmer interest in gaining further knowledge about cover crops was evaluated through a single survey item that read simply, “I would like to learn more about using cover crops.” Over 40 percent of the farmers surveyed agreed that they would like to learn more, 44 percent were uncertain, and only 16 percent disagreed (table 4).

Comparison groups

Analysis identified statistically significant differences for three comparison variables: Farm size, knowledge of cover crops, and previous experience with cover crops. Forty-two percent of farmers who generated less than \$250,000 in gross farm income expressed interest in learning more about cover crops, compared to 37 percent of those who made more than \$250,000 (figure 11). Farmers who were more confident in their knowledge of cover crop use were also more interested in adding to that knowledge: 44 percent were interested in learning more about cover crops, compared to 39 percent among farmers who indicated that they lack sufficient knowledge to use cover crops (figure 12). Finally, of those farmers who had planted cover crops, 58 percent agreed that they would like to learn more, compared to only 38 percent among those who had not (figure 13).

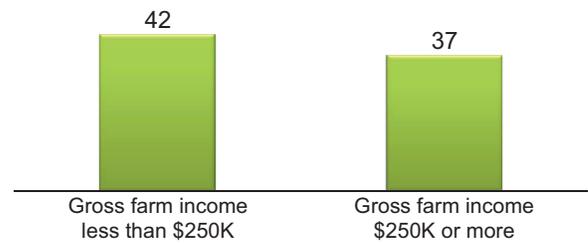


Figure 11. Percent agree or strongly agree would like to learn more, by gross farm sales

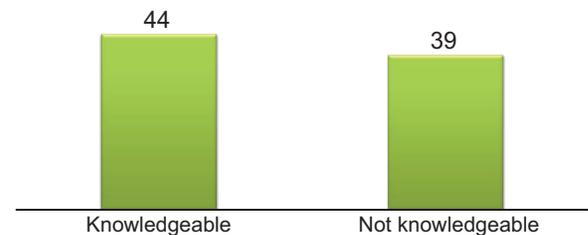


Figure 12. Percent agree or strongly agree would like to learn more, by knowledge

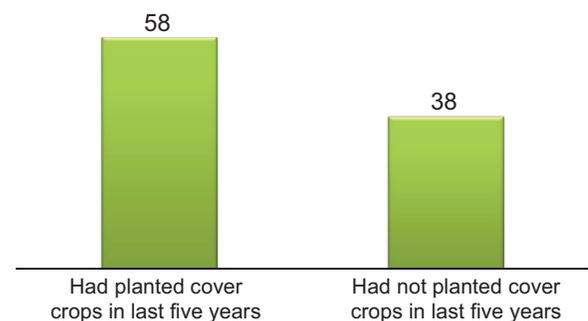


Figure 13. Percent agree or strongly agree would like to learn more, by previous cover crop use

Table 4. Interest in information about cover crops

	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
— Percentage —					
I would like to learn more about using cover crops	3	13	44	36	5

Summary and Conclusions

Most Iowa farmers believe that cover crops can lead to agronomic and conservation benefits. However, larger-scale farmers and those who plant corn and soybeans were slightly less likely to agree that cover crops can reduce erosion, improve soil productivity, or reduce nutrient loss. While there was less consensus regarding factors that may act as barriers to and/or facilitators of cover crop use, a similar pattern emerged. While Iowa's climate represents a substantial perceived impediment to cover crop use to many Iowa farmers, farmers with larger operations, those who plant corn and soybeans, and those who plant crops on highly erodible land cited climate-related barriers at a higher rate. The fact that farmers in each of those categories were also more likely to indicate that availability of shorter-season crop varieties would positively influence their likelihood of cover crop use further underscores the importance of climate as a major factor in decisions regarding cover crop use.

Lack of necessary equipment and knowledge regarding cover crop use also appear to be important barriers to cover crop use. Many farmers cited lack of necessary equipment as an impediment, and farmers who plant corn or soybeans or generally crop HEL indicated that lack of equipment and sufficient knowledge of cover crops are particularly significant barriers to the use of cover crops. Larger-scale farmers were less likely to express interest in learning more about cover crops.

Considered together, these findings point to substantial challenges to efforts focused on getting more cover crops on Iowa's farmland. Larger-scale farmers cultivate the majority of Iowa's cropland, and corn and soybean farmers and farmers who plant crops on highly erodible land are precisely the groups whose land could benefit the most from using cover crops. Yet, farmers with these characteristics are less likely

to agree that cover crops can lead to agronomic and environmental benefits. In addition, they are more likely to view climatic conditions, lack of appropriate equipment, and lack of cover crop knowledge as barriers to cover crop use.

On the other hand, farmers who expressed more confidence in their knowledge of cover crops and those who had actually used cover crops at some point in the previous five years tended to rate agronomic and environmental benefits more highly. They also appear to be less concerned about barriers. These results indicate, as would be expected, that knowledge and experience are important predictors of attitudes toward cover crops. Nevertheless, it is important to note that substantial numbers of farmers who reported having used cover crops still perceive climatic, equipment, and knowledge barriers to their use.

The results of this research point to several strategies that could be followed to increase the use of cover crops in Iowa.

Address climate and equipment barriers

This should continue to be a major focus of cover crop research and outreach efforts. Innovative solutions to these impediments are currently under development. Aerial and other means of over-seeding into standing cash grain crops show promise as ways to address climate and equipment barriers simultaneously. New cover crop technologies that employ perennial grasses rather than annual plants and development of short-season crops with yields comparable to long-season could also address climate-related concerns. For those farmers who lack the necessary equipment and/or knowledge, cover crop services provided by trained custom operators could overcome those barriers while also providing income-generating opportunities for service providers.

Increase knowledge and confidence

This research indicated that knowledge and experience with cover crops are important

predictors of farmer attitudes toward their use. Efforts to increase knowledge and comfort level with cover crops should focus on both farmers and the agribusiness networks that provide them with inputs and technical assistance. The likelihood of widespread use of cover crops will be higher if farmers and the cooperatives, seed dealers, crop advisers, custom operators, and other key actors who work with them become more knowledgeable and confident in their abilities to manage cover crops.

Coordinate efforts

Cover crops research and outreach partnerships between proponents such as ISU Extension and Outreach, Iowa Learning Farms, and Practical

Farmers of Iowa should be continued. Further development and dissemination of research-based information, more demonstration of cover crops integrated into local cropping systems, cultivation of local technical assistance from trusted sources, and other means of increasing farmer and agribusiness knowledge, capacity, and confidence in cover crops will be needed to attain widespread adoption.

Highlights

Benefits of cover crops

Most farmers believed that cover crops provide agronomic and environmental benefits:

- Cover crops can reduce soil erosion significantly: 83% agreement
- Cover crops can improve productivity: 63% agreement
- Cover crops can reduce nutrient loss: 58% agreement

Farmers who were less likely to agree that cover crops can result in these benefits:

- Larger-scale farmers
- Farmers who plant corn and/or soybean

Farmers who were more likely to agree that cover crops can result in these benefits:

- Farmers who are more knowledgeable about cover crops
- Farmers who have planted cover crops in the past

Barriers to Cover Crop Use

Climatic factors

Many farmers viewed climatic factors as barriers to cover crops, but uncertainty was also high:

- Rarely enough time between harvest and winter to justify use: 61% agreement, 31% uncertain
- Cover crops can delay spring planting: 38% agreement, 46% uncertain
- If shorter-season varieties yielded the same as longer-season, would be more likely to plant: 31% agreement, 55% uncertain

Farmers who were more likely to cite climatic barriers:

- Larger-scale farmers
- Farmers who plant corn and/or soybean
- Farmers who generally crop highly erodible land

Farmers who were less likely to cite climatic barriers:

- Farmers who are more knowledgeable about cover crops
- Farmers who have planted cover crops in the past

Capacity

Most farmers either agreed or were uncertain about their capacity to plant cover crops:

- Do not know enough about cover crops to use them: 35% agreement, 33% uncertain
- Do not have the necessary equipment to use cover crops: 40% agreement, 31% uncertain

Interest in Learning More

Many farmers were interested in learning more about using cover crops, but many were uncertain:

- Farmers who would like to learn more: 41%
- Most farmers were either uncertain (44%) or disagreed (16%) that they would like to learn more
- Farmers who already cite knowledge of cover crops or who reported previous experience with cover crops were more likely to be interested in learning more
- Larger-scale farmers were less likely to express interest in learning more about cover crops

Prepared by J. Gordon Arbuckle, Jr., extension sociologist; and John Ferrell, research assistant. Renea Miller provided valuable layout assistance to the questionnaire and this report. The Iowa Department of Agriculture and Land Stewardship, Division of Statistics, assisted in the data collection.

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