



# 2018 Summary Report

## Introduction

The Iowa Farm and Rural Life Poll is an annual survey of Iowa farmers. The survey project collects and disseminates information on issues of importance to farmers and agricultural stakeholders across Iowa and the Midwest. The Farm Poll has been conducted every year since its establishment in 1982, and is the longest-running survey of its kind in the nation. Iowa State University Extension and Outreach, the Iowa Agriculture and Home Economics Experiment Station, the Iowa Department of Agriculture and Land Stewardship, and the Iowa Agricultural Statistics Service are partners in the Farm Poll. The information gathered through the annual survey is used to inform the development and improvement of research and extension programs and is used by local, state, and national leaders in their decision-making processes. We thank the many farm families who responded to this year’s survey and appreciate their continued participation.

## Who participates?

The 2018 Farm Poll questionnaires were mailed in February 2018 to a statewide panel of 2,151 farmers. Completed surveys were received from 1,061 farmers, resulting in a

response rate of 50 percent. On average, Farm Poll participants were 66 years old. Because the Farm Poll is a panel survey, in which the same farmers participate in multiple years, participants are somewhat older on average than the general population of farmers. This year’s survey contained questions about quality of life and farm financial well-being, rented land, soil and water conservation, prairie strips, and precision agriculture. Copies of this or any other year’s reports are available from your local ISU Extension and Outreach county office, the [Extension Store](https://store.extension.iastate.edu) (<https://store.extension.iastate.edu>), [Extension Sociology](https://ext.soc.iastate.edu/programs/iowa-farm-and-rural-life-poll/) (<https://ext.soc.iastate.edu/programs/iowa-farm-and-rural-life-poll/>), or from the authors.

## Quality of life and farm financial well-being

Every two years since 1982, the Farm Poll has asked farmers to report on changes in quality of life, defined as “the degree of satisfaction with all aspects of life,” for their families and families in their communities. In 2018, 84 percent of participants reported that quality of life for their families either stayed the same or improved over the five years leading up to February/March 2018 (table 1). This represents a slight continuing drop from 87 percent in

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**Table 1. Quality of life 2018**

	Become Much Worse	Become Somewhat Worse	Remained the Same	Become Somewhat Better	Become Much Better
During the past five years, has the quality of life for families in your community	3%	23%	52%	20%	2%
During the past five years, has the quality of life for your family	3%	13%	50%	30%	4%
In the next five years, will the quality of life for families in your community	3%	20%	51%	24%	2%
In the next five years, will the quality of life for your family	2%	14%	50%	31%	3%
In the next five years, will the overall economic prospects for Iowa farmers	5%	37%	33%	23%	2%

2016 and 91 percent in 2014. Seventy-four percent indicated that quality of life among families in their communities had either remained the same or improved, down from 79 percent in 2016 and from the all-time Farm Poll high of 85 percent in 2014.

Farmers remained fairly optimistic about the future: 84 percent predicted that quality of life would stay the same or improve for their families over the next five years (table 1), compared to 83 percent in 2016 and 86 percent in 2014. Seventy-seven percent believed the same about families in their communities, up from 71 percent in 2016, and about the same as 2014 (78 percent).

Respondents' predictions regarding the overall economic prospects for farmers were less optimistic. While 25 percent predicted improvements in the next five years, 42 percent indicated that economic prospects would become worse (table 1). Thirty-three percent predicted that the farm economy would stay the same. These results represent a slight improvement over 2016, when just 17 percent of farmers anticipated improvement and half predicted worsening prospects.

The 2018 Farm Poll survey repeated a short question set about "current financial well-being" that was previously asked in 2016 and 2008. As expected, given recent weakness in commodity crop markets, evaluations of

farmers' financial well-being declined, with 46 percent reporting that the financial well-being of farmers in their part of the state was either a moderate or serious problem, up from 39 percent in 2016 (table 2). In 2008, that figure was 21 percent, so the 2018 result is more than double what it was a decade ago. Perceptions of the financial well-being of agribusiness firms in their local area held steady since 2016, with 32 percent of respondents perceiving a moderate or serious problem, compared to 33 percent in 2016 and 21 percent in 2008. Respondents' rating of the financial well-being of their own farms as a problem rose, with 20 percent reporting a moderate or serious problem, up from 18 percent in 2016 and 13 percent in 2008.

## Rented land

More than half of Iowa's farmland is rented, yet with few exceptions,<sup>1</sup> little research has focused on issues related to rented land in Iowa. Periodically, the Farm Poll includes a number of questions about rented farmland to learn more about who owns it and how it is managed. This year's questions focused on several dimensions of landlord-tenant relationships.

Forty-six percent of Farm Poll respondents reported that they rented farmland from others in 2017, up slightly from 45 percent in 2013, the last time the questions were

**Table 2. Perceptions of “current financial well-being,” 2008, 2016, and 2018**

		Not A Problem	A Slight Problem	A Moderate Problem	A Serious Problem	Not Sure
Of farmers in your area	2018	9%	39%	38%	8%	6%
	2016	13%	39%	31%	8%	9%
	2008	43%	30%	17%	4%	7%
Of agribusiness firms in your area	2018	21%	40%	27%	5%	7%
	2016	23%	34%	28%	5%	11%
	2008	42%	30%	17%	4%	7%
Of financial institutions in your area	2018	48%	25%	17%	3%	8%
	2016	43%	28%	15%	3%	11%
	2008	53%	23%	13%	3%	8%
Of your own farm	2018	43%	35%	17%	4%	2%
	2016	47%	31%	15%	3%	3%
	2008	59%	25%	11%	2%	3%

asked. This section reports data only for those farmers who reported that they rented land. Several questions have been asked at 5-year intervals since 2008, so where applicable, we compare results from 2008, 2013, and 2018. It is important to note that the full sample of farmers from each year is included in this analysis, not just the farmers who were in all three years. Thus, the estimates are not precise measures of change over time, but rather may be indicative of trends.

On average, respondents who rented land leased 431 acres in 2017, up from an average of 392 acres in 2013. Most farmers who rented land reported multiple landlords, and the average number of landlords was 3.3, up from 2.8 in 2013. Most farmers (73 percent) reported 1-3 landlords, while 19 percent had 4-6, 5 percent had 7-10, and 3 percent reported more than 11 (table 3). These proportions have been relatively stable since 2008.

**Table 3. Number of landlords**

	2008	2013	2018
1-3 landlords	75%	74%	73%
4-6 landlords	19%	20%	19%
7-10 landlords	5%	4%	5%
11 or more landlords	1%	2%	3%

The fact that most farmers rent land from multiple landlords provides a challenge to survey research on landlord characteristics. To avoid making the survey questionnaire overly complex by asking about multiple landlords, farmers were asked to report on the landlord from whom they had rented the most land.

### *Landlord and lease characteristics*

Farmers were asked to report the gender of their primary landlord. In 2018, 60 percent were male and 40 percent female (table 4). This represented a slight decrease in male landlords from 2013, when 62 percent were male and 38 percent female.

Several questions examined landlords’ ties to farming and the rented land. Farmers were provided several categories and asked to select the one “that best describes” their landlord. Half of farmers characterized their landlord as either a former farmer (30 percent) or the spouse/widow/widower of a former farmer

**Table 4. Landlord gender, largest parcel rented**

	2013	2018
Male	62%	60%
Female	38%	40%

**Table 5. Landlord ties to farming and the rented land, largest parcel rented**

	2008	2013	2018
A former farmer	46%	34%	30%
The widow/widower of a former farmer	16%	17%	20%
An inheritor of farmland	30%	29%	31%
An individual investor with family ties to the land	-	8%	9%
An individual investor with no direct family ties to the land	8%	6%	6%
A farmland management firm		3%	3%
Other		3%	1%

**Table 6. Farmer relationship with landlord, largest parcel rented**

	2013	2018
A relative	44%	50%
A friend of the family	21%	24%
A person who is neither a relative nor a friend of the family	29%	23%
A company or financial institution	4%	3%
Other	2%	1%

(20 percent) (table 5). Thirty-one percent selected “inheritor of farmland.” Nine percent were investors with some family ties to the land, and six percent were investors with no family ties. Three percent selected the category “farmland management firm,” and one percent rented their largest parcel from some other entity. Table 5 shows a steady decline in the “former farmer” category and an increase in the spouse/widow/widower and investor categories between 2008 and 2018.

In 2013 and 2018, the survey asked respondents about familial or social ties to their primary landlord. In 2018, 50 percent of respondents’ primary landlords were relatives, compared to 44 percent in 2013 (table 6). Twenty-four percent characterized their landlord as a friend of the family and 23 percent as neither a relative nor a friend of the family. Small percentages rented from a company or financial institution (3 percent) or from another type of entity (1 percent).

The next questions, posed only in 2008 and 2018, asked farmers where their primary landlord lived in relation to the rented land. In 2018, about 60 percent indicated that they lived in the county and about 10 percent lived in an adjacent county (table 7). Thirteen percent reported primary landlords who lived elsewhere in Iowa, and 19 percent indicated that their landlord lived out of state. Thus, most primary landlords lived relatively close to their land, and more than 80 percent within Iowa.

Short length of tenure and tenure insecurity are often cited as impediments to tenant investment in soil fertility and soil and water conservation practices. Most farmers had rented from their primary landlords for more than 10 years, and the length of tenure appears to be increasing (table 8). Proportion of farmers in the longest tenure category, 31 or more years, increased from 12 percent in 2008 to 20 percent in 2018. Similarly, the proportion

of farmers with shorter tenure length (1-10 years) decreased from 38 percent in 2008 to 31 percent in 2018.

The survey also asked farmers to categorize their lease agreement for the largest parcel that they rented in 2017. Eighty-one percent reported a cash rent agreement, with 42 percent indicating a written agreement, and 39 percent verbal (table 9). Seventeen percent reported a crop share arrangement, with 10 percent indicating that their crop share lease agreements were verbal, and 7 percent written. These distributions were substantially similar to those reported in 2013.

### *Rented land and conservation*

There are a number of long-standing questions about relationships between land tenure and soil and water conservation. In particular,

discussion often focuses on the question of whether farmers take the same care of rented land as they do land that they own. Such differences in stewardship actions are difficult to ascertain through surveys such as this one. Nevertheless, the survey posed several questions focused on gaining insight into landlord-tenant soil and water conservation communication, attitudes, and actions.

Several questions examined farmer-landlord communication about farming and conservation. In 2018, farmers reported they had communicated with their landlords about farming practices an average of 15 times over the previous year, compared to 15 times in 2013 and 17 times in 2008 (table 10). Communication about soil and water conservation was less frequent, at six times over the past year, compared to seven times in 2013 and five times in 2008.

**Table 7. Landlord place of residence, largest parcel rented**

	2008	2018
On the land	-	25%
In the county (2008)/Not on the land, but in the same county (2018)	60%	33%
In an adjacent county	11%	10%
Somewhere else in Iowa	8%	13%
Outside of Iowa	18%	19%
Other	4%	1%

**Table 8. Number of years renting from landlord, largest parcel rented**

	2008	2013	2018
1-3 years	10%	7%	6%
4-10 years	28%	25%	31%
11-20 years	29%	31%	30%
21-30 years	21%	20%	20%
31 or more years	12%	16%	20%

**Table 9. Type of lease agreement, largest parcel rented**

	2013	2018
Verbal cash rent agreement	37%	39%
Written cash rent agreement	45%	42%
Verbal crop share agreement	12%	10%
Written crop share agreement	7%	7%
Other	0%	2%

**Table 10. Communication with landlord, largest parcel rented**

	2008 Median	2008 Mean	2013 Median	2013 Mean	2018 Median	2018 Mean
Over the past year, about how many times did you communicate with your landlord about farming practices?	4.0	17.0	4.0	14.0	4.0	15.1
Over the past year, about how many times did you communicate with your landlord about soil and water conservation needs?	1.0	4.5	2.0	7.0	2.0	5.9

A small percentage of farmers reported that their landlords communicated with them on a daily basis, or 365 times per year. Because a small number of relatively high-value observations can inflate averages, the median was also calculated for each of the communication-related variables. As can be seen from table 10, the median numbers for communication and visitation were substantially lower than the averages, with a median of four for communication about farming in general and two times for communication about conservation in 2018.

A question posed in both 2013 and 2018 asked farmers about distribution of responsibility for addressing soil and water conservation needs on the land they rent. In both years, 38 percent reported that they, the tenants, were solely responsible for conservation decisions (table 11). In 2018, 36 percent indicated that they were primarily responsible with landlord input, compared to 34 percent in 2013. Fourteen percent reported that responsibility was shared equally, a decline from 19 percent in 2013. The proportion of respondents indicating that their landlord was primarily responsible, with some input from them, increased slightly from 7 to 9 percent between

2013 and 2018. Very few farmers reported that their landlord was solely responsible for addressing soil and water conservation needs.

The 2018 survey repeated a 2008 question set examining tenant perceptions of landlord stewardship ethics and behaviors and landlord-tenant sharing of responsibility for conservation action. The survey provided several statements and asked respondents to rate their agreement or disagreement on a 5-point scale. Comparisons of 2008 and 2018 responses found substantial differences.

The item, “if conservation practices are needed on the land I rent, it is my responsibility to address the need,” received the highest levels of agreement in 2018, with 72 percent of farmers agreeing or strongly agreeing with the statement (table 12). This result is slightly higher than the 67 percent agreement on the item in 2008. Conversely, in 2018, 29 percent agreed with the statement, “if conservation practices are needed on the land I rent, it is my landlord’s responsibility to address the need,” compared to 38 percent in 2008. Together these results indicate that tenants perceive an increase in their responsibility for conservation actions and a decline in their landlords’ responsibility.

**Table 11. Responsibility for addressing soil and water conservation needs, largest parcel rented**

	2013	2018
Me alone	38%	38%
Primarily me, with landlord input	34%	36%
Equally me and my landlord	19%	14%
Primarily my landlord, with my input	7%	9%
My landlord alone	2%	3%

There were similar declines in agreement on items focused on decision making. The proportion of farmers who agreed that their landlords “participate substantially in farming decisions” declined from 27 to 21 percent (table 12). The proportion of respondents who reported that their landlords “participate substantially in conservation decisions” also declined, from 41 to 37 percent.

Results showed declines in level of agreement on two items focused on landlords’ stewardship ethics. Percent of farmers who agreed with the statement, “my landlord places land stewardship goals ahead of income goals,”

declined from 44 percent in 2008 to 38 percent in 2018 (table 12). Similarly, agreement with the statement, “my landlord is more interested in maintaining soil and water quality than maximizing profits,” dropped from 45 to 36 percent between 2008 and 2018.

Two items focused on conservation behaviors. The first, “my landlord requires me to minimize impacts on soil and water quality,” relates to contractual obligations to pursue soil and water conservation. There was a major decline in agreement on this item, from 46 percent in 2008 to 32 percent in 2018 (table 12). Similarly, percent agreement

**Table 12. Farmers’ perspectives on rented land and soil and water conservation**

		Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
If conservation practices are needed on the land I rent, it is my responsibility to address the need	2018	4%	12%	11%	59%	13%
	2008	1%	14%	18%	63%	5%
If conservation practices are needed on the land I rent, it is my landlord’s responsibility to address the need	2018	15%	39%	17%	25%	4%
	2008	3%	37%	22%	35%	3%
My landlord participates substantially in conservation decisions	2018	11%	31%	22%	34%	3%
	2008	6%	31%	21%	38%	3%
My landlord participates substantially in farming decisions	2018	29%	41%	10%	19%	2%
	2008	14%	46%	13%	24%	3%
My landlord places land stewardship goals ahead of income goals	2018	5%	23%	34%	33%	5%
	2008	6%	21%	29%	37%	7%
My landlord is more interested in maintaining soil and water quality than maximizing profits	2018	7%	22%	36%	31%	5%
	2008	3%	17%	35%	42%	3%
My landlord requires me to minimize impacts on soil and water quality	2018	7%	33%	28%	28%	4%
	2008	4%	26%	25%	43%	3%
My landlord has established adequate conservation measures on his/her land	2018	4%	16%	21%	51%	7%
	2008	2%	11%	15%	66%	7%
I am less likely to use cover crops on rented land	2018 only	7%	26%	25%	36%	6%
I am less likely to invest my own money in structural conservation practices (i.e., grassed waterways, terraces) on rented land	2018 only	7%	31%	16%	40%	7%

with the item, “my landlord has established adequate conservation measures on his/her land,” declined from 73 percent in 2008 to 58 percent in 2018.

Two items that were only in the 2018 survey asked farmers about conservation behaviors on rented land compared to owned land. Nearly half (47 percent) of respondents agreed with the statement, “I am less likely to invest my own money in structural conservation practices (i.e., grassed waterways, terraces) on rented land,” and 42 percent agreed that they would be less likely to use cover crops on rented land (table 12).

A final rented land question, which was posed for the first time in 2018, asked farmers to estimate how much the landlord from whom they rented the largest parcel had invested in soil and water conservation practices on that land over the previous 10 years. Forty-one percent of farmers who rent land reported that their landlords had not invested any money in conservation over the previous decade (table 13). Thirteen percent estimated between \$1 and \$1,500, 11 percent between \$1,501 and \$3,000, and 13 percent between \$3,001 and \$5,000. Twenty-two percent estimated that their landlord had invested more than \$5,000.

## Use of selected conservation practices, 2016 and 2018

The 2018 Farm Poll survey contained questions about use of selected soil and water conservation and other practices. Identical questions were posed in 2016, so we can

examine trends in practice use over the two-year period from 2015 to 2017, during which many of the practices were promoted heavily by stakeholder groups in support of the [Iowa Nutrient Reduction Strategy \(INRS\)](#). The survey provided farmers with a list of key practices, most of which are recommended by the INRS for nutrient loss reduction. Three response categories were provided: not used in 2015 (or 2017), no plans to use it; not used in 2015 (or 2017), might use it in the future; and I used the practice in 2015 (or 2017). Table 14 reports the results for the latter two categories for both years. The percentage of farmers who were not using the practice and had no intention of doing so in the future may be calculated using the percentages from the other two categories. Responses are reported for all farmers who reported corn, soybean, or other crop production in the 2016 survey (n=892) and in the 2018 survey (n=858). It is important to note that since the Farm Poll survey is a longitudinal panel survey and not a true random sample survey, the results are not necessarily representative of all Iowa farmers and could over- or underestimate practice use. That said, the results are likely indicative of trends.

Among in-field management practices, no-till was most prevalent. Fifty percent of respondents reported no-till on at least some of the land they farm, up from 42 percent in 2015 (table 14). Percent of farmers reporting cover crops on at least some of their land increased two points, from 21 percent in 2015 to 23 percent in 2017. For reference, the first time

**Table 13. Landlord conservation investment, last 10 years**

\$0	41%
\$1-\$1,500	13%
\$1,501-\$3,000	11%
\$3,001-\$5,000	13%
\$5,001-\$10,000	11%
\$10,001 or more	11%



**Table 14. Use of selected practices, 2015 and 2017 (corn, soy, and other crop farmers only)**

	Used in 2015	Used in 2017	Might use in future (2015)	Might use in future (2017)
<b>In-field management: Tillage and cover crops</b>				
No-till (continuous)	42%	50%	18%	17%
Cover crops	21%	23%	34%	32%
Extended rotations (3 or more crops over a 3-5 year rotation)	15%	22%	18%	17%
Strip-till	7%	7%	15%	15%
<b>Nitrogen management</b>				
Nitrogen stabilizers (e.g., N-Serve)	38%	43%	20%	17%
Growing season nitrogen application (i.e., side-dress)	28%	35%	23%	22%
Nitrogen rate based on Corn N rate calculator (MRTN)	18%	26%	28%	27%
Variable rate N application	30%	22%	15%	26%
Spring (starter) N	70%	51%	12%	12%
<b>Edge-of-field conservation practices</b>				
Buffers along streams or field edges to filter nutrients and sediment from runoff	46%	56%	16%	13%
Terraces	37%	44%	11%	9%
In-field buffer strips (e.g., contour buffer strips) to filter nutrients and sediment	25%	32%	19%	17%
<b>Other practices</b>				
Fall N application	21%	29%	14%	12%
Tile, ditches, or other drainage	47%	59%	22%	18%
Manure used as fertilizer	43%	43%	13%	13%

the Farm Poll asked about use of cover crops, in 2010, just 12 percent of farmers reported that they had used cover crops in the previous five years. Reported use of extended rotations, defined as planting three or more crops over a 3-5 year period, increased from 15 percent in 2015 to 22 percent in 2017.

Among major nitrogen management practices, nitrogen stabilizer use was most common, at 43 percent, up from 38 percent in 2015 (table 14). Growing season nitrogen application also increased, from 28 percent in 2015 to 35 percent in 2017. Use of nitrogen calculators to determine optimum fertilizer rates increased from 18 percent in 2015 to 26 percent in 2017. Farmers reported declines in the use of variable rate nitrogen application (30 percent to 22 percent) and

spring (starter) nitrogen (70 percent to 51 percent). Interestingly, the decline in use of spring nitrogen was accompanied by an increase in use of fall nitrogen application, from 21 percent in 2015 to 29 percent in 2017. The percentage of farmers reporting use of tile or other drainage increased from 47 percent to 59 percent.

Farmers also reported increased use of major edge-of-field practices. Use of riparian buffers was 56 percent in 2017, up from 46 percent in 2015 (table 14). Proportion of farmers reporting terraces was also higher, increasing from 37 percent in 2015 to 44 percent in 2017, and reported use of in-field buffer strips rose from 25 percent to 32 percent.

It is interesting to note that for most practices, the proportion of farmers who indicated that

they might use them in the future remained relatively stable, while the proportion of farmers using the practices increased (table 14). This indicates that for many practices there was a substantial decline in proportion of farmers in the “did not use, no plans to use it” category between the 2016 and 2018 surveys.

## Watershed management

It is increasingly recognized that farmers who are involved in watershed groups [are more likely to adopt certain conservation practices](#), and [farmer-led watershed groups can effectively deal with water quality issues](#) by working together with other watershed residents and outside partner groups. The 2018 Farm Poll asked respondents about their involvement in watershed groups. Two short definitions of terms preceded the questions:

A **watershed** is an area of land that drains into a common waterway or water body. Watersheds are often described as “nested” because smaller watersheds that drain into smaller waterways make up larger watersheds that drain into rivers and ultimately into the sea. **Watershed management** refers to planning and action focused on maintaining clean water and general environmental quality within a watershed.

The survey first asked whether there was an active watershed management group in the watershed where respondents farm. Thirty percent responded affirmatively (table 15). Thirty-six percent reported that there was not an active group in their watershed, and 34 percent did not know if there was an active

group in their watershed. Just 15 percent of farmers indicated that they were involved in organized watershed management activities.

## Prairie strips

Since the mid-2000s, the [Prairie STRIPS project at Iowa State](#) has conducted research on how to incorporate strips of native prairie into fields of corn, soybeans, and other annual crops. STRIPS stands for Science-based Trials of Rowcrops Integrated with Prairie Strips. Project research has shown that converting 10 percent or less of crop fields to diverse, native perennials can reduce soil loss from fields by 90 percent and reduce nitrogen loss through surface runoff by up to 85 percent. Prairie strips also provide habitat for wildlife, including pollinators and other beneficial insects. Increasing numbers of farmers and farmland owners are implementing the prairie strips practice and finding it to be a conservation practice that offers multiple production and conservation benefits.

As more farmers and agricultural landowners have implemented prairie strips on working lands, the project team has become interested in understanding the potential for more widespread adoption of the practice. To this end, the 2018 Farm Poll survey contained a brief set of three questions to gauge farmer knowledge of and interest in the practice statewide. To ensure that all respondents had a basic understanding of the prairie strips practice, the survey provided a short description that was developed in consultation with project researchers:

Prairie strips are an agricultural conservation practice that uses strips of

**Table 15. Awareness of and involvement in watershed groups**

	Yes	No	Don't Know
Is there an active watershed management group in the watershed(s) where you farm?	30%	36%	34%
Are you involved in organized watershed management activities?	15%	78%	8%

native prairie vegetation within or at the edges of fields to protect soil and water and provide habitat for wildlife. Iowa State University researchers have shown that strategically converting small areas of crop fields to native prairie (generally in-field contour buffer strips or filter strips at the edge of fields) can significantly reduce soil erosion and nutrient loss and improve wildlife habitat.

Results show that 56 percent of farmers had heard about the practice before reading the description (table 16). A second question asked respondents if they would be interested in learning more about the practice: 22 percent selected “yes” and 36 percent selected “maybe,” indicating that a majority of farmers were at least open to the possibility of learning more. Similarly, 15 percent of farmers responded that they would be interested in planting prairie strips on their land, and an additional 39 percent indicated that they might be interested.

## Precision agriculture

Precision agriculture has been defined by the [National Research Council](#) and the [USDA Economic Research Service](#) as “a suite of technologies that may reduce input costs by providing the farm operator with detailed spatial information that can be used to optimize field management practices.” The 2018 Farm Poll survey contained several question sets that explored current use of selected precision agriculture technologies and perceived benefits and challenges related to such technologies. The question sets were developed in collaboration with researchers at

[Idaho State University](#), [Penn State University](#), and [South Dakota State University](#). A short description of precision agriculture preceded the question sets:

According to the USDA, precision agriculture, also known as “site-specific crop management,” is an information- and technology-based agricultural management system used to identify, analyze, and manage variability within fields for optimum profitability, sustainability, and environmental protection. Examples of precision technologies include tractor guidance systems, yield or soil mapping, drones, or variable rate input applicators.

Results are provided only for farmers who reported corn, soybean, or other crop production (n=858) because the precision agriculture technologies listed in the survey are most relevant for crop production.

### *Technologies and services used*

The first question set sought to ascertain which of several common types of technologies or services farmers used in the previous growing season. As with the conservation practice questions above, the survey provided three response categories: not used in 2017, no plans to use it; not used in 2017, might use it in the future; and I used it in 2017. The list of technologies was preceded by the text, “on the land that you farmed in 2017, were any of the following precision farming technologies or services used?”

The most commonly used technology was GPS yield monitors and/or maps, with 56 percent

**Table 16. Awareness of and interest in the prairie strips practice**

	Yes	Maybe	No
Before reading the description above, had you ever heard of the prairie strips conservation practice?	56%	8%	36%
Would you be interested in learning more about the prairie strips conservation practice?	22%	36%	42%
Would you be interested in planting prairie strips on your farmland?	15%	39%	46%

of respondents reporting use, followed closely by GPS soil maps (55 percent), variable rate equipment (49 percent), and GPS guidance systems (48 percent) (table 17). Less commonly used technologies were crop management online decision tools (25 percent), satellite imagery (22 percent) and drones or aircraft-based imagery (12 percent).

Many precision agriculture technologies are offered by service providers such as agricultural retailers and cooperatives. The survey asked respondents to indicate if they had contracted with a service provider for any of the technologies that they reported using. Forty-eight percent of farmers responded that they had contracted with service providers for at least one of the technologies employed in their farm operation in 2017.

### Potential benefits

The next set of questions focused on perceptions of potential benefits of the same technologies. A brief introductory text preceded 12 statements: “considering the technologies or services above that you believe are most important to your operation (or, if you don’t use any, could be important), please rate your agreement or disagreement with the following statements. *Using that technology or service can...*” Respondents were asked to indicate their agreement or disagreement with each statement on a 4-point scale (table 18).

All of the statements garnered at least 70 percent agreement, indicating that respondents generally perceived the technologies that they used (or might use) to be beneficial. The top item, with 95 percent agreement, was improvement in input application efficiency (table 18). Tied for second were increasing yields of individual crops and improving confidence in management decisions (both 90 percent agreement), followed closely by increasing whole-farm profitability (88 percent) and confirming effectiveness of past management decisions (87 percent).

Several items focused on different types of subfield management that precision technologies might facilitate. The items “identify subfield areas needing nutrient loss management” and “identify subfield areas needing soil health management” received 88 and 87 percent agreement, respectively (table 18). These were followed closely by “increase overall profitability by identifying and improving management of unprofitable subfield areas” (86 percent agreement) and “identify subfield areas needing soil erosion management” (84 percent agreement). Considered together, these results suggest that farmers see much potential benefit in subfield management using precision technologies.

The remaining three items focused on whether the precision technologies that they used

**Table 17. Precision technologies used**

	I used it in 2017	Not used in 2017; might use it in the future	Not used in 2017; no plans to use it
GPS yield monitors and/or maps	56%	14%	29%
GPS soil maps	55%	20%	25%
Variable rate equipment (sprayers, fertilizer applicators, planters, etc.)	49%	24%	27%
GPS guidance systems (steering assistance, auto steer, etc.)	48%	15%	37%
Data pertinent to crop management from online decision tools	25%	38%	38%
Satellite imagery	22%	37%	41%
Drones or aircraft-based imagery	12%	38%	50%

or might use could help them to optimize cropping systems and land use. Increasing profitability by optimizing crop types and rotation received 85 percent agreement (table 18). Seventy-three percent agreed that the technologies could help “identify opportunities to change field layouts to improve overall economic performance” and 71 percent agreed that they might be used to “identify areas that could be shifted from row crops to perennial crops or conservation plantings.” While these items had high agreement, levels of strong agreement were generally lower and levels of disagreement were higher than other items in this set.

### Potential concerns

The next question set examined potential downsides of precision agriculture technologies. This set was preceded by the phrase, “the following are potential challenges and/or concerns related to use of precision

farming technologies,” and respondents were asked to rate their agreement or disagreement with the items on a 4-point scale.

There was greater variability in responses to the challenges/concerns items than the potential benefits question set, with agreement levels ranging from 91 percent to 37 percent (table 19). The highest level of agreement was for the item, “the cost of new precision farming hardware is too high.” A second cost-related item, “the cost of maintaining precision farming hardware is too high,” received 76 percent agreement, and 55 percent agreed that the cost of precision agriculture exceeds the benefits of using it. Just 37 percent agreed with the item, “precision farming technologies are only beneficial for big farms.”

Four items focused on use (and potential misuse) of data. Eighty-one percent of respondents agreed that possible use of data from precision agriculture technologies for

**Table 18. Potential benefits of precision agriculture technologies**

	Strongly Disagree	Disagree	Agree	Strongly Agree
increase efficiency of input application	2%	4%	64%	31%
increase yield for individual crops	2%	8%	68%	22%
improve confidence in management decisions	2%	8%	67%	23%
increase profitability of the farm operation as a whole	2%	10%	61%	27%
confirm the effectiveness of prior management decisions	2%	10%	68%	19%
identify subfield areas needing nutrient loss management	2%	11%	66%	22%
identify subfield areas needing soil health management	2%	12%	66%	21%
increase overall profitability by identifying and improving management of unprofitable subfield areas	2%	12%	64%	22%
identify subfield areas needing soil erosion management	2%	15%	64%	20%
increase profitability by optimizing crop types and rotation	2%	13%	63%	21%
identify opportunities to change field layouts (share and size of fields) to improve overall economic performance	3%	24%	59%	14%
identify areas that could be shifted from row crops to perennial crops or conservation plantings	4%	26%	58%	12%

regulatory purposes was a concern, while 71 percent agreed that they were concerned that corporations could use farmers' planting and harvest data to manipulate markets (table 19). Similarly, 62 percent were concerned that corporations could use data for their benefit rather than the benefit of farmers. More than three-quarters (77 percent) indicated that they were not sure if they were using their data as effectively as they might.

Three items examined farmers' capacity to learn and use technologies effectively. Fifty-five percent agreed that precision technologies are difficult to learn, and 39 percent agreed that they take too much time to learn (table 19). One statement focused on the potential difficulty of keeping up with rapidly changing technologies: "keeping up with precision

technologies is like a never-ending treadmill" was the second-highest rated item overall, with 89 percent agreement.

### ***Innovation orientation***

A final question in this section asked farmers to rate their propensity to adopt new technologies in agriculture relative to other farmers. The survey provided four categories analogous to the "innovator," "early adopter," "early majority," and "late majority" categories of adopters from the [diffusion of innovations](#) tradition and asked farmers, "Regarding new agriculture technologies and practices, which of the following categories best describes you?" Only three percent of farmers selected the category, "I am usually one of the first among my peers to try new technology," indicating that very few farmers perceive themselves as

**Table 19. Potential concerns about precision agriculture technologies**

	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Agree</b>	<b>Strongly Agree</b>
<b>Cost</b>				
The cost of new precision farming hardware is too high	1%	8%	61%	30%
The cost of maintaining precision farming hardware is too high	1%	23%	59%	17%
The cost of precision farming services exceeds benefits	3%	42%	44%	11%
Precision farming technologies are only beneficial for big farms	7%	56%	26%	12%
<b>Data</b>				
Data from precision technologies could be used for regulatory purposes	3%	16%	64%	17%
I am concerned that corporations could use farmers' planting and harvest data to manipulate markets	3%	26%	52%	19%
I am concerned that corporations will use data for their benefit and not farmers'	4%	34%	44%	18%
I'm not sure I am using the data I collect as effectively as possible	2%	21%	66%	12%
<b>Knowledge and capacity</b>				
Keeping up with precision technologies is like a never-ending treadmill	1%	11%	64%	24%
Precision farming technologies are difficult to learn	3%	41%	50%	5%
Precision farming technologies take too much time to learn	4%	58%	35%	4%

innovators (table 20). Twenty-seven percent selected “I may not be among the first, but I tend to try new technology before most of my peers” and 41 percent selected “I tend to try new technology once I have seen a number

of my peers use it successfully.” Finally, 29 percent indicated that they tend to try new technology only after most other farmers have used it successfully.

**Table 20. Innovation orientation**

I am usually one of the first among my peers to try new technology	3%
I may not be among the first, but I tend to try new technology before most of my peers	27%
I tend to try new technology once I have seen a number of my peers use it successfully	41%
I generally only try new technology after most of my peers have used it successfully	29%

## Endnotes

<sup>1</sup> The Farmland Ownership and Tenure in Iowa survey is one of the few research efforts that focuses on rented land. The 2017 report can be found at: <https://store.extension.iastate.edu/product/6492>

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