

2017 PRECISION AGRICULTURE DEALERSHIP SURVEY

Bruce Erickson, Jess Lowenberg-DeBoer, and Jeff Bradford

December 2017

Departments of Agricultural Economics and Agronomy, Purdue University

SPONSORED BY
CROPLIFE MAGAZINE
AND PURDUE
UNIVERSITY

CONTENTS

LIST OF FIGURES AND REFERENCE TO SURVEY QUESTION	2
ABOUT THE SURVEY.....	3
CUSTOM APPLICATION	6
DEALER USE OF PRECISION TECHNOLOGIES.....	7
DEALER OFFERINGS OF SITE SPECIFIC SERVICES.....	10
SOIL SAMPLING PROCEDURES.....	12
ANALYSIS OF DATA.....	14
PROFITABILITY OF PRECISION SERVICE OFFERINGS.....	16
PRODUCER’S USE OF PRECISION TECHNOLOGIES	17
FUTURE INVESTMENT PLANS.....	20
BARRIERS TO GROWTH AND EXPANSION.....	21
SUMMARY	23
SURVEY INSTRUMENT.....	24

Corresponding author Bruce Erickson, Department of Agronomy, Purdue University, 915 W. State St., West Lafayette, Indiana 47907. email: berickso@purdue.edu

Bruce Erickson is Agronomy Education Distance & Outreach Director at Purdue University. Jess Lowenberg-DeBoer is Elizabeth Creak Professor of Agri-Tech Applied Economics at Harper Adams University, Newport, United Kingdom. Jeff Bradford is Graduate Research Assistant, Purdue University.

IRB (Institutional Review Board) Approval: 1702018754

It is the policy of Purdue University that all persons have equal opportunity and access to its educational programs, services, activities, and facilities without regard to race, religion, color, sex, age, national origin or ancestry, marital status, sexual orientation, disability or status as a veteran. Purdue University is an Affirmative Action institute.

Copyright ©2017 by Bruce Erickson. All rights reserved. Copies of this document for non-commercial purposes may be made by any means, provided this copyright notice appears on all such copies. Attribution for graphics or statistic from this report should cite the 2017 CropLife Purdue University Precision Dealer Survey.

LIST OF FIGURES AND REFERENCE TO SURVEY QUESTION

Figure 1. Q20: Respondent location by state.....	3
Figure 2. Q1: Organizational type represented by respondents.....	4
Figure 3. Q5: Number of retail outlets owned or managed.	4
Figure 4. Q4: Annual retail sales of agronomy products and services for the respondent’s location.	5
Figure 5. Q3: Responsibility of survey respondent.....	5
Figure 6. Q8: Acres custom applied at dealer’s retail location.	6
Figure 7. Q9 and Q10: Percentage of fertilizer and pesticide sales custom applied.....	6
Figure 8. Q13: Retailer use of precision technology for their business.....	7
Figure 9. Q13: Use of precision technology over time by retailers, automated technologies.	8
Figure 10. Q13: Use of precision technology over time by retailers, sensing technologies.	9
Figure 11. Q14: Dealer offerings of precision services.....	10
Figure 12. Q14: Dealer offering of precision services over time, sensing technologies. 2020 are projections. .	11
Figure 13. Q14: Dealer offerings of precision services over time, variable rate technologies.	12
Figure 15. Q12: Factors used by retailers to determine management zones for precision soil sampling.	13
Figure 16. Q12: Grid sizes used by retailers for precision soil sampling.	13
Figure 14. Q12: Types of soil sampling services offered by retailers.	13
Figure 17. Q16: Ways dealers manage farm-level data to assist customers in decision-making.....	14
Figure 18. Q16: Managing farm-level data to assist customers in decision making over time.	15
Figure 19. Q18: Management decisions influenced from pooled data.	15
Figure 20. Q15: Profitability of precision service offerings for retailers.....	16
Figure 21. Q15: Profitability of precision services over time for retailers.....	17
Figure 22. Q21: Producer use of precision technologies, retailers estimate of their market area.....	18
Figure 23. Q21: Farmer use of precision technologies, estimated by retailers. 2020 numbers are projections.	19
Figure 24. Q21: Farmer use of variable rate precision technologies, estimated by retailers. 2020 numbers are projections.	19
Figure 25. Q7: Expected investment in precision technology by retailers.	20
Figure 26. Q22: Customer issues that create barriers to expansion and growth in precision agriculture.	21
Figure 27. Q22: Dealer and technology issues that create a barrier to expansion and growth in precision agriculture.....	22
Figure 28. Q22: Dealer and technology issues that create a barrier to expansion and growth in precision agriculture.....	22

ABOUT THE SURVEY

In February 2017 CropLife magazine and the Departments of Agricultural Economics and Agronomy at Purdue University conducted the 18th survey of crop input dealers about precision agriculture technologies. As with previous surveys, dealerships were asked questions about how they use precision agriculture within their business, what precision products and services they offer to their customers, customer adoption of precision farming, and questions aimed at understanding practices such as constraints to adoption and profitability. In addition, to better understand farmers and retailers use of data, additional questions were added about these practices. This survey is the most complete, longest-running, and continuous survey of precision farming practices in the United States.

The questionnaire was deployed using two modes of contact: A paper copy was mailed to a subset of CropLife magazine's subscription list, and a link to the identical set of questions was sent via email from a subset of CropLife's email list. The paper version survey instrument is at the end of this paper. A total of 209 questionnaires were completed, a response rate of 8%. Response by state is shown in Figure 1.

Figure 1. Q20: Respondent location by state.

State	% of Respondents	State	% of Respondents
Illinois	16%	Pennsylvania	2%
Iowa	12%	South Dakota	2%
Indiana	9%	California	1%
Wisconsin	7%	Idaho	1%
Ohio	6%	Kentucky	1%
Missouri	6%	North Carolina	1%
Nebraska	6%	Texas	1%
Kansas	5%	Alabama	1%
Minnesota	5%	Arkansas	1%
North Dakota	4%	Colorado	1%
Michigan	3%	Georgia	1%
Washington	3%	Oregon	1%
New York	2%	South Carolina	1%
Tennessee	2%	Wyoming	1%
Montana	2%		

Respondents were asked several questions about the organization they represent. Eighty-nine percent of respondents were agricultural retail input suppliers, 5% consultants, 4% farm equipment dealers, and 2% other. Of the ag retailers 47% indicated they represent a cooperative, 37% an independent dealership and 16% are part of a national or regional dealership (not a cooperative), Figure 2.

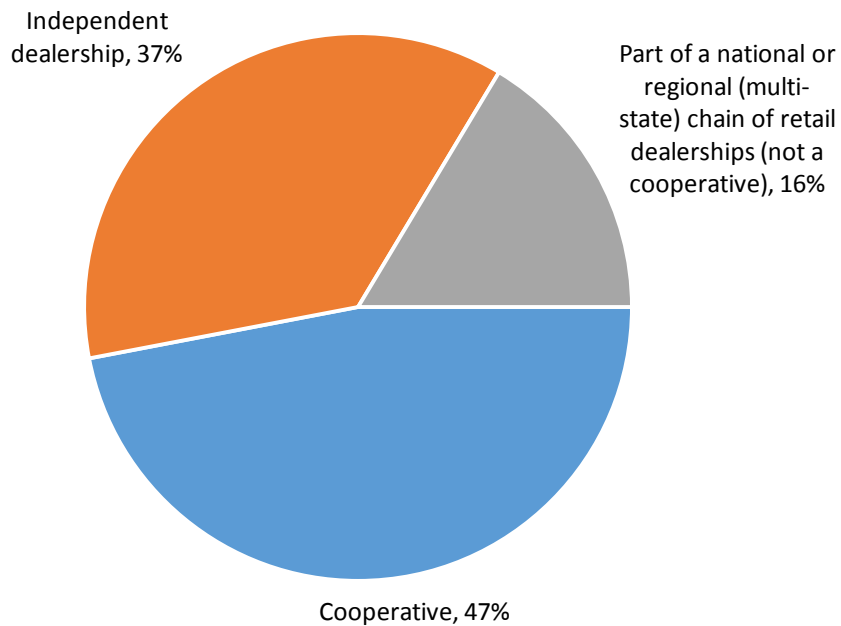


Figure 2. Q1: Organizational type represented by respondents.

The organizations the respondents represent are primarily multiple-retail locations, Figure 3. Three percent of the respondents did not own or manage a retail outlet. Thirty-two percent of respondents reported having only one retail outlet, up 8% compared to 2015. The number of respondents that owned or managed five stores or less was 60%, up 13% over 2015. The number of respondents that owned or managed six or more stores is 45%, down 6% compared to 2015.

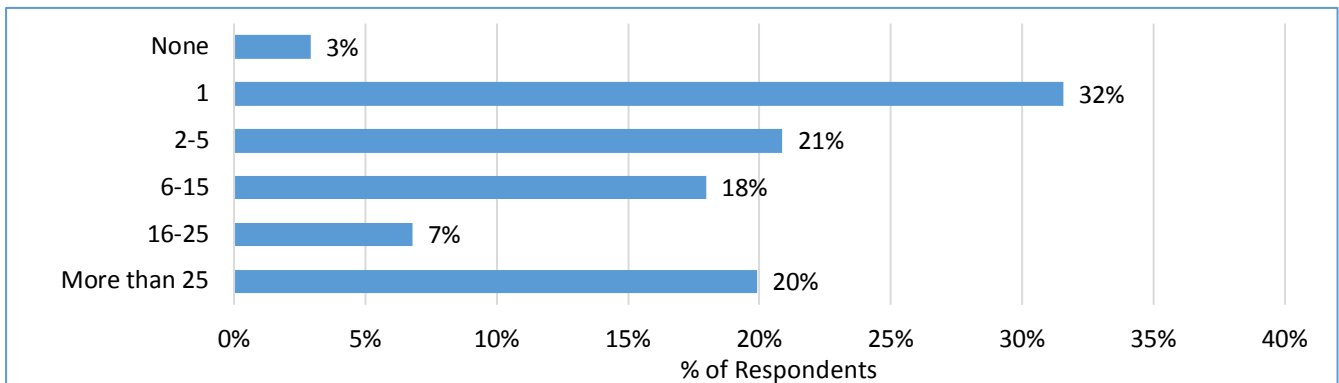


Figure 3. Q5: Number of retail outlets owned or managed.

Another metric for understanding the surveyed organizations is the total annual retail sales of agronomy products (fertilizer, chemicals, seed) and services at the respondent's location in 2016, Figure 4. The \$1 million to \$5 million group and the more than \$20 million group had the most respondents with 28% each. The survey question categories changed in 2017 to help better define those respondents with greater than \$7 million in

annual agronomy sales. In 2015, 50% of respondents had annual agronomy sales equal to or greater than \$7 million.

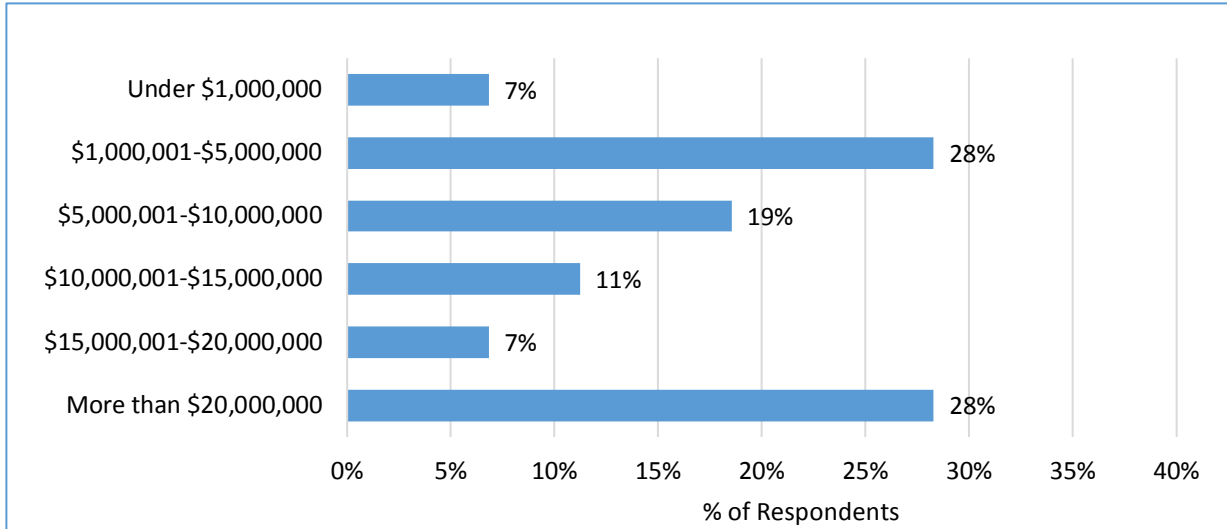


Figure 4. Q4: Annual retail sales of agronomy products and services for the respondent's location.

The survey asked about the position the respondent held within their organization. Forty-five percent reported being the owner or location manager, and 19% percent reported being a technical consultant or precision agriculture manager. Other common job responsibilities for respondents were sales and sales management (19%) and department manager (11%). Overall the respondents of the survey are those that lead and manage the organization, or work directly with customers (Figure 5).

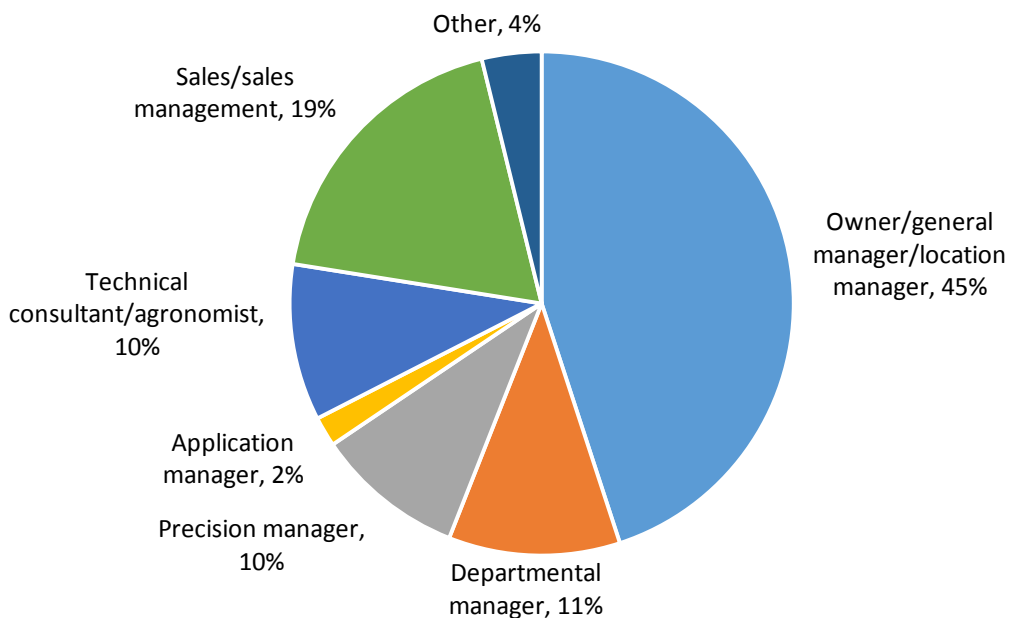


Figure 5. Q3: Responsibility of survey respondent.

CUSTOM APPLICATION

Custom applications of pesticides, fertilizers, and seeds for their farmer customers is an important business aspect for many ag retailers. Figure 6 shows the acres of custom application the retailers apply at their location. Multiple applications made on the same field do not count as additional acres.

The largest segment, one quarter of the responses, were those applying more than 100,000 acres annually. Retailers applying more than 50,000 acres annually account for more than half the respondents. The percent of respondents applying over 50,000 acres is down 6% from the 2015 survey.

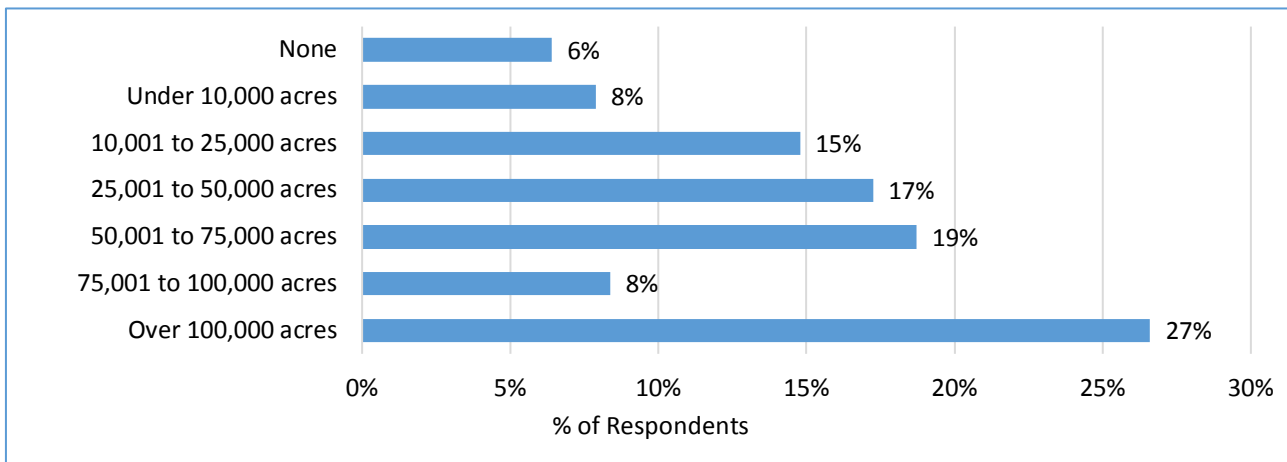


Figure 6. Q8: Acres custom applied at dealer's retail location.

Digging deeper into how custom application and input sales work hand-in-hand, respondents reported the share of fertilizer and pesticide sales that were custom applied (Figure 7), as compared to selling to farmers for them to apply. On average, respondents reported custom applying 63% of fertilizer sales and 55% of pesticide sales for customers. Retailers that do more custom application tend to do relatively more with fertilizers as opposed to pesticides. Retailers that do less custom application apply more pesticides.

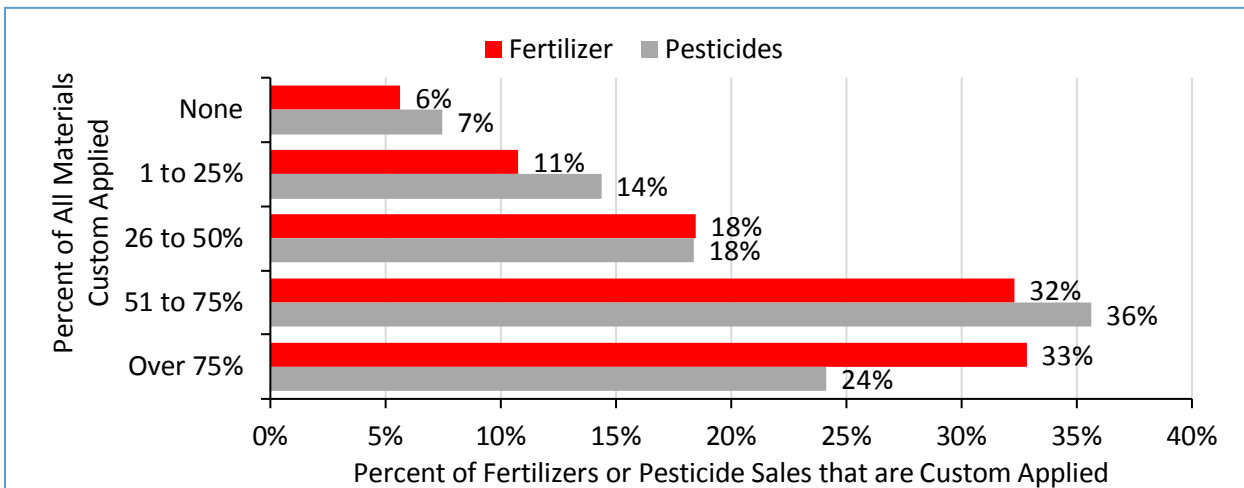


Figure 7. Q9 and Q10: Percentage of fertilizer and pesticide sales custom applied.

Respondents also indicated what percentage of their custom application acres used certain technologies. Sixty-nine percent of the respondent’s applications used GPS auto guidance while 35% used GPS with manual control. The trend has been an increase in recent years of respondents using more auto guidance technologies and less manual guidance. Fifty-nine percent of application acres used auto sprayer boom section or nozzle control and 31% of acres used variable prescription maps to control the application.

DEALER USE OF PRECISION TECHNOLOGIES

Dealers get utility from the precision technologies they use for their own business purposes, such as guidance on their applicators, as well as the precision products and services they offer to customers detailed in the next section. Eighty-one percent of dealers were offering some type of precision agronomic service for their customers.

Figure 8. Q13: Retailer use of precision technology for their business.

Precision Ag Technology	2017
Precision agronomic services for customers (such as soil sampling with GPS, GIS field mapping, etc.)	81%
GPS guidance systems with automatic control (autosteer) for fertilizer/chemical application	78%
Auto sprayer boom section or nozzle control	73%
GPS guidance systems with manual control (light bar) for fertilizer/chemical application	55%
Satellite/aerial imagery for internal dealership purposes	52%
Smart scouting using an app on a mobile device to record field situations and locations	44%
Field mapping with GIS to document work for billing/insurance/legal purposes	43%
UAV or drone for internal dealership purposes	34%
GPS to manage vehicle logistics, tracking locations of vehicles, and guiding vehicles to the next site	34%
Telematics to exchange information among applicators or to/from office locations	24%
Soil electrical conductivity (EC) mapping	22%
Sprayer turn compensation	22%
Y drops on fertilizer applicators	19%
Other soil sensors for mapping, mounted on a pickup, applicator or tractor (example: pH sensor)	9%
Chlorophyll/greenness sensors mounted on a pickup, applicator or tractor (CropSpec, GreenSeeker, OptRx, etc.)	9%
Do not use precision technology	5%

The two technologies that stand out as the most widely utilized by dealers are GPS guidance systems with automatic control (autosteer) for fertilizer/chemical application, at 78% adoption, and auto sprayer boom section or nozzle control at 73% (Figure 8). These numbers represent the percent of dealerships utilizing the technology in some form, which they may use on some or all of their equipment and on some or all of the acres they service. About half of dealers are using remote sensing from aerial/satellite imagery to assist with

their delivery of products and services, 44% are using an app on a mobile device to assist in field scouting and about one third are utilizing UAV or drone technology to assist with their business. Twenty-two percent of dealers are using soil electrical conductivity mapping, but less than 10% of dealers are using other on-the-go sensors such as for soil pH or leaf greenness.

Retailer’s use of precision ag technology over time is reported in Figure 9 with automated technologies and Figure 10 with sensing technologies. Note that the survey went from every year to every other year in 2011. For automated technologies, all were down compared to 2015. This has been the area of precision farming experiencing the most growth in recent years—a weak farm economy and other financial pressures on retailers could explain part of this. The downward trend for GPS guidance with manual control (lightbar) continues. Peaking at 79 percent in 2009, the current survey has usage rates down to 55 percent in 2017. The decline is because it is being replaced with autoguidance technology. Note that the guidance numbers prior to 2004 do not distinguish manual and autoguidance, as the survey question then just asked about guidance in general because autoguidance was not widely available commercially.

Telemetry showed the greatest decline from the 2015 survey to the 2017 survey. The decrease in adoption of telematics may be related to poor signal strength, the amount of time needed to transfer the data, lack of

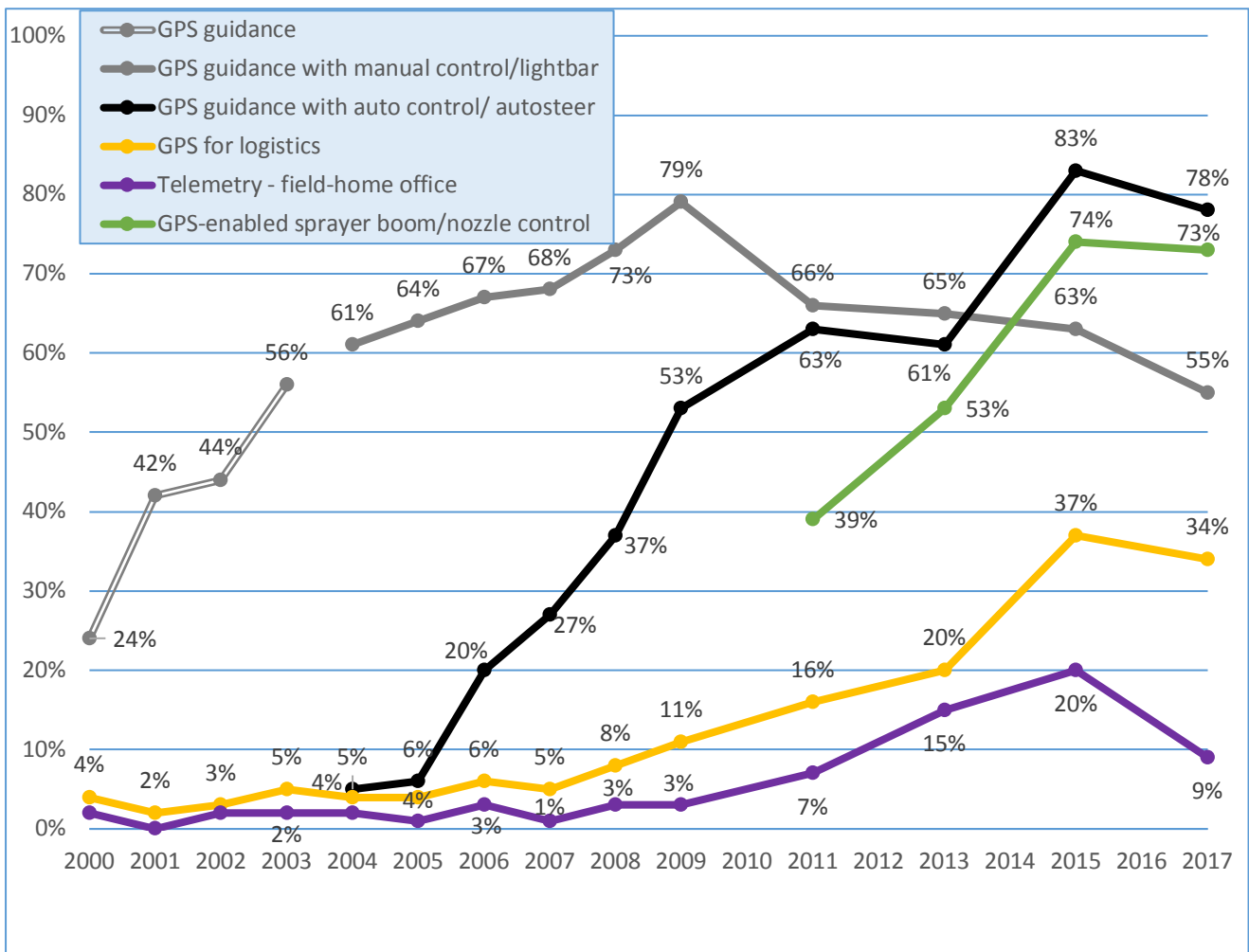


Figure 9. Q13: Use of precision technology over time by retailers, automated technologies.

connectivity with hardware and software packages, and/or the hardware or software is not easy to use. Data signal strength in some rural areas is poor and retailers are stretching further from their home bases which can lead to long data download times. Some programs have telemetry built in to their platform, others require data to be exported and migrated from platform to platform. The data migration can be problematic when dealing with converting data in to the proper files extensions for the various platforms that are available.

For sensing technologies (Fig. 10), all are up compared to 2015, especially UAVs and soil electrical conductivity (EC) mapping.

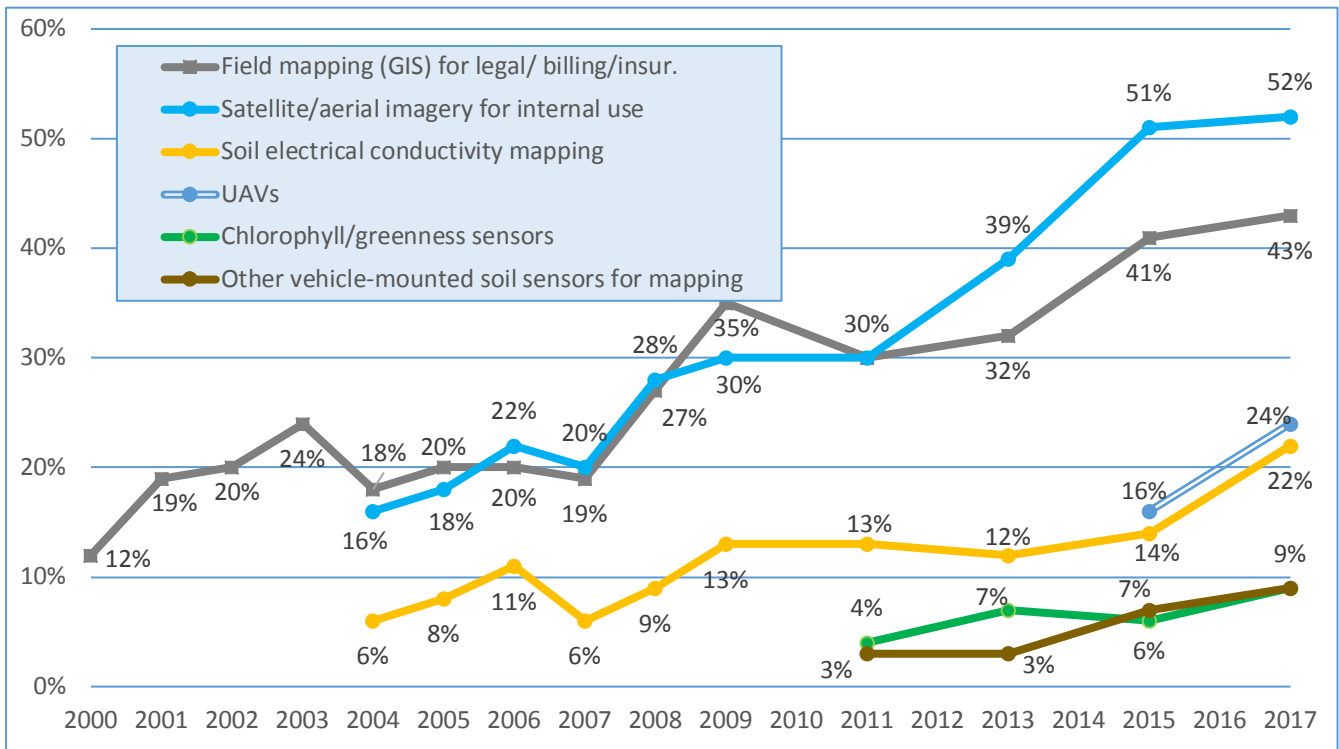


Figure 10. Q13: Use of precision technology over time by retailers, sensing technologies.

DEALER OFFERINGS OF SITE SPECIFIC SERVICES

Another element of precision technology for dealers is in the services they offer to their farmer customers. Respondents were asked to report their current offerings of precision services and what they plan to offer three years from now, in 2020 (Figure 11).

Site-specific services that dealers now offer most include field mapping, and technologies related to precision fertilizers and soil amendments-- grid or zone soil sampling, VRT fertilizer or lime prescriptions, and VRT fertilizer applications. Over the next 3 years, the areas that respondents are planning the most growth are in VRT pesticide application (24% of respondents will add), UAV/drone imagery (27%), chlorophyll/greenness sensors for N management (18%), and profit/cost mapping (22%). The areas of VRT seeding prescriptions (10%), yield monitor and other data analysis (10%), satellite/aerial imagery (12%), and soil EC mapping (10%) are the next most popular areas for growth. All other services are poised to grow 3 to 6% over the next three years. In many past surveys, dealers have optimistically overestimated their precision offerings compared to the actual numbers the survey showed in years following.

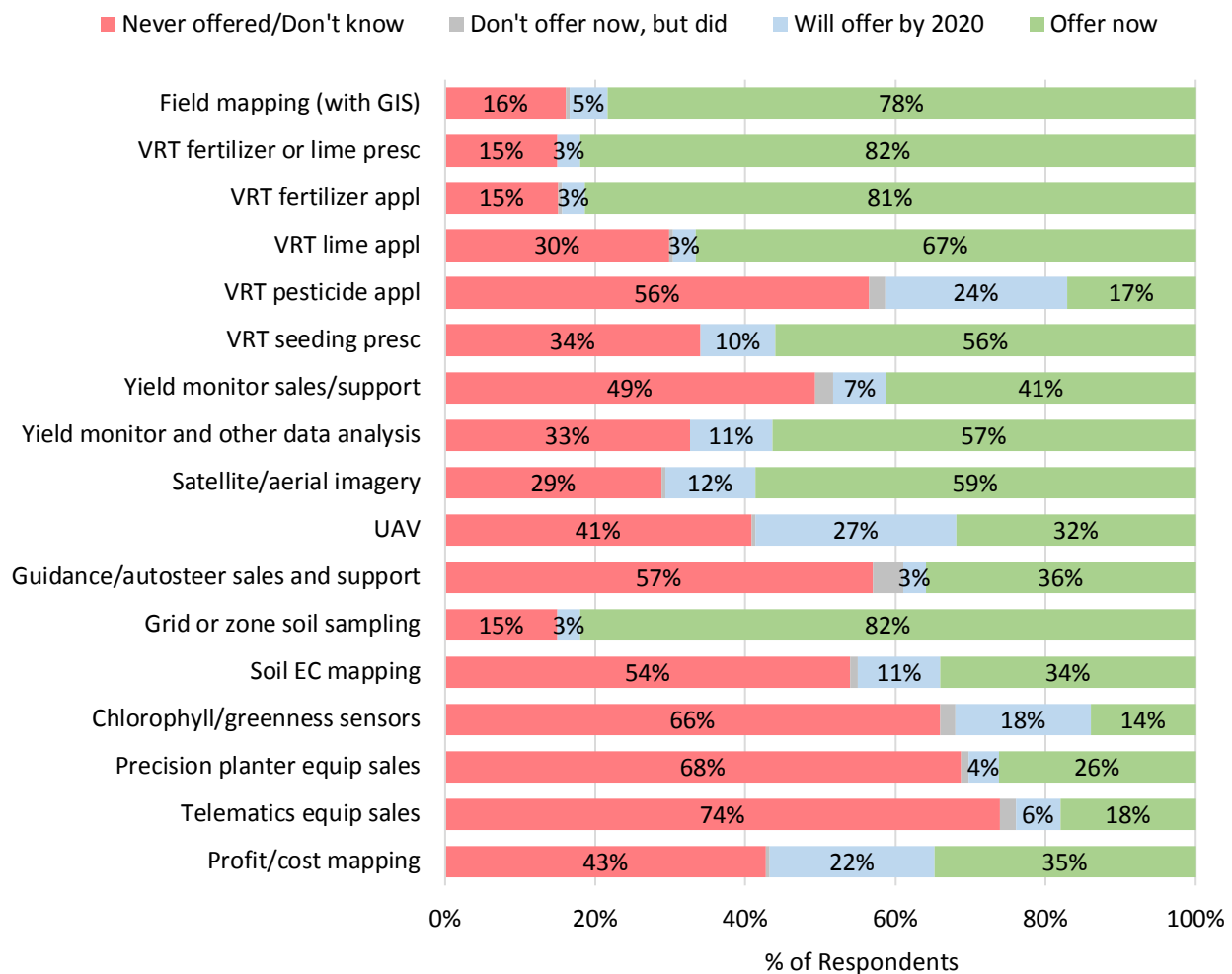


Figure 11. Q14: Dealer offerings of precision services

Figure 12 shows the adoption of service and sensor precision ag services over time. All of these technologies showed growth from 2015 to 2017, and all but two areas had double digit growth. Field mapping with GIS increased 21% from 2015 to 2017 to lead all categories. Yield monitor and other data analysis had the lowest growth at 6% from 2015 to 2017.

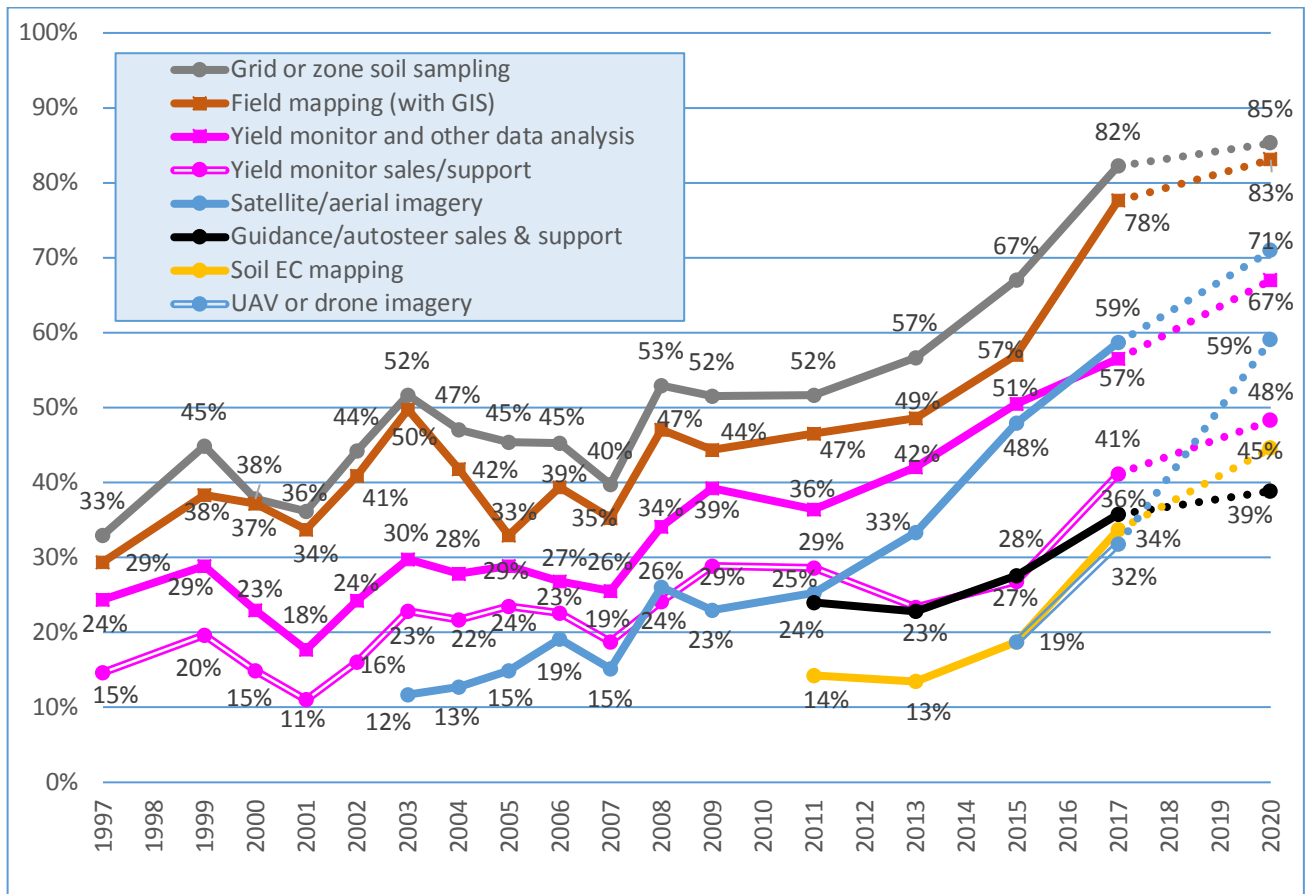


Figure 12. Q14: Dealer offering of precision services over time, sensing technologies. 2020 are projections.

Figure 13 shows the adoption of variable rate technology (VRT) services offered over time. All these site-specific services showed growth except VRT pesticide application which had a 10% decrease from 2015 to 2017. It can be a challenge to quantify the changing mix of various insect, disease, and weed populations across fields needed to craft a variable rate prescription. The growth leader in site-specific services was VRT fertilizer applications with a 12% increase. The 2017 survey question no longer separates VRT single fertilizer applications from multiple product applications. Also note that small changes in adoption may reflect the inherent variability and error present in any survey, as it is a different pool of respondents each time.

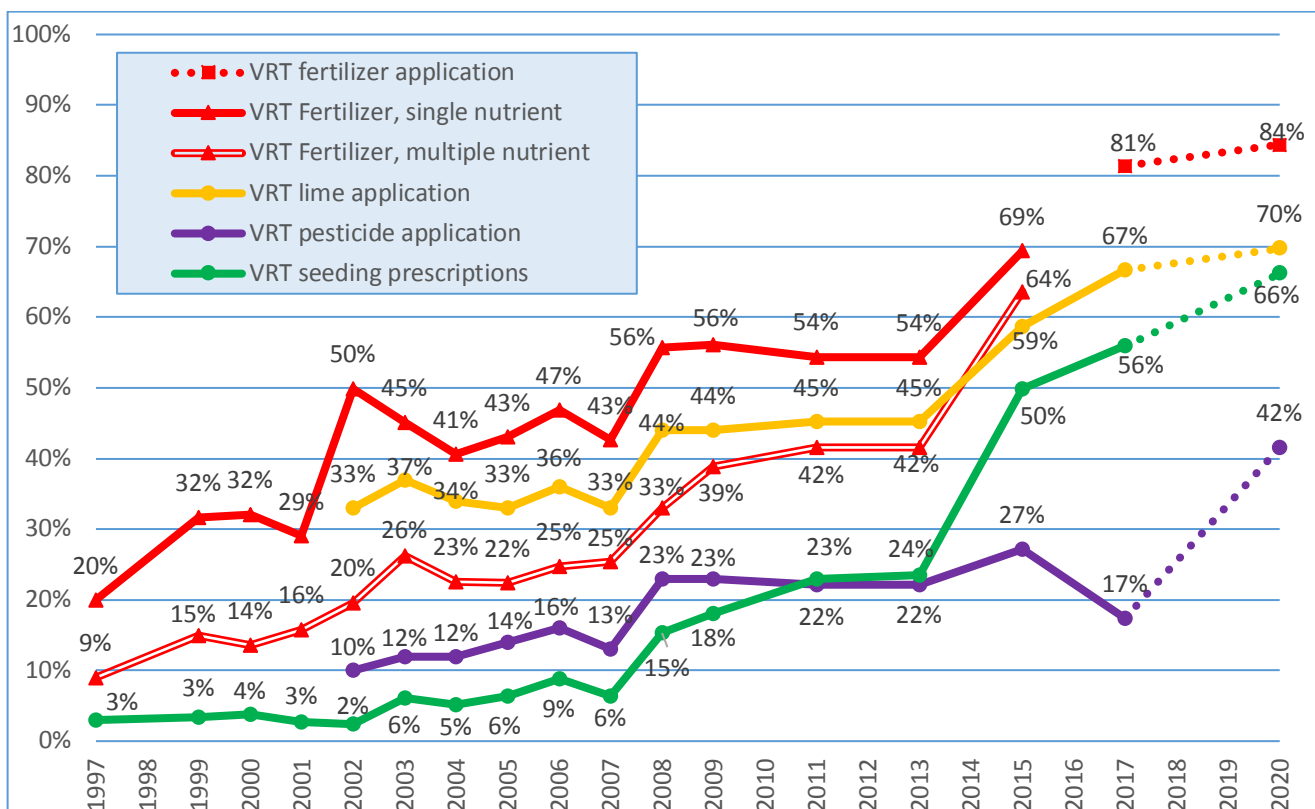


Figure 13. Q14: Dealer offerings of precision services over time, variable rate technologies.

SOIL SAMPLING PROCEDURES

An important role of many agricultural dealers, especially of agronomic products and services, is helping producers manage soil nutrients. Most of the time this starts with soil sampling, a service offered by 82% of dealers. The exact location of the soil sample is easily determined using GPS. The location information combined with a fertilizer recommendation from a lab informs the rates used for variable rate application technology.

Respondents were asked about the soil sampling procedures they used—multiple responses were allowed for multiple procedures. Sixty-seven percent of dealers offer grid soil sampling, 54% offer traditional or whole field sampling, and 47% offer sampling using management zones (Figure 14). For dealers who offer management zones more are using soil mapping units or yield maps to delineate the zones, and fewer are using soil electrical conductivity (Figure 15). For dealers who grid sample, 2.5 acres (1 hectare) is the most common grid size (Figure 16). Grids larger than 2.5 acres are more common than smaller grids. The appropriate grid size is a compromise of the labor/time and equipment needed for sampling and soil testing costs vs. the specificity desired to inform variable rates.

The overall trend of less respondents supplying soil sampling services, when comparing 2017 to 2015, may be due to the fact lower grain prices are causing farmers to economize on production inputs and services. Some farmers seem to be reducing sampling to cut costs. This may explain the shift in the grid sizes toward larger grids sampled shown in Figure 16.

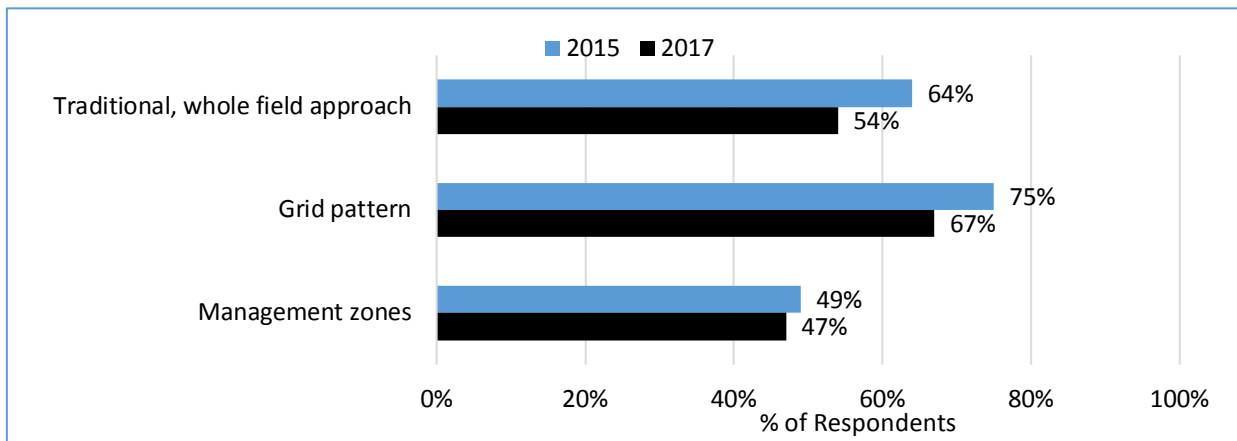


Figure 16. Q12: Types of soil sampling services offered by retailers.

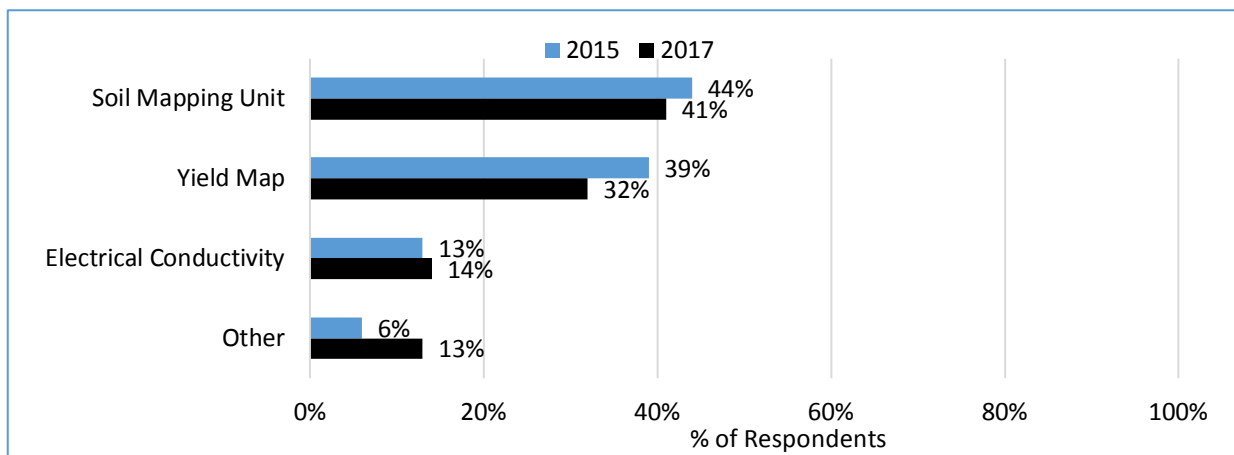


Figure 14. Q12: Factors used by retailers to determine management zones for precision soil sampling.

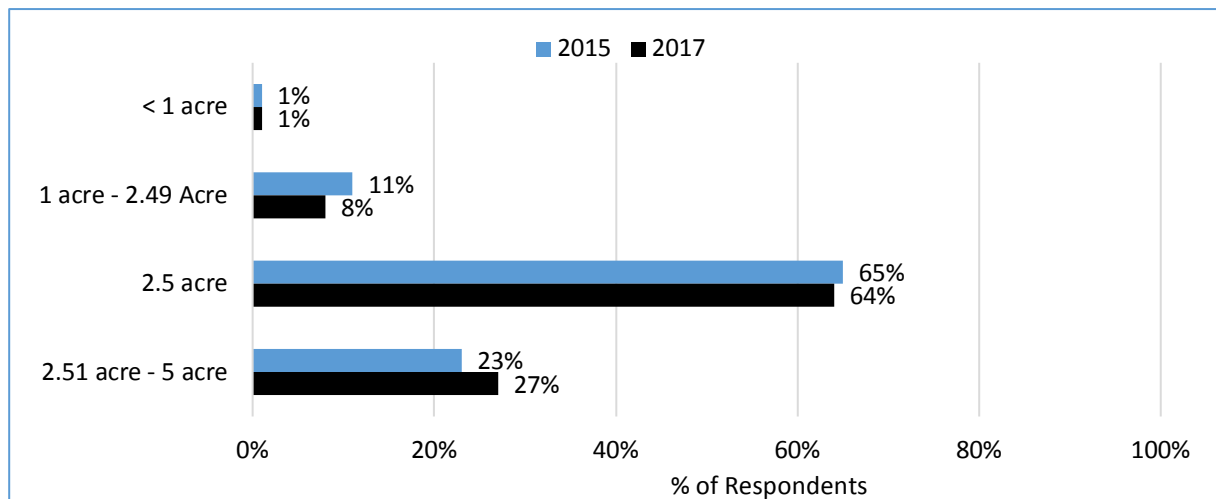


Figure 15. Q12: Grid sizes used by retailers for precision soil sampling.

ANALYSIS OF DATA

Precision agriculture can provide an overwhelming amount of data from yield monitors, soil sampling, machine operations, and inputs applied to various portions of fields, to name a few. Often producers need assistance in analyzing these data for meaningful insights. Figure 17 reports how dealers help customers manage farm-level data in decision-making.

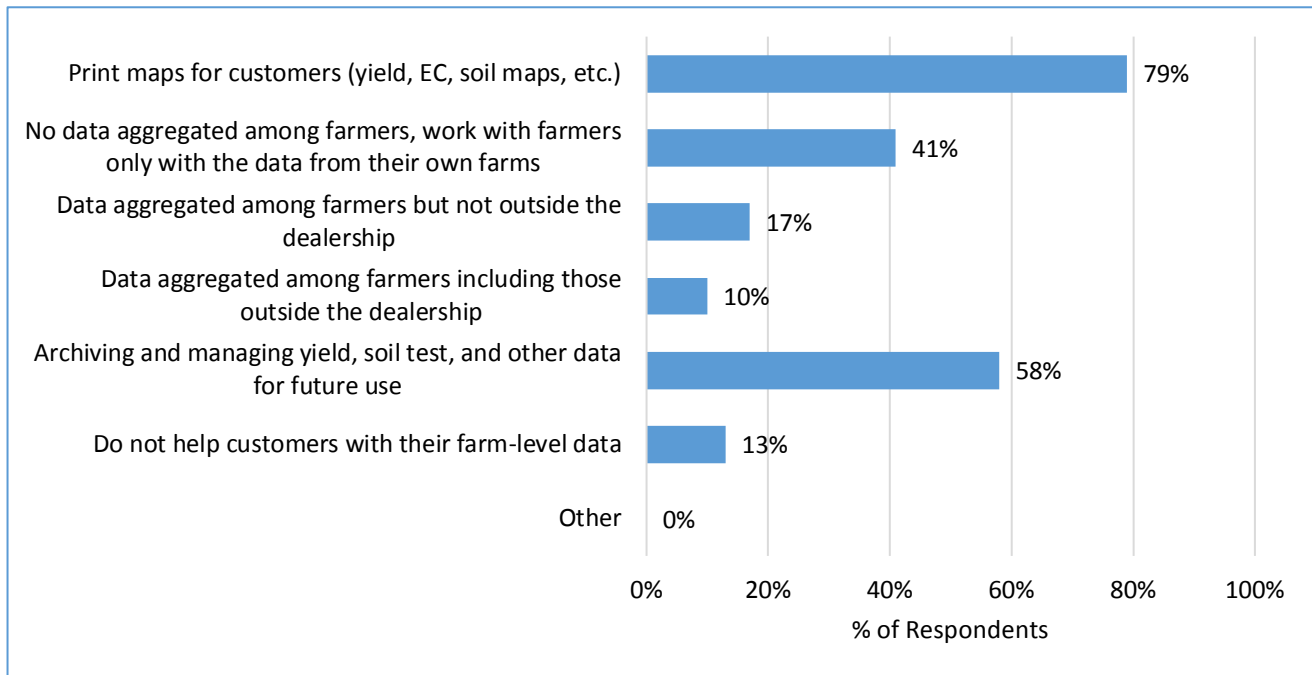


Figure 17. Q16: Ways dealers manage farm-level data to assist customers in decision-making.

The most common way dealers report helping customers was printing maps, such as yield, soil electrical conductivity, and soil maps. Beyond printing maps, 58% of dealers are archiving and managing yield, soil test, and other data for future use. Forty-one percent of respondents work with farmers individually.

In addition to the farmer's individual data, 17% of the respondents reported working with farmers by using data aggregated among farmers within the dealership. Ten percent reported using data aggregated among farmers including those outside the dealership. Thirteen percent of the respondents do not help farmers with their farm-level data. Forty-five percent of dealers have a customer data privacy statement and/or data terms & conditions agreement.

Figure 18 shows how respondents are helping customers with their data and making decisions over time. Respondents helping customers by printing maps was trending up until this last survey. All other ways respondents are helping customers have had very little change in the last four surveys.

Figure 19 shows the types of decisions where pooled customer data is used for decision-making, reported by dealers as a major influence, some, or no influence. Dealers report fertilizer and liming decisions are most influenced.

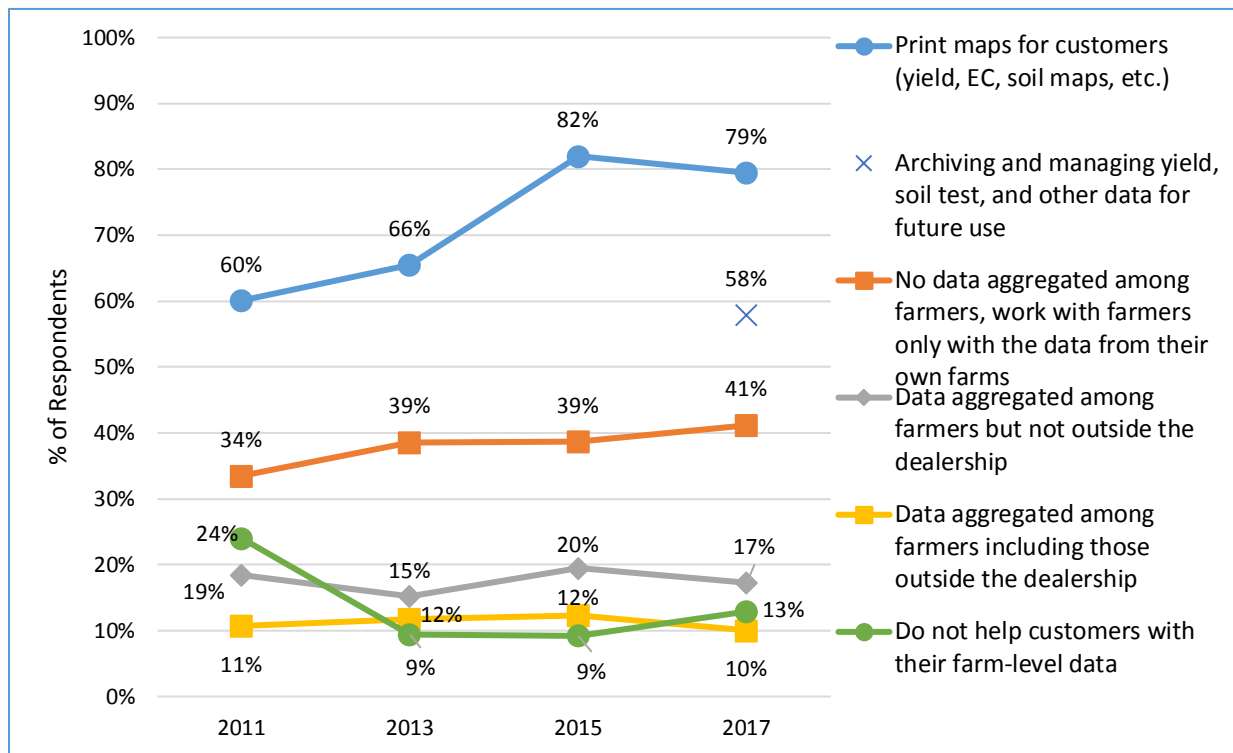


Figure 18. Q16: Managing farm-level data to assist customers in decision making over time.

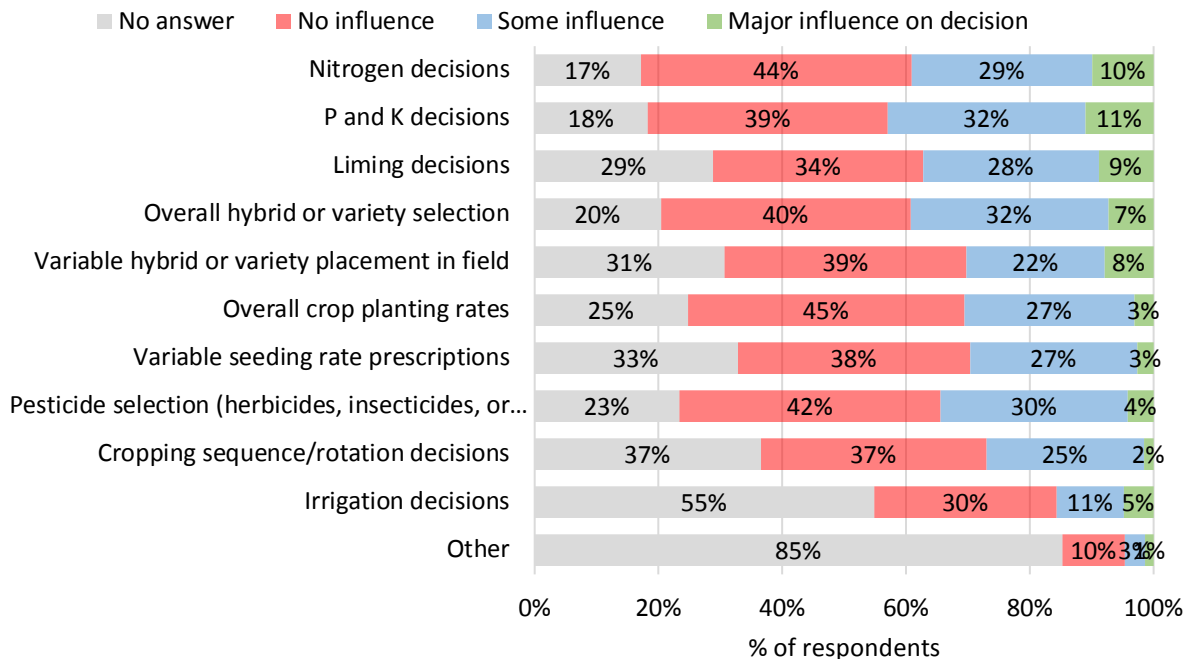


Figure 19 Q18: Management decisions influenced from pooled data.

PROFITABILITY OF PRECISION SERVICE OFFERINGS

Dealerships were asked to report on the profitability of the precision technology services they offer: either making a profit, breaking even, not breaking even, or don't know, Figure 20.

Overall, the categories with the greatest percent of respondents making a profit are VRT fertilizer or lime prescriptions (68%), VRT fertilizer applications (80%), VRT lime applications (69%), and grid or zone soil sampling (61%). The remaining services had less than 45% of respondents reporting a profit. UAV or drone imagery is a service area where dealers struggle the most to generate a profit where more than half of respondents are losing money or just breaking even.

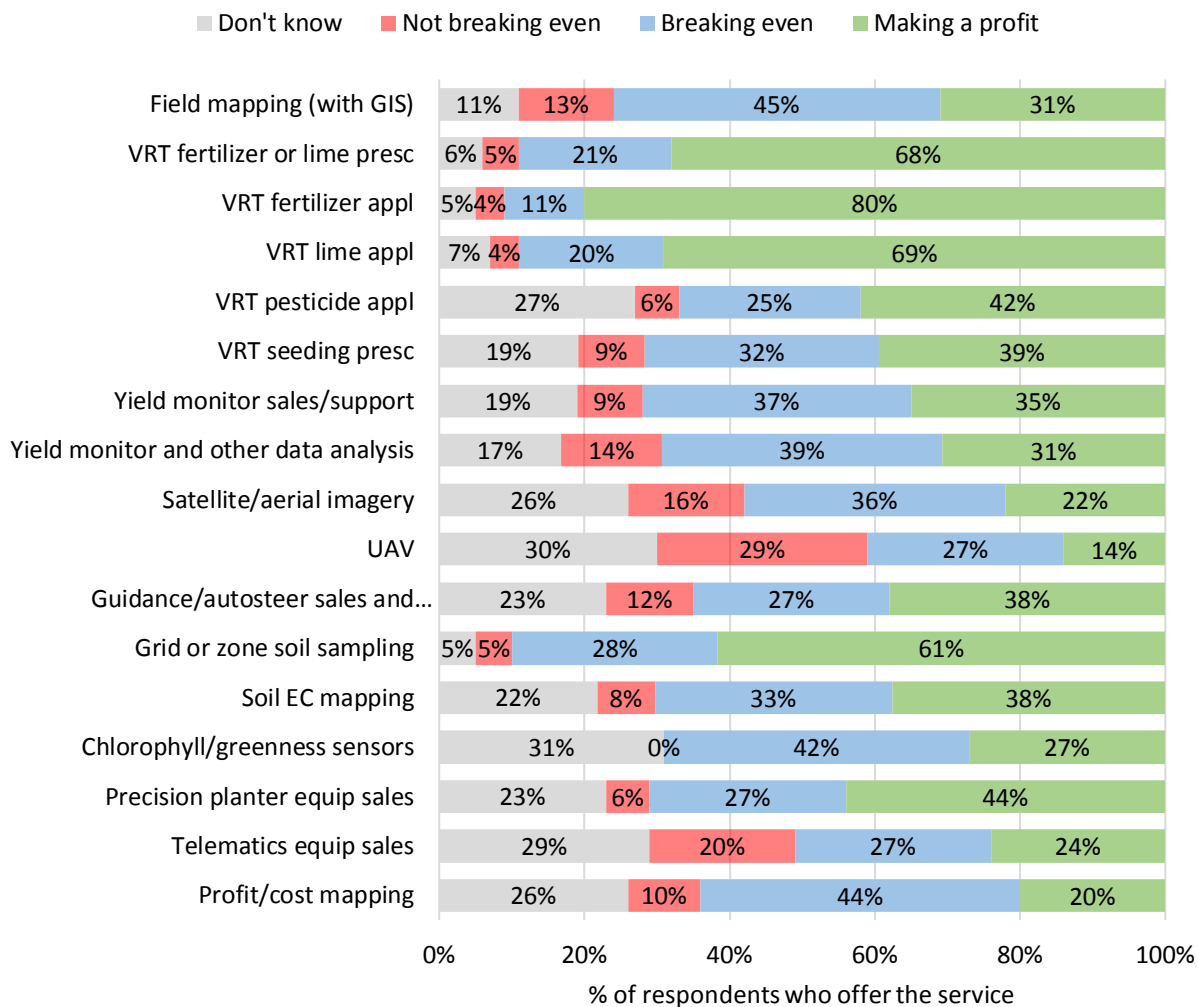


Figure 20. Q15: Profitability of precision service offerings for retailers.

Figure 21 shows the percent of respondents making a profit in certain precision ag services over time. VRT fertilizer applications and grid soil sampling have had steady profit growth since 2003. Satellite and aerial imagery has had a downward trend since 2003.

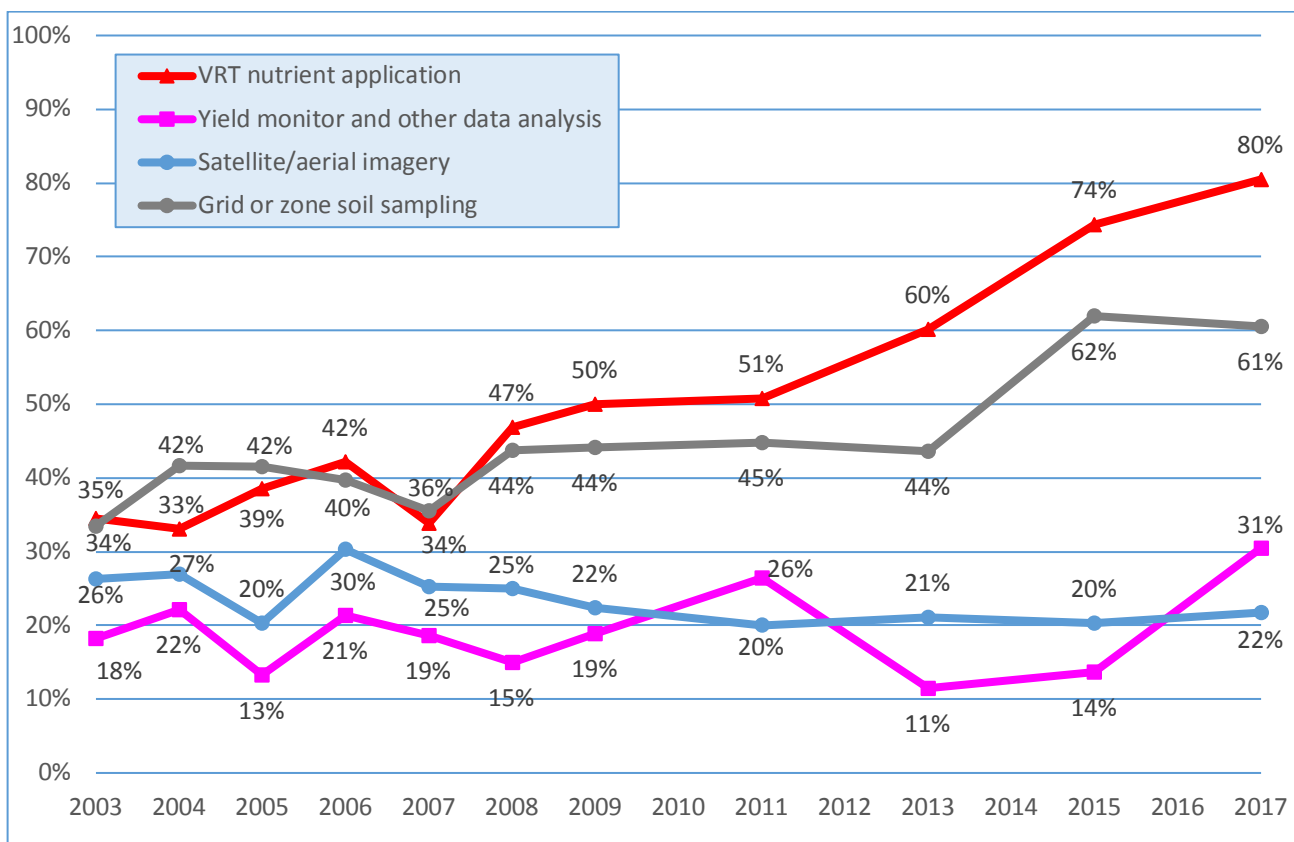


Figure 21. Q15: Profitability of precision services over time for retailers.

PRODUCER’S USE OF PRECISION TECHNOLOGIES

While the survey focuses primarily on the technologies used and precision services offered by dealers, dealers’ insights into their customers’ practices offers a different look into the adoption of these practices. As a part of the survey, respondents reported on the share of acres in their local market area that are utilizing various precision technologies, both now and in the future.

Figure 22 shows the estimated market area of the various precision technologies available. GPS guidance with automatic control continues to have the highest farmer adoption. There are many benefits to autosteer including less operator fatigue, more time focused on the operating equipment and less waste of applied inputs. Field mapping, soil sampling and VRT lime and fertilizer applications make up the next highest grouping with between one third and one-half of acres in the dealer’s areas using these technologies. The next grouping is planter adaptations to improve precision, satellite and aerial imagery, VRT seeding and cloud storage technologies with 13% to 22% of the market area. The final group is the newer technologies looking at data analysis technologies, on-the-go sensors, VRT pesticides, changing hybrids on-the-go and UAVs with 3% to 9% of the market area. Some of these technologies are very new and unproven in their capabilities.

Figure 22. Q21: Producer use of precision technologies, retailers estimate of their market area.

Precision Ag Technologies	Estimated Market Area	
	2017	Est 2020
Guidance/Autosteer	60%	72%
Field Mapping (with GIS)	45%	61%
Grid or Zone Soil Sampling	45%	62%
VRT Lime Application	40%	51%
VRT Fertilizer Application	38%	54%
Planter Adaptations to Improve Precision	22%	37%
Satellite or Aerial Imagery	19%	33%
Cloud Storage of Farm Data	14%	32%
Variable Down Pressure on Planter	14%	28%
VRT Seeding	13%	30%
Any Data Analysis Service (Encirca, FieldView, FBN, FarmServer, etc.)	13%	30%
Soil EC Mapping	9%	17%
Variable Hybrid Placement Within Fields	7%	19%
UAV or Drone Imagery	6%	22%
Y Drops on Fertilizer Applicator	6%	16%
Telematics	5%	12%
VRT Pesticide Application	3%	13%
Chlorophyll/Greenness Sensors for N Management	3%	10%

In Figures 23 and Figure 24, you can see the changes over time in the percent of the market area of various precision ag technologies used by farmers. As with the dealer information, the 2017 survey doesn't separate single and multi-nutrient VRT fertilizer applications. All precision ag practices show steady growth, with the exception of VRT pesticide applications which fell back to 2001 levels from the 2015 survey to the 2017 survey. The estimated growth in the next three years would return VRT pesticide applications back to 2013 levels.

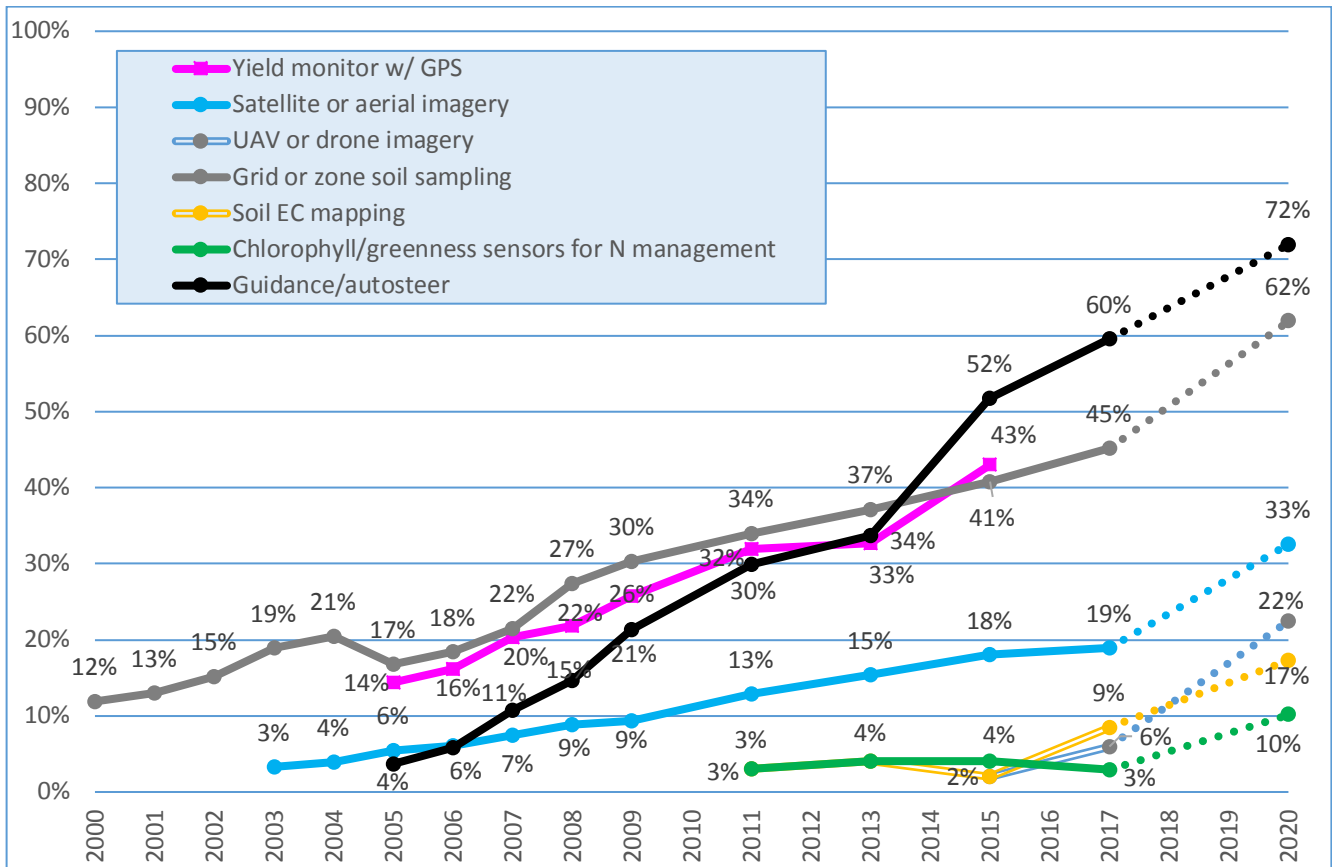


Figure 23. Q21: Farmer use of precision technologies, estimated by retailers. 2020 numbers are projections.

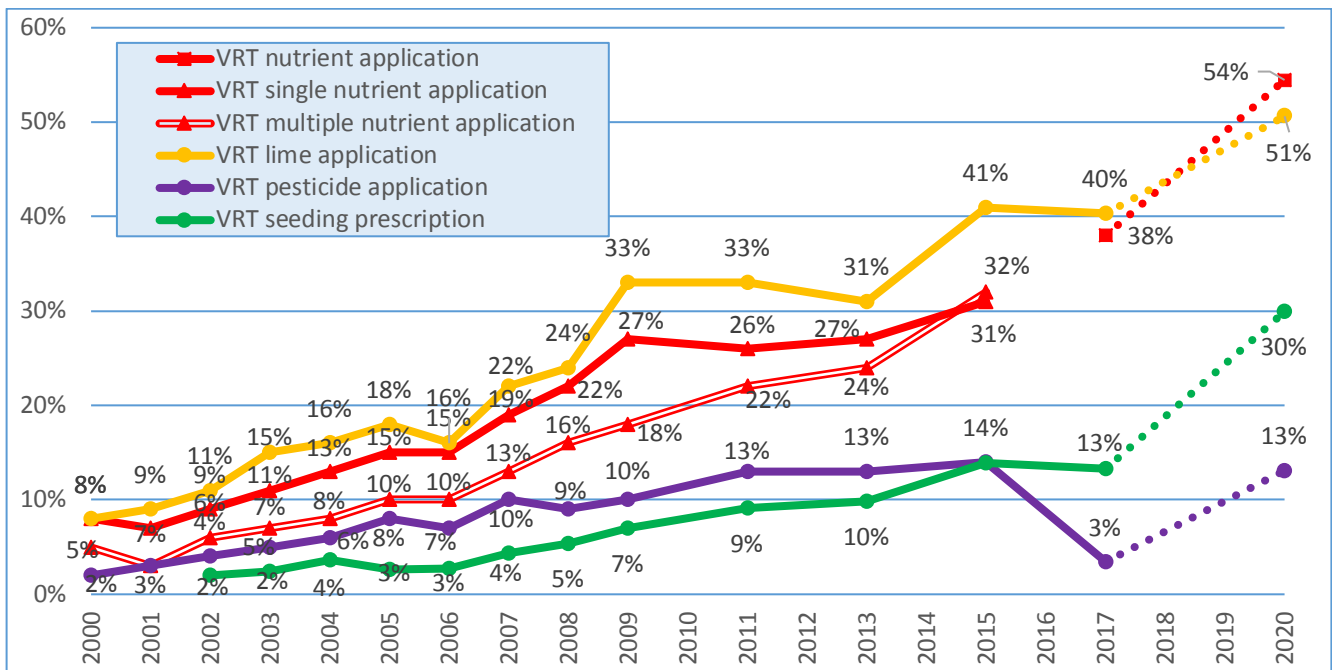


Figure 24 Q21: Farmer use of variable rate precision technologies, estimated by retailers. 2020 numbers are projections.

FUTURE INVESTMENT PLANS

Dealers were asked about their investment plans in 2017 for precision technologies, selecting a range in dollars. Thirteen percent of retailers were not planning on investing in precision technologies in 2017, Figure 25. Comparing over time, those retailers looking to invest in precision technologies are doing so at the smaller monetary levels. Those retailers investing \$10,000 or less is up 7% from the 2015 survey. Retailers investing \$100,000 or more is down 9% from the 2015 survey. Retailers from \$10,001 up to \$99,999 are going to invest at the same levels that they did in 2015.

An important consideration, not included in this survey, is the investment in the human capital and supporting assets. For instance, dealers may be investing in UAV technologies, but tangential investments in additional employees, office space, computers, storage facilities, or employee vehicles required are not considered in the survey.

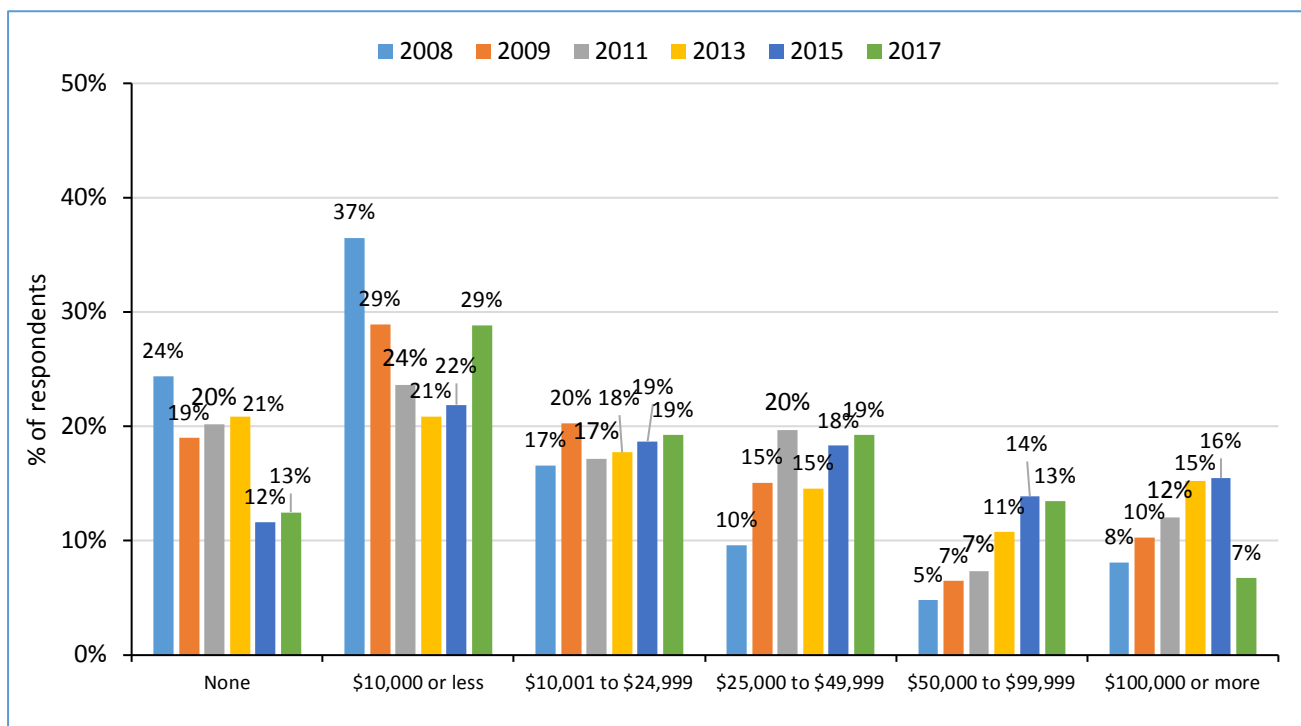


Figure 25. Q7: Expected investment in precision technology by retailers.

BARRIERS TO GROWTH AND EXPANSION

Across the years, we've seen the adoption rates for precision technologies and related services can often have significant variation across technologies. In an attempt to understand what prevents growth and expanded use of precision technologies the survey asked respondents to report on producer and dealer barriers. These barriers were evaluated at the aggregated precision agricultural level; specific technologies were not evaluated.

Producer Barriers

Figure 26 shows the perceived barriers by respondents over time. Farm income pressure is the most volatile form year to year followed by cost of services greater than the benefit from the services. Topography limiting use, soil types limit profitability, interpreting and making decisions and customer confidence seem to stay fairly flat from year to year. The only two evaluated barriers in which more respondents agreed than disagreed in 2017 is farm income pressure (65% agree vs. 11% disagree) and the cost of precision ag services is greater than the benefits (34% agree vs. 30% disagree).

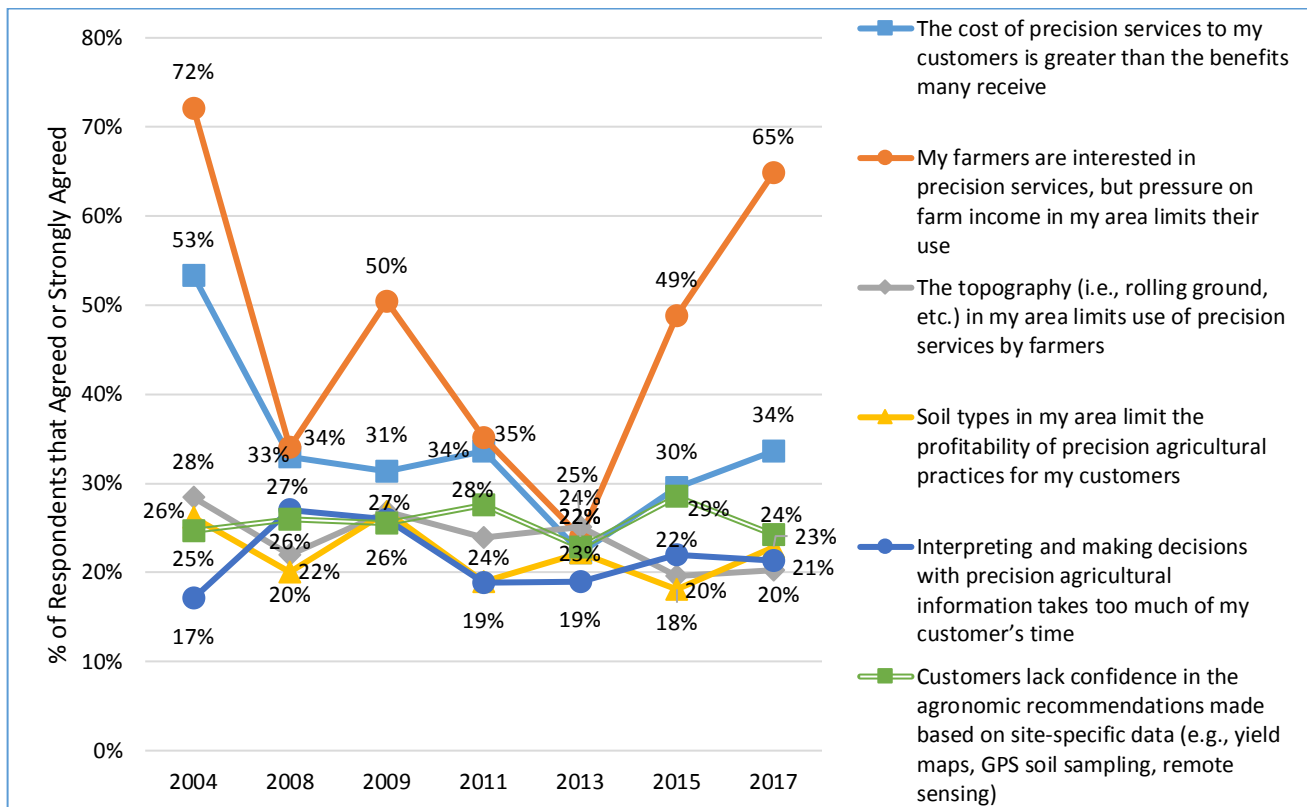


Figure 26. Q22: Customer issues that create barriers to expansion and growth in precision agriculture.

Dealer Barriers

When asked about the barriers dealers face, a range of responses were reported, Figures 27 and 28. In 2017, the highest barrier of the options offered to dealers in the survey was the difficulty in finding employees who can deliver on precision products and services, followed by the fees they can charge are not high enough to enable a profit.

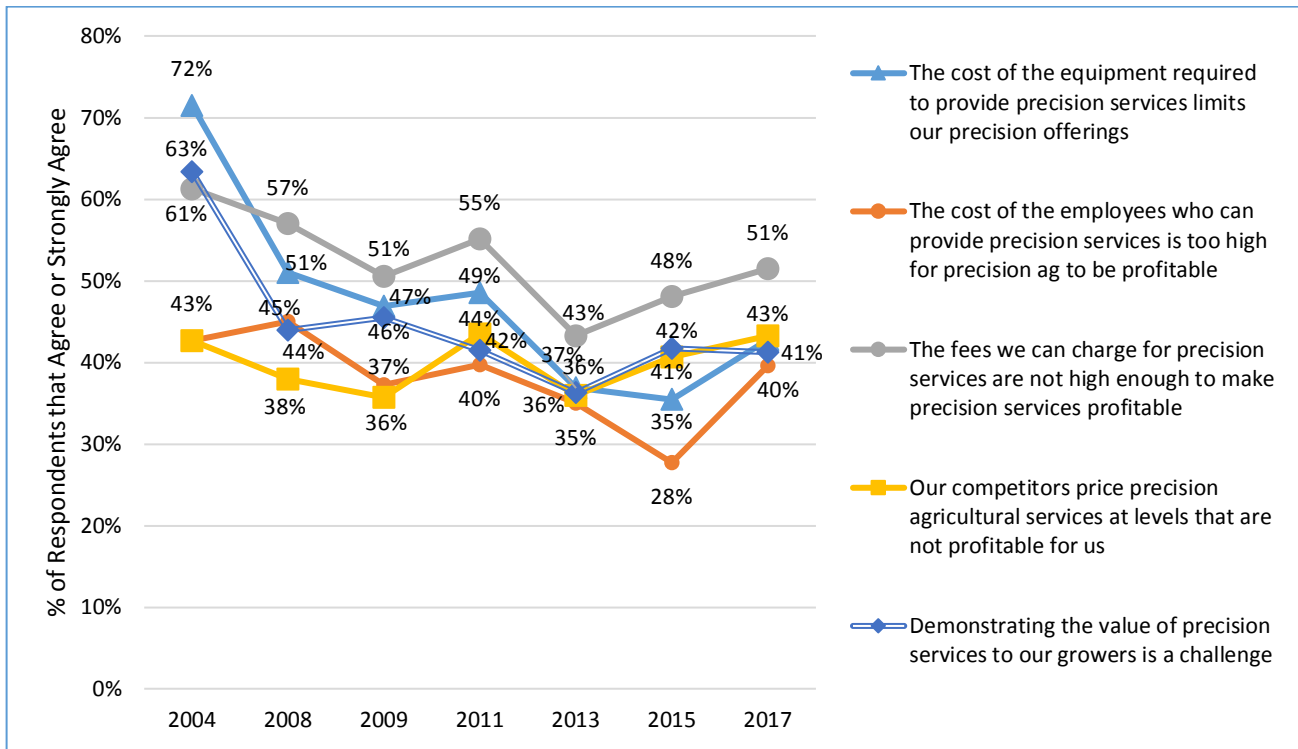


Figure 27. Q22: Dealer and technology issues that create a barrier to expansion and growth in precision agriculture.

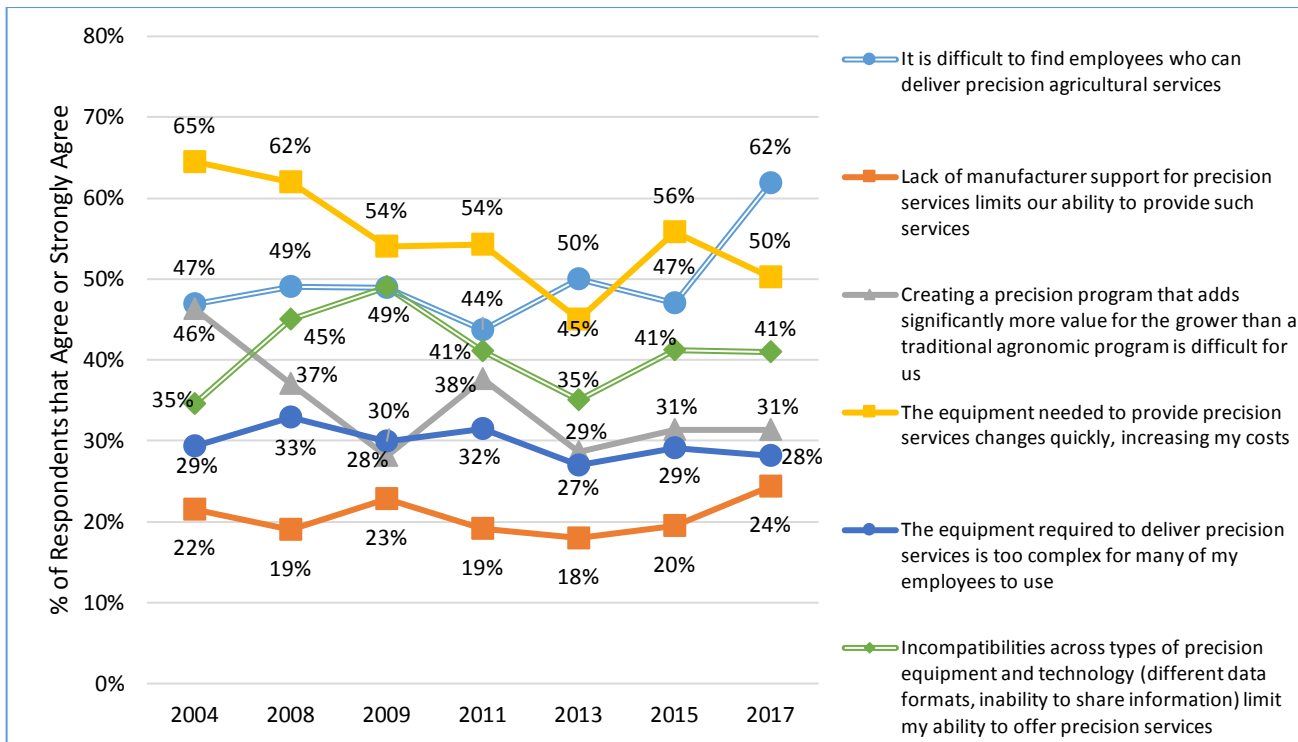


Figure 28. Q22: Dealer and technology issues that create a barrier to expansion and growth in precision agriculture.

SUMMARY

Precision agriculture utilizes information technology through a set of related tools, aiming to manage crops more accurately and meticulously. Using embedded and remote sensors that measure soil and crop parameters spatially and temporally, software that analyzes variability to detect correlations and trends for informing inputs, through to more exact and tailored applications of seeds, fertilizers, pesticides, and other inputs—with the overall goal to increase the efficiency of the production process through better-utilized inputs and/or enhanced productivity. This survey spans the entire two decades since agricultural retailers and farmers began using GPS to guide soil sampling and apply fertilizers and soil amendments variably across fields, and farmers used GPS-linked yield monitors to create maps that helped illuminate differences across fields and among years.

Since the mid-1990's there have been watershed changes to the technologies as well as new types introduced. The most significant of these in changing how crops are produced has been GPS guidance—first manual, and now supplanted by autoguidance systems that are becoming ubiquitous among farms and dealerships in the U.S. Sprayer boom section and planter row controllers are offshoots of guidance that are achieving widespread use.

Autoguidance and autocontrols on inputs are now mostly standard equipment across dealerships, partially because they are relatively simple to use and the benefits are relatively obvious. Guidance and section controllers don't depend on site-specific information to extract value, only location and previous applications. They help reduce input costs by reducing skips, overlaps and duplicate applications. In contrast, the information-intensive side of precision farming continues to struggle in demonstrating value. Using site-specific information from fields, such as remote sensing imagery, soil test results, soil or yield maps, to characterize and understand field variability and its impact on crop performance, and then to act upon that by variably managing fields—has been a greater challenge than many would have predicted two decades ago.

The 2017 survey shows an increase use in data collection technology such as greenness sensors, UAV's and EC mapping, while the use of logistics and telemetry services have declined. Respondents continue to struggle with generating a profit with the higher end precision ag tools and services. More dealer respondents are offering precision ag services with the exception of VRT pesticide applications. Farmers in the market areas of the dealers continue to adopt more precision ag practices. Some of these increases may be from improved hardware and software compatibility, greater ability to move, store, and analyze data, and familiarity with some of these new technologies.

The 2017 survey shows farmer income and the value perceived by the growers continues to be a barrier for growth. Respondents struggle with hardware and software incompatibilities, hiring the people to manage precision ag services, competitive pricing and difficulty in showing the customer value. As seen in the past, as farm incomes go down, there is a reduction in precision ag services purchased or utilization of cheaper services. As dealerships began to struggle with profit margins, smaller investments were made in precision technologies. One of the emerging dealership issues is the need for employees with the skills and experience to utilize precision agriculture tools and grow the precision service business. This is a job opportunity for those willing to acquire those skills and for the educational institutions who rise to the challenge of providing precision agriculture education.



18th Precision Agriculture Services Dealership Survey



Dear agricultural retailer,

The CropLife/Purdue survey is the longest-running, most widely used survey that chronicles the development and adoption of precision agriculture! To keep providing this information to you and the entire agricultural community, we depend on your continued input. Please complete this survey by March 10, 2017. Two ways to participate:

Send this paper back to: CropLife, 37733 Euclid Ave., Willoughby, OH 44094; Fax: 440-942-0662.

Or complete the survey online at <http://precisionsurvey.questionpro.com>

Thank you for your participation!

Jess Lowenberg-DeBoer

Purdue University Agricultural Economics

Bruce Erickson

Purdue University Agronomy

Paul Schrimpf

CropLife, Meister Media

1. Which best describes your business? *[please mark only one]*

Agricultural retail input supplier

Agricultural consultant

Farm equipment dealer

Other: *[please specify]* _____

2. If you answered agricultural retail input supplier above-- Are you a: *[please mark only one]*

Cooperative

Independent dealership

Part of a national or regional (multi-state) chain of retail dealerships (not a cooperative)

Other: *[please specify]* _____

3. Your primary responsibility: *[please mark only one]*

Owner/general manager/location manager

Technical consultant/agronomist

Departmental manager

Sales/sales management

Precision manager

Other: *[please specify]* _____

Application manager

4. What were the total annual retail sales (in dollars) of agronomic products and services (fertilizer, chemicals, seed, services) at this location in 2016? *[please mark only one]*

Under \$1,000,000

\$10,000,001 - \$15,000,000

\$1,000,001 - \$5,000,000

\$15,000,001 - 20,000,000

\$5,000,001 - \$10,000,000

More than \$20,000,000

5. How many total retail outlets does your company own or manage? *[please mark only one]*

None

1

2-5

6-15

16-25

More than 25

6. How many of each of the work roles does your business at your location employ? *[please provide a count for each one, include full and part time]*

_____ Applicator—Runs the equipment that applies pesticides and fertilizers to farmer's fields.

_____ Agronomist—Provides recommendations on crop and soil management to farmers.

_____ Precision sales specialist—Works specifically with precision equipment sales and support.

_____ Precision equipment technician—Installs new precision equipment; troubleshoots and repairs ON SITE.

_____ Technical support—Works with customers REMOTELY to troubleshoot precision equipment and software.

_____ Data manager/analyst—Manages agronomic data from the dealership and customer's farms.

7. How much will your location be investing in precision/site-specific technology during 2017?

None

\$25,001 - \$50,000

\$1 - \$10,000

\$50,001 - \$100,000

\$10,001 - \$25,000

More than \$100,000

8. In a typical year how many total acres do you custom apply at your location (fertilizer, chemicals, seeding – total acres including multiple applications)? *[please mark only one. If none, go to Question 12]*

Under 10,000 acres

50,001 to 75,000 acres

10,001 to 25,000 acres

75,001 to 100,000 acres

25,001 to 50,000 acres

Over 100,000 acres

9. In 2016, approximately what percentage of your total fertilizer sales were custom applied? _____%

10. In 2016, approximately what percentage of your total herbicide/pesticide sales were custom applied? _____%

11. In 2016, approximately what percentage of your total custom application (total acres, all products) used:

- GPS guidance systems with manual control (light bar) _____%
- GPS guidance systems with automatic control (autosteer) _____%
- Auto sprayer boom section or nozzle control _____%
- Variable rate prescription map _____%

12. Do you offer soil sampling — traditional, following a grid pattern and/or by management zone? *[mark all that apply]*

- Don't offer soil sampling Traditional, whole field approach
- Grid pattern Management zones

If grid, what grid size most commonly used?
[mark only one]

- < 1 acre
- 1 acre - 2.49 acre
- 2.5 acre
- 2.51 acre - 5 acre

If management zone, determined by what factor?
[mark only one]

- Soil mapping unit
- Electrical conductivity
- Yield map
- Other *[please specify]*: _____

13. In which of the following ways does your dealership use precision technology? *[mark all that apply]*

- Precision agronomic services for customers (such as soil sampling with GPS, GIS field mapping, etc.)
- GPS guidance systems with manual control (light bar) for fertilizer/chemical application
- GPS guidance systems with automatic control (autosteer) for fertilizer/chemical application
- Auto sprayer boom section or nozzle control
- Sprayer turn compensation
- Y drops on fertilizer applicators
- Satellite/aerial imagery for internal dealership purposes
- UAV or drone for internal dealership purposes
- Soil electrical conductivity (EC) mapping
- Other soil sensors for mapping, mounted on a pickup, applicator or tractor (example: pH sensor)
- Chlorophyll/greenness sensors mounted on a pickup, applicator or tractor (CropSpec, GreenSeeker, OptRx, etc.)
- Field mapping with GIS to document work for billing/insurance/legal purposes
- Telematics to exchange information among applicators or to/from office locations
- GPS to manage vehicle logistics, tracking locations of vehicles, and guiding vehicles to the next site
- Smart scouting using an app on a mobile device to record field situations and locations
- Do not use precision technology

14. Which "site-specific" (precision) services/products will you offer in the following time periods?

	Offer now	Will offer by 2020	Don't offer now, but did	Never offered or don't know
	<i>[please mark only one column per row]</i>			
Field mapping (with GIS)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VRT (variable rate) fertilizer or lime prescriptions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VRT fertilizer application	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VRT lime application	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VRT pesticide application	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VRT seeding prescriptions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yield monitor sales/support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yield monitor and other data analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Satellite/aerial imagery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UAV or drone imagery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Guidance/autosteer sales & support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grid or zone soil sampling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Soil EC mapping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chlorophyll/greenness sensors for N management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Precision planter equipment sales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telematics equipment sales (Farmobile, Trimble DCM-300, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Profit/cost mapping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. For the following services that you offer, currently how profitable is each specific service for your dealership?

	Not breaking even	Breaking even	Making a profit	Don't know	Don't offer this
<i>please mark only one column per row</i>					
Field mapping (with GIS)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VRT (variable rate) fertilizer or lime prescriptions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VRT fertilizer application	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VRT lime application	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VRT pesticide application	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VRT seeding prescriptions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yield monitor sales/support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yield monitor and other data analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Satellite/aerial imagery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UAV or drone imagery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Guidance/autosteer sales & support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grid or zone soil sampling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Soil EC mapping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chlorophyll/greenness sensors for N management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Precision planter equipment sales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telematics equipment sales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Profit/cost mapping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. How do you help manage the farm-level data (i.e., yield maps, soil tests, EC, satellite imagery) of your farmer- customers to assist in their decision-making? *[mark all that apply]*

- Print maps for customers (yield, EC, soil maps, etc.)
- No data aggregated among farmers, work with farmers only with the data from their own farms
- Data aggregated among farmers but not outside the dealership
- Data aggregated among farmers including those outside the dealership
- Archiving and managing yield, soil test, and other data for future use
- Other *[please specify]* _____
- Do not help customers with their farm-level data

17. Does your company have a customer data privacy statement and/or data terms & conditions agreement? Yes No

18. What crop management decisions are being influenced by pooled data from your customer's farms?

	No influence	Some influence	Major influence on decision
<i>please mark only one column per row</i>			
Nitrogen decisions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P and K decisions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Liming decisions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall hybrid or variety selection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Variable hybrid or variety placement in field	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall crop planting rates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Variable seeding rate prescriptions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pesticide selection (herbicides, insecticides, or fungicides)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cropping sequence/rotation decisions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Irrigation decisions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other <i>[please specify]</i> _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19. As you look at the current and future precision situation in your local market, what emerging precision technologies have the greatest potential to impact your business?

20. For your retail location, what state are you located in? _____. What is your ZIP code? _____.

21. Please answer the following question whether or not you offer any precision services. Approximately what percentage of the total acreage in your market area (all growers, not just your current customers) is currently using the following agricultural practices? What percent will be using each one in three years?

	Currently	In 3 Years
	Percentage of acres. Please answer all spaces	
Field mapping (with GIS)	_____ %	_____ %
VRT fertilizer application	_____ %	_____ %
VRT lime application	_____ %	_____ %
VRT pesticide application	_____ %	_____ %
VRT seeding	_____ %	_____ %
Variable hybrid placement within fields	_____ %	_____ %
Satellite or aerial imagery	_____ %	_____ %
UAV or drone imagery	_____ %	_____ %
Guidance/autosteer	_____ %	_____ %
Grid or zone soil sampling	_____ %	_____ %
Soil EC mapping	_____ %	_____ %
Chlorophyll/greenness sensors for N management	_____ %	_____ %
Telematics	_____ %	_____ %
Cloud storage of farm data	_____ %	_____ %
Planter adaptations to improve precision	_____ %	_____ %
Variable down pressure on planter	_____ %	_____ %
Y drops on fertilizer applicator	_____ %	_____ %
Any data analysis service (Encirca, FieldView, FBN, FarmServer, etc.)	_____ %	_____ %

22. As you think about the potential for precision agriculture in your market area, what are the primary barriers preventing more farmers from adopting or expanding their use of precision agricultural services and/or preventing you from offering more precision services?

Please rate the following statements on a scale from 1 (strongly disagree) to 5 (strongly agree).

Customer Issues

The cost of precision services to my customers is greater than the benefits many receive	1 2 3 4 5
My farmers are interested in precision services, but pressure on farm income in my area limits their use	1 2 3 4 5
The topography (i.e., rolling ground, etc.) in my area limits use of precision services by farmers	1 2 3 4 5
Soil types in my area limit the profitability of precision agricultural practices for my customers	1 2 3 4 5
Interpreting and making decisions with precision agricultural information takes too much of my customer's time	1 2 3 4 5
Customers lack confidence in the agronomic recommendations made based on site-specific data (e.g., yield maps, GPS soil sampling, remote sensing)	1 2 3 4 5
Customer concerns with data privacy limit their participation	1 2 3 4 5

Dealer Issues

The cost of the equipment required to provide precision services limits our precision offerings	1 2 3 4 5
The cost of the employees who can provide precision services is too high for precision ag to be profitable	1 2 3 4 5
It is difficult to find employees who can deliver precision agricultural services	1 2 3 4 5
The fees we can charge for precision services are not high enough to make precision services profitable	1 2 3 4 5
Lack of manufacturer support for precision services limits our ability to provide such services	1 2 3 4 5
Creating a precision program that adds significantly more value for the grower than a traditional agronomic program is difficult for us	1 2 3 4 5
Demonstrating the value of precision services to our growers is a challenge	1 2 3 4 5
Our competitors price precision agricultural services at levels that are not profitable for us	1 2 3 4 5
The equipment needed to provide precision services changes quickly, increasing my costs	1 2 3 4 5
The equipment required to deliver precision services is too complex for many of my employees to use	1 2 3 4 5
Incompatibilities across types of precision equipment and technology (different data formats, inability to share information) limit my ability to offer precision services	1 2 3 4 5

THANKS AGAIN FOR YOUR INPUT! PLEASE MAIL THIS TO THE ADDRESS LISTED AT THE TOP OF THE FIRST PAGE.