2015
PRECISION AGRICULTURAL SERVICES DEALERSHIP SURVEY RESULTS

SPONSORED BY *CROPLIFE* MAGAZINE AND THE CENTER FOR FOOD AND AGRICULTURAL BUSINESS

by

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August 2015

Dept. of Agricultural Economics/Dept. of Agronomy

Purdue University

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ABOUT THE SURVEY

In the spring of 2015, *CropLife* magazine and the Departments of Agricultural Economics and Agronomy at Purdue University conducted the 17th survey of crop input dealers about their use of agricultural precision technologies. As with the previous surveys, dealerships were asked questions about customer adoption of precision services, how precision technology is used at the dealership, and the profit potential of the technology. Additionally, questions were included this year's survey to investigate the skills needed of those working in the precision technology areas of the organizations.

The questionnaire was mailed to 2,500 *CropLife* retail crop input dealership readers across the US. (See Appendix II to this report for a copy of the questionnaire.) A total of 261 questionnaires were returned, a response rate of 10.4 percent. This was up from 6.8 percent in 2013, the lowest rate of return for this survey. The highest rate of return was 38 percent in 1996.

Of the 261 total respondents, only 101 provided the state of their location. These reporting respondents represented 13 states with the largest share, 16.8 percent, from Illinois (Figure 1).

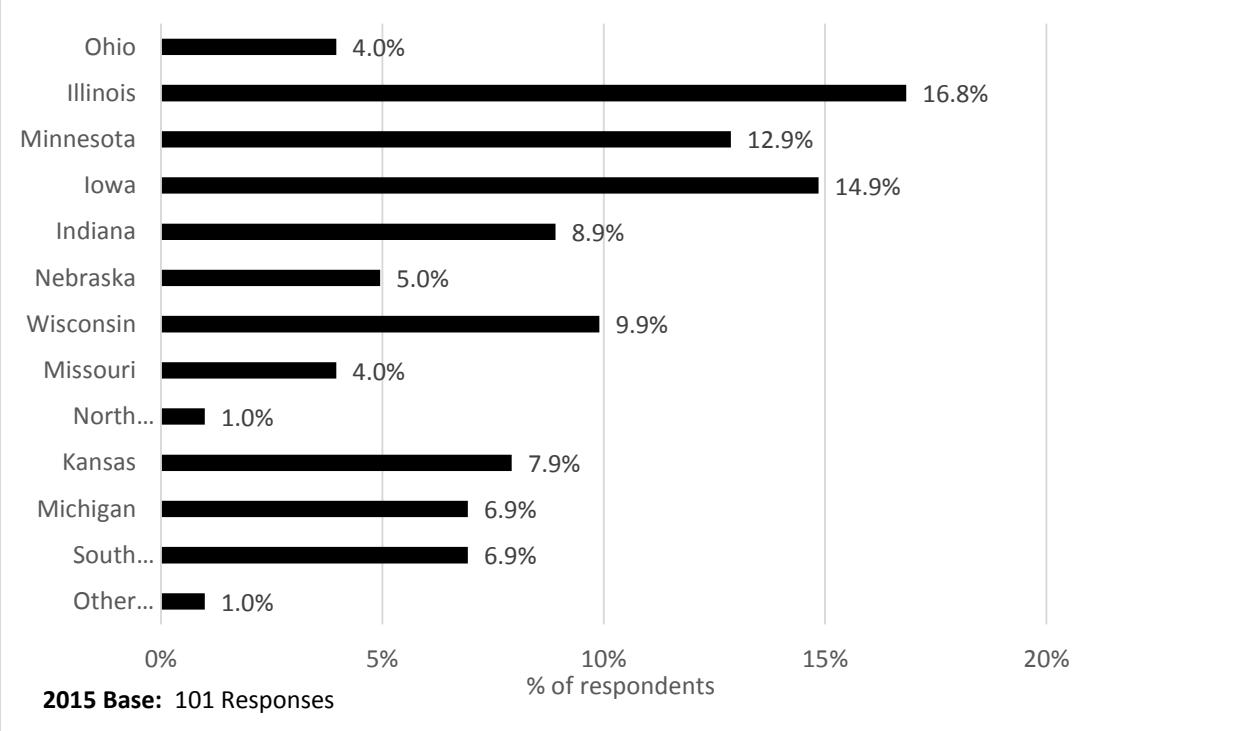

Figure 1. States Represented.

Respondents were asked several questions about the organization they represented. The majority of respondents indicated they represented a cooperative (53%) with independent dealerships (31%) and national or regional dealerships (not a cooperative) (14%) also represented (Figure 2).

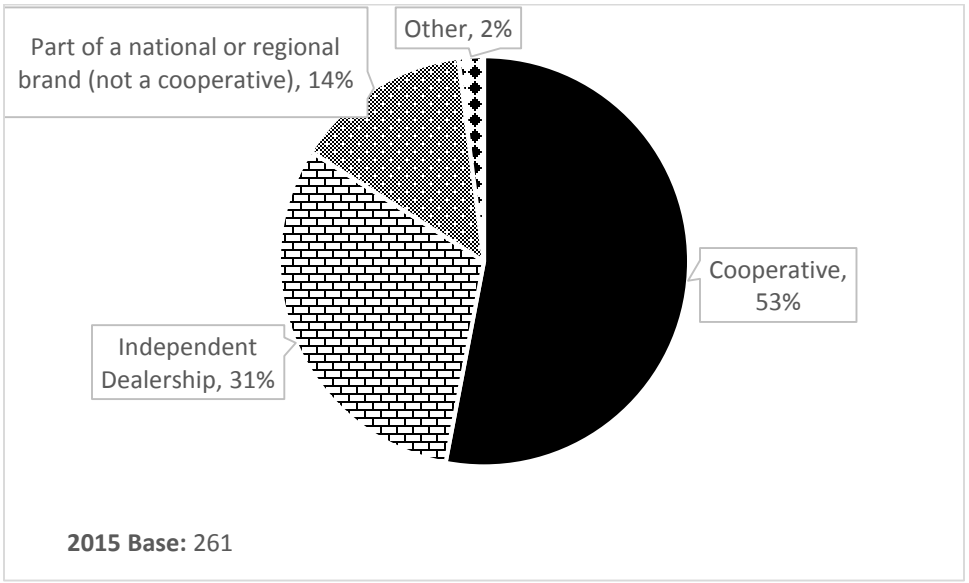

Figure 2. Organization Type Represented by Respondents.

The organizations the respondents represent are primarily multiple-retail locations (Figure 3). Only 26 percent of respondents reported fewer than 2 retail locations. A majority of respondents, 51 percent, reporting their organization has 6 or more retail locations. This is a deviation from the previous surveys demographics; in 2013, organizations having 6 or more retail locations only accounted for 32 percent of respondents.

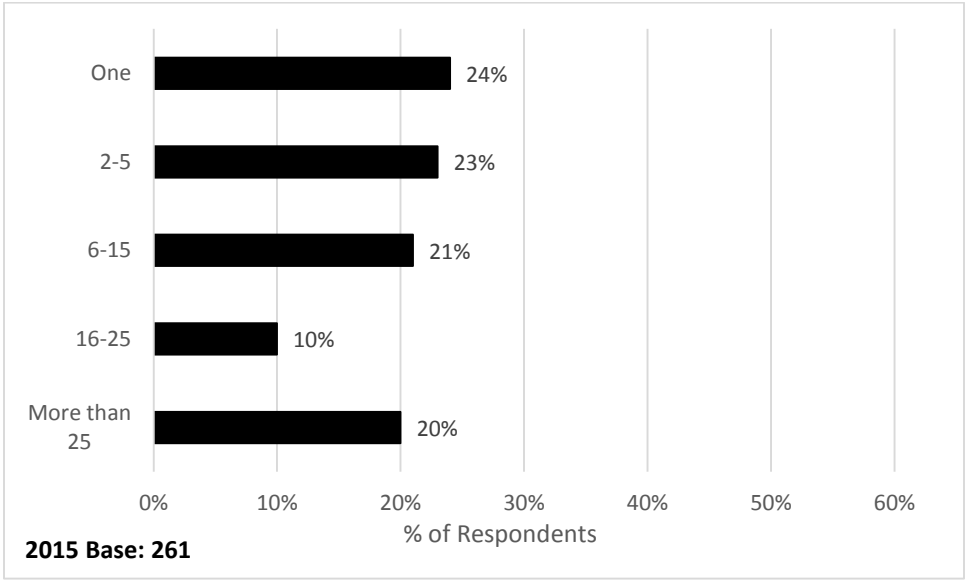

Figure 3. Number of Retail Outlets Owned or Managed.

Another metric for understanding the size of the surveyed organizations are the agronomy sales for 2014, Figure 4 (for the specific location of the respondent only). These sales include fertilizer, chemicals, seed, and services. Consistent with results in 2013, half of all respondent reported location agronomy sales of $7 million or more.

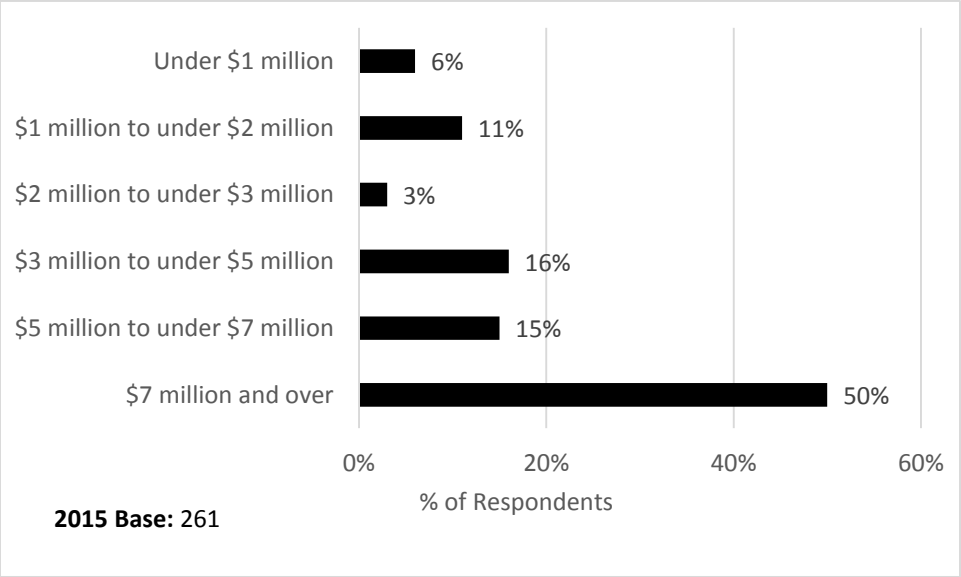

Figure 4. Annual Agronomy Sales at Location (2014).

Finally, the survey asked about the position the respondents held within their organization. Sixty percent reported being the owner or location manager. A total of 11 percent reported being a technical consultant or precision agriculture manager. Other common job responsibilities for respondents were sales and sales management (17%) and department manager (9%). Overall, the respondents of the survey are those that lead and manage the organization, or work directly with customers.

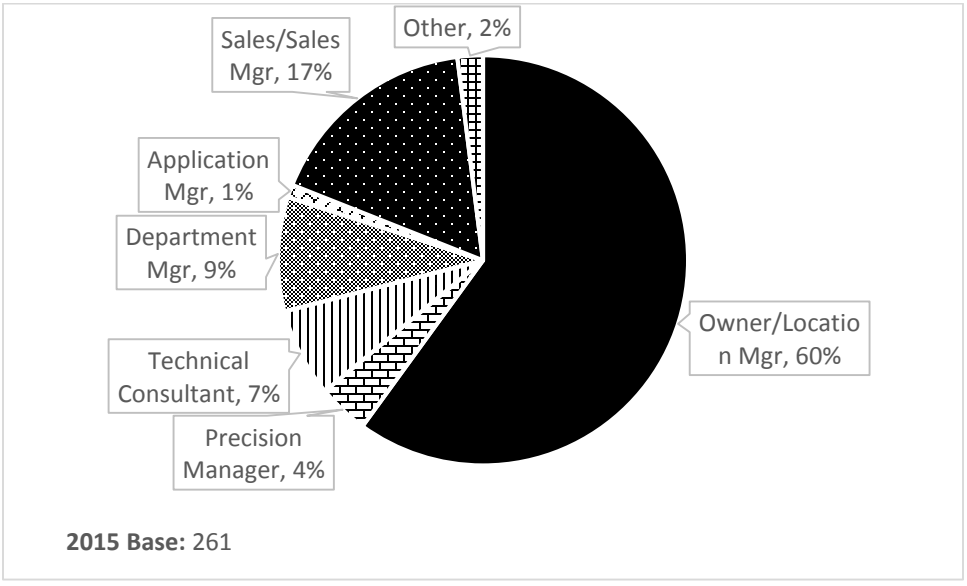

Figure 5. Responsibility of Survey Respondent.

CUSTOM APPLICATION

An important component of the agricultural input supplier business is often custom application services. In Figure 6 the acres of customer application the retailers apply in a typical year are reported. These applied acres include fertilizer, crop protection/pest management, and seeding applications and would allow for multiple application on the same field (for example, one physical acre represents multiple applied acres in this survey question).

The largest segment of respondents were those applying more than 100,000 acres annually. Retailers applying more than 50,000 acres annually account for 60 percent of respondents. Overall, this year's survey respondents covered more acres of custom application than in the previous survey, where only 42 percent of applied more than 50,000 acres annually.

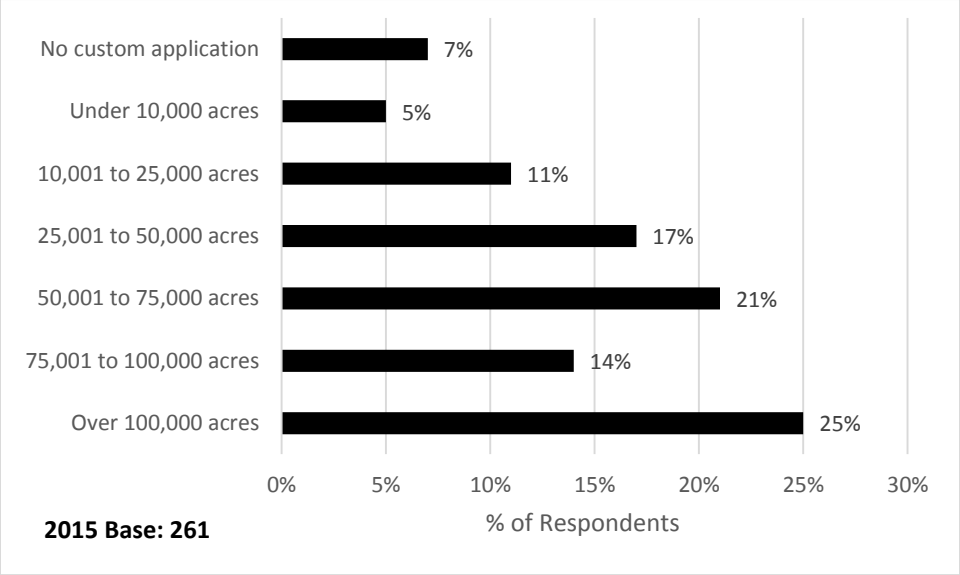

Figure 6. Acres Custom Applied.

Digging deeper into how custom application and input sales work hand-in-hand, respondents were asked to report the share of fertilizer and pesticide sales that were customer applied (Figure 7). For both, the majority of product sales are custom applied as it was reported a high percentage of product sales being custom applied. Fertilizer, however, is more prevalent as nearly 45 percent of respondent reported custom applying more than 75 percent of total fertilizer sales. Nearly 25 percent of respondents reporting custom applying more than 75 percent of the pesticide material sales. On average, respondents reported custom applying 66.8 percent of fertilizer sales and 57.9 percent of pesticide sales.

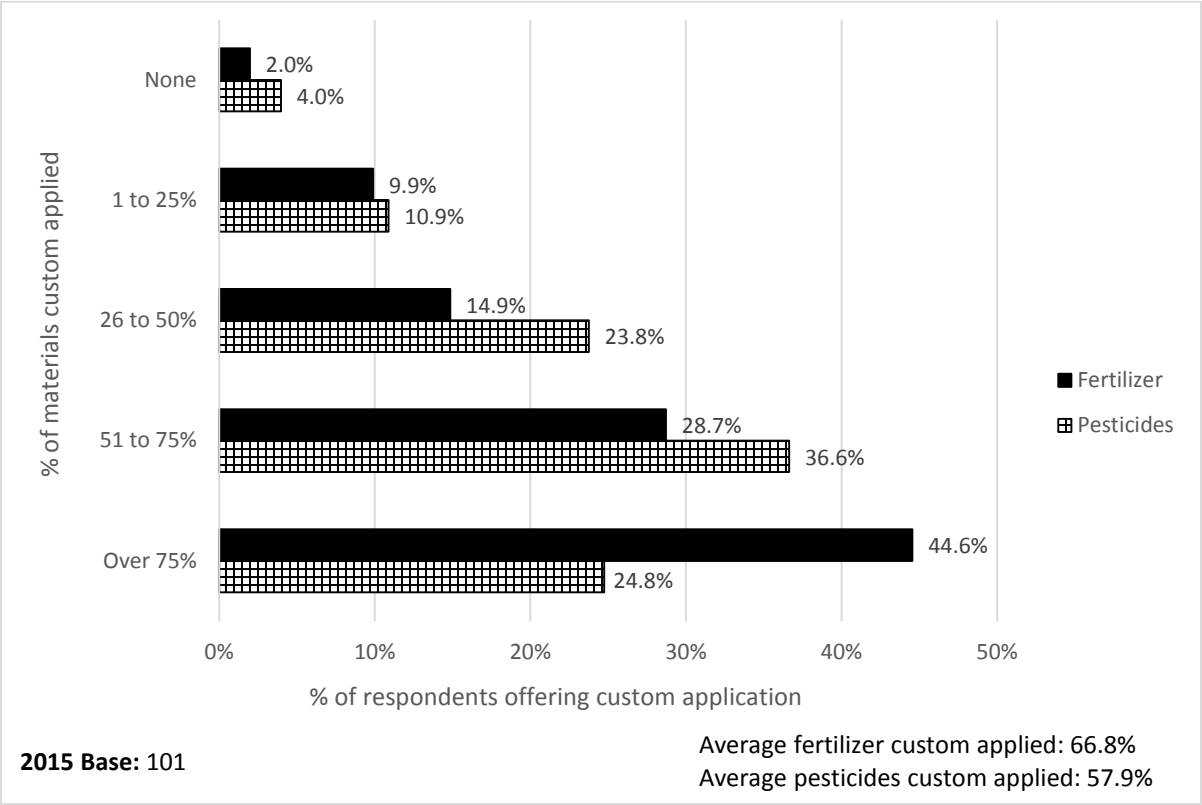

Figure 7. Custom Application of Fertilizer and Pesticides.

To understand how customer applicators are using precision technology for application services, survey respondents were asked about their use of manual guidance (lightbar) and auto guidance (Figure 8) and the type of GPS correction they utilized (Figure 9). On average, respondents reported that they used autosteer technologies on 67.7 percent of their application acres. As most might expect, half of all respondents reported they used autosteer technologies on more than 75 percent of their custom-applied acres. Only 10.9 percent reported using no autosteer capacities.

For lightbars, or manual control technologies, respondents on average reported that 36.3 percent of their acres were applied using the technology. More respondents reported not using lightbars (37.0 percent) and those using it on nearly all their acres (23.0 percent using it on more than 75 percent of customer applied acres).

These results do not provide insights into the application activities or inputs applied that may use more, or less, of autosteer or lightbar technologies. Some application activities may lend themselves to the use of precision technologies more than others.

A consideration for dealers using guidance is the type of GPS correction used (Figure 9). The majority of respondents indicated they were using the U.S. government's free WAAS correction system, 69.9 percent. For more accurate GPS correction, 27.2 percent reported purchasing a satellite correction (such as OmniSTAR XP or HP, StarFire2) and 25.7 percent reported purchasing RTK correction. Much fewer, 5.3 percent, reported purchasing Real Time Network correction. In addition to purchasing RTK correction, an option of erecting an RTK base stations exists. Nearly 12 percent of respondents reporting doing this for the GPS correction.

Aggregating the personal base stations and the purchased corrections, a total of 37.4 percent of respondents reported using RTK correction.

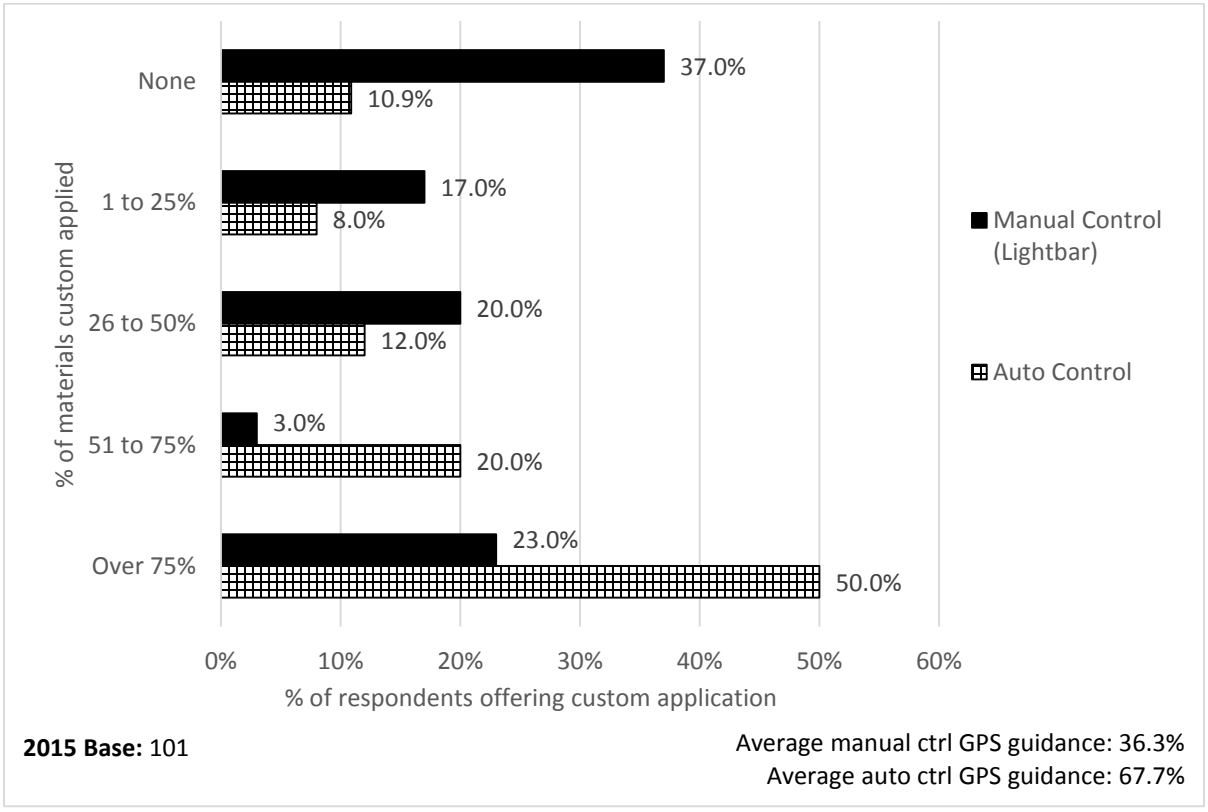

Figure 8. Use of GPS Guidance Systems for Custom Application.

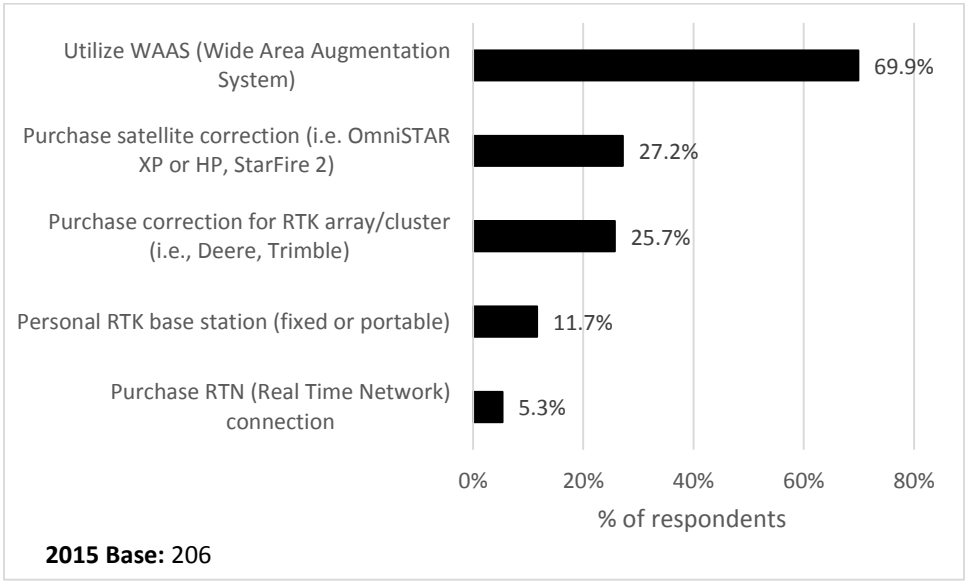

Figure 9. Types of GPS Correction Used.

DEALER USE OF PRECISION TECHNOLOGIES

Precision technology can provide utility to agricultural retailers and dealers in numerous ways. The first is helping them provide services to their customers, as was seen with customer application services in Figure 8. The second way is in the service they offer their customers, such as variable rate (VRT) application of fertilizer.

The first way in which respondents were asked about the use of specific precision technology was with respect to the utilization of the technology in their business,

Figure 10. Overall, the most popular technology used for dealers was GPS guidance with auto control/autosteer. Also popular was GPS-enabled sprayer section control (74 percent) and GPS guidance with manual control (63 percent). A total of 82 percent indicated they offered precision technology services to their customers (more detail reported in section 3.2).

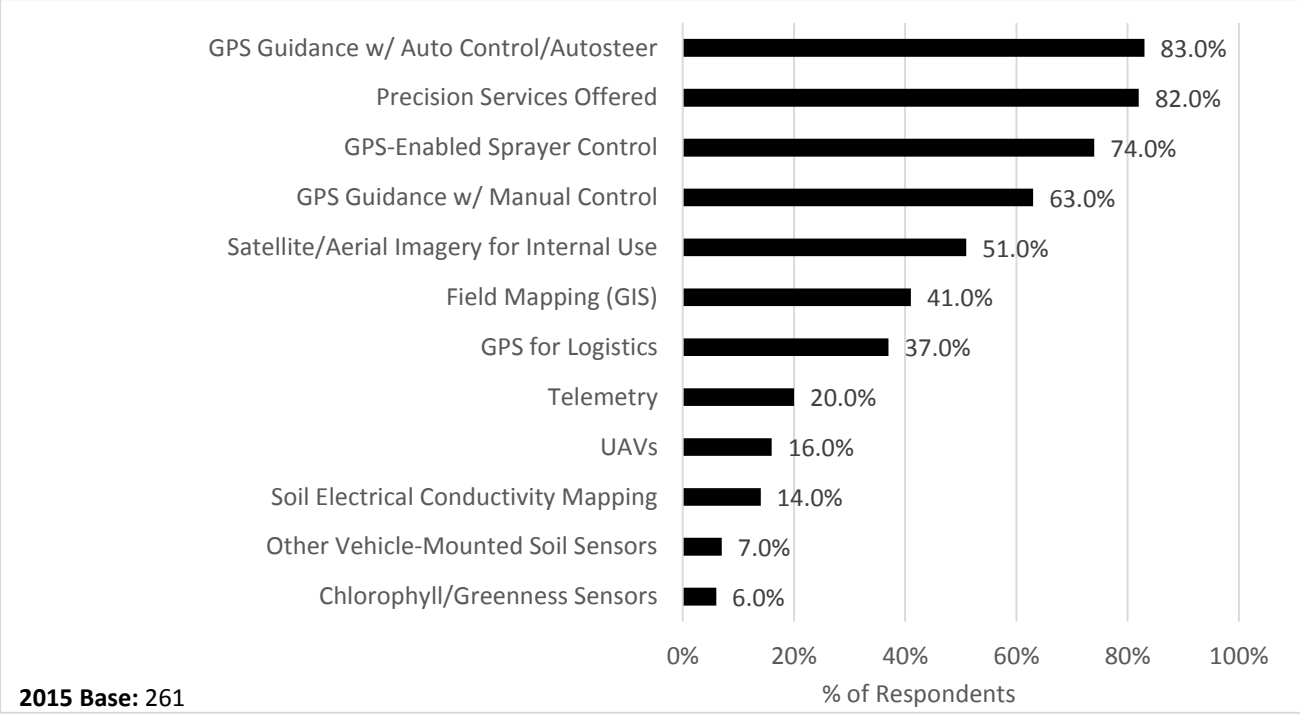

Figure 10. Use of Precision Technology.

Retailer's use of precision technology over time is reported in Figure 11 and Figure 12. In recent years satellite/aerial imagery, field mapping (GIS), and GPS for logistics have shown strong gains in adoption. The use of soil electrical conductivity mapping has been stable in usage since 2009. Note that the survey went to every other year in 2011, thus the time/year scale is not consistent from left to right, exaggerating trends since 2009 as compared to before 2009. Telemetry for wirelessly transferring data has been an interesting newcomer the last three years; increasing steadily since it was first included in the survey in 2011. The rate at which it has been adopted rivals that of GPS automated guidance; but questions remain regarding any barriers to utilization such as wireless Internet connective at broadband speeds. It's worth noting that the only technology in a declining trend is GPS guidance with manual control (lightbar). Peaking at 79 percent of respondents using in 2009, current survey results mark the third survey of declining usage rates, down to 63 percent. This decline is because it is being replaced with autoguidance technology.

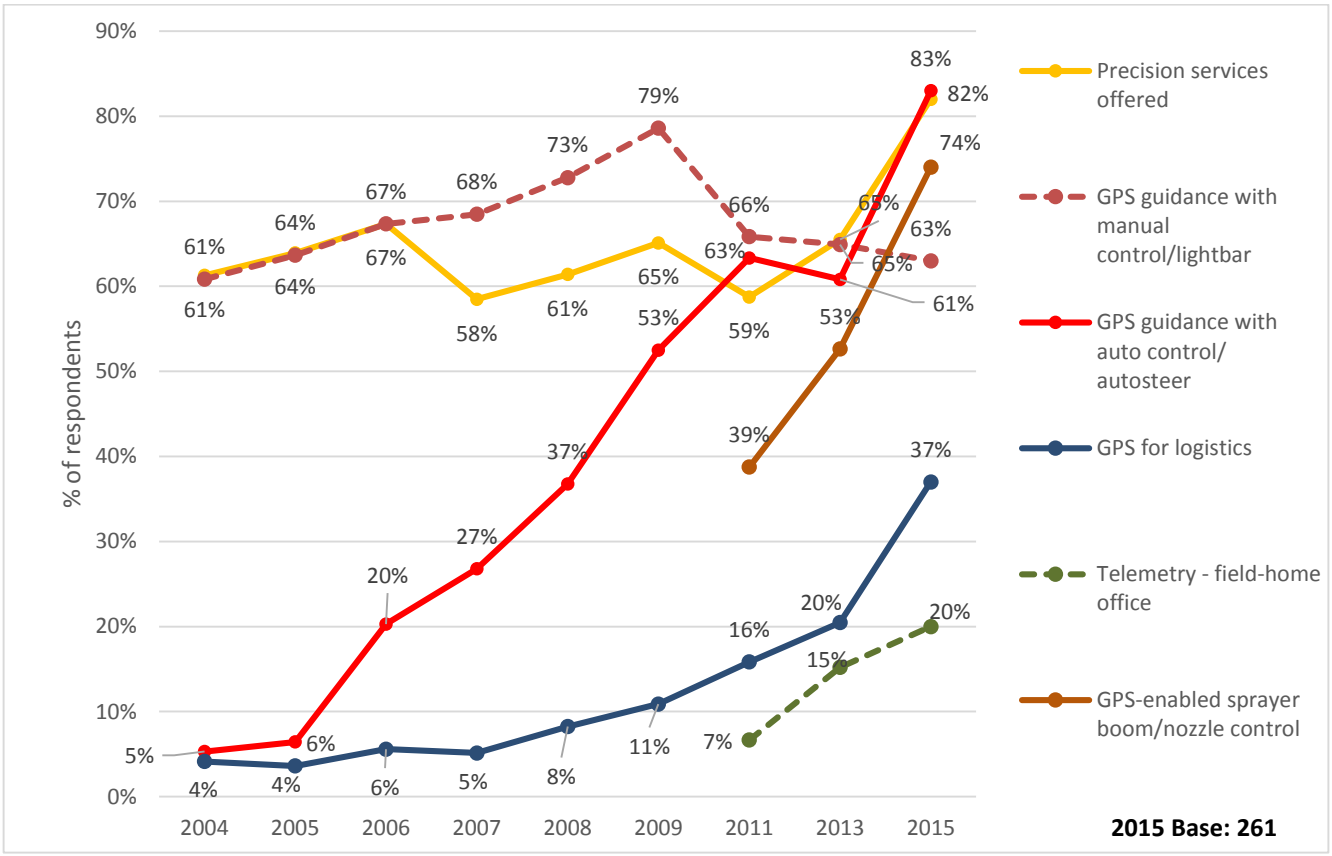

Figure 11. Use of Precision Technology over Time, Automated Technologies.

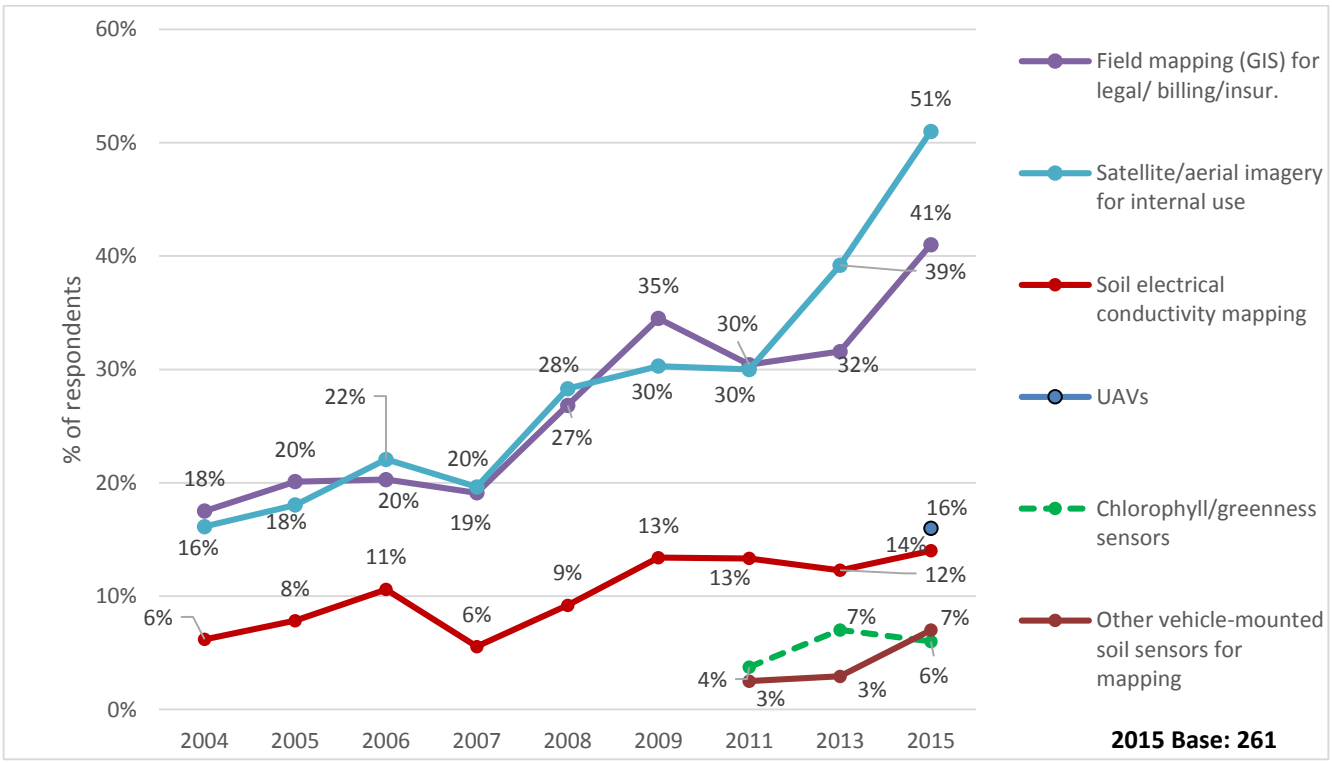

Figure 12 Use of Precision Technology over Time, Site-Specific Technologies.

OFFERINGS OF SITE-SPECIFIC SERVICES

The second element of precision technology use by agricultural dealers and retailers is for the precision services they offer. For this question, respondents were asked to report their current offering of precision services and their plans for precision services to offer three years from now, in 2018 (shown in Figure 13 and Figure 14).

Across all precision services, the share of respondents offering a given service was significantly higher in this year's survey when compared to the previous surveys. Offerings of VRT seeding prescription services saw the most significant increase, a jump of 26 percentage points. The service with the least growth in offering was yield monitor sales and support, up 3 percentage points.

Also a part of this question were dealers' plans to offer services in the next three years. Over the next three years, respondents planned to increase their offering of UAV services the most, increasing 19 percentage points from 2015 to 2018. The technology with the least amount of increase projected over the next three years was VRT lime application, only up 2 percentage points.

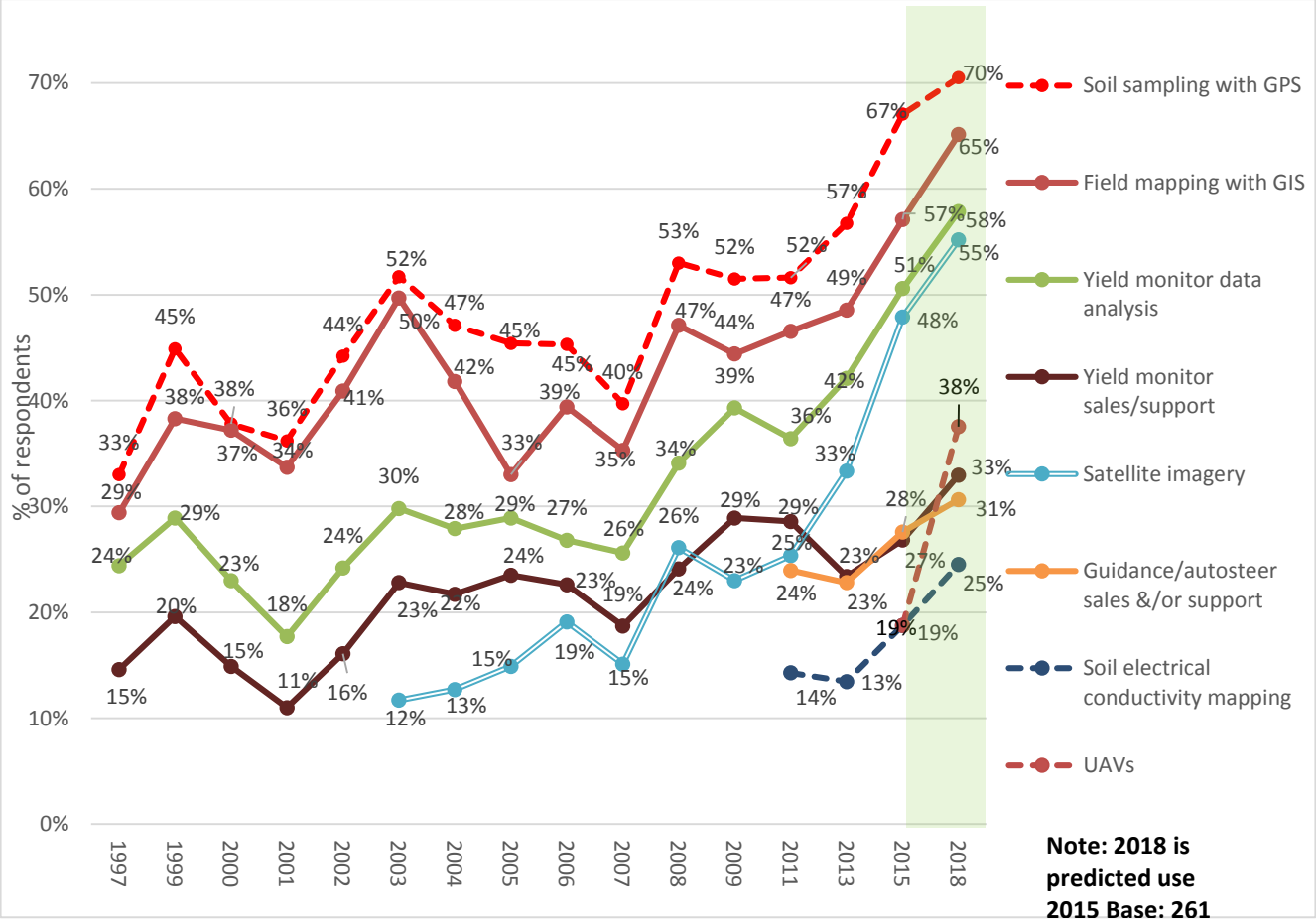

Figure 13. Precision Ag Services Offered Over Time, Automated and Sensing Technologies.

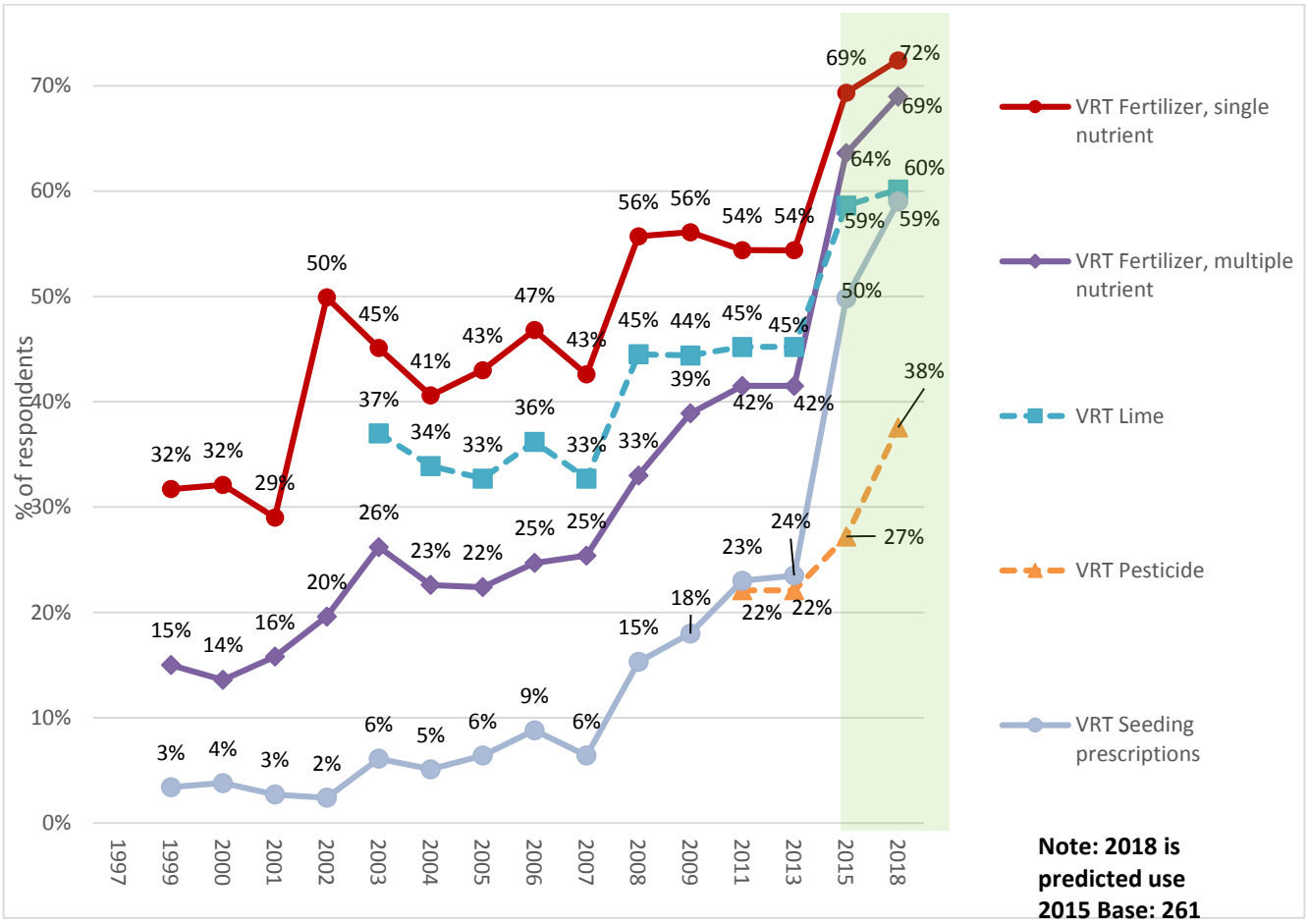

Figure 14. Precision Ag Services Offered Over Time, Site-Specific Technologies.

A Look at Soil Sampling

An important role of many agriculture dealers, especially of agronomic products and services, is helping producers manage soil nutrients. Soil sampling is often a big part of this.

One of the hallmark accomplishments of precision agriculture is the ability to pinpoint the exact location of the soil sample. The location information, as well as the sample results, can inform fertilizer recommendation rates, especially if the producer is looking to use variable rate application technology.

As part of the survey, respondents were asked about the soil sampling procedure they used. In Figure 15 two aspects are presented. In solid black, the overall soil sampling scheme is evaluated. Respondents reported using grid soil sampling practices the most, 75.4 percent of respondents. The second most common practice was the traditional practice of whole fields, nearly 64 percent. It's important to note it is likely a dealer could offer multiple ways of sampling soil and respondents were asked to report all practices that were applicable.

The second component of soil sampling included in Figure 15 is a deeper look at how dealers are using zone management, which nearly half of respondents reporting using. One third of respondents reported using soil mapping units to guide soil sampling zones, followed closely by using yield maps.

Only 7.7% of respondents reported they did not offer soil sampling services.

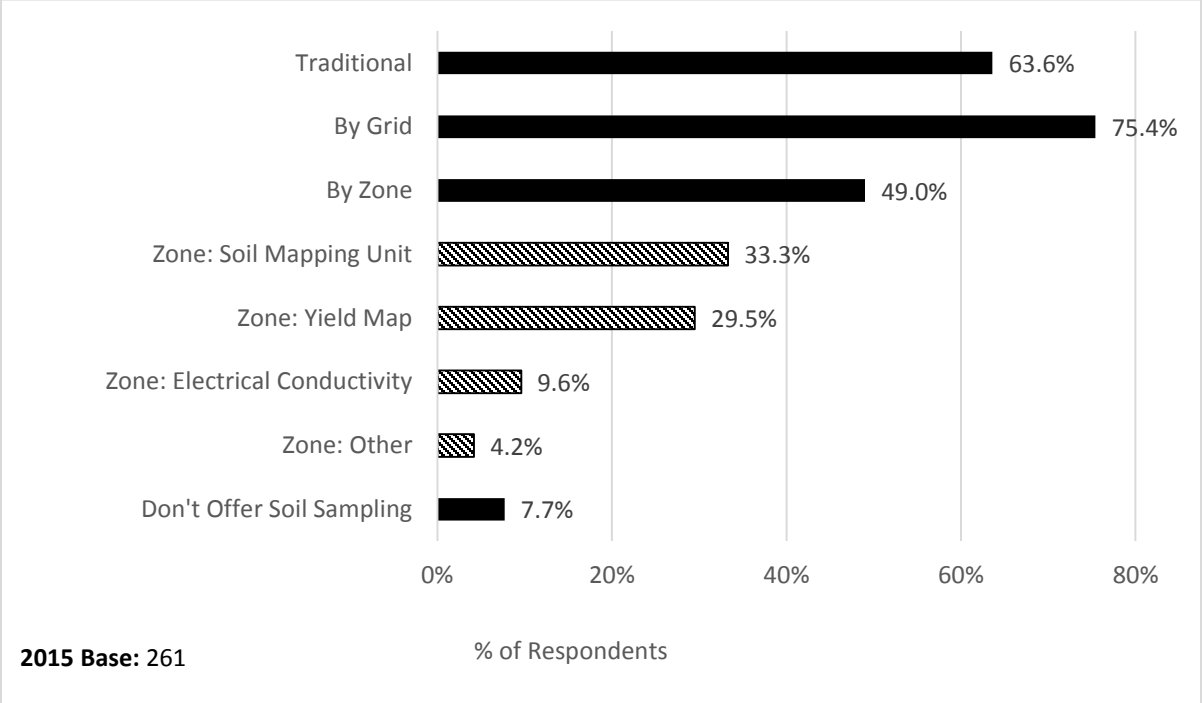

Figure 15. Types of Soil Sampling Offered.

Respondents were asked about the soil sample grid sizes offered, Figure 16. A full 71.7 percent of respondents reported using 2.5 acre grids, the most common. Grid sizes larger than 2.50 acres (2.51-5.00 acres) were more common (25.1 percent) than smaller than 2.50 acres (12.9 percent total).

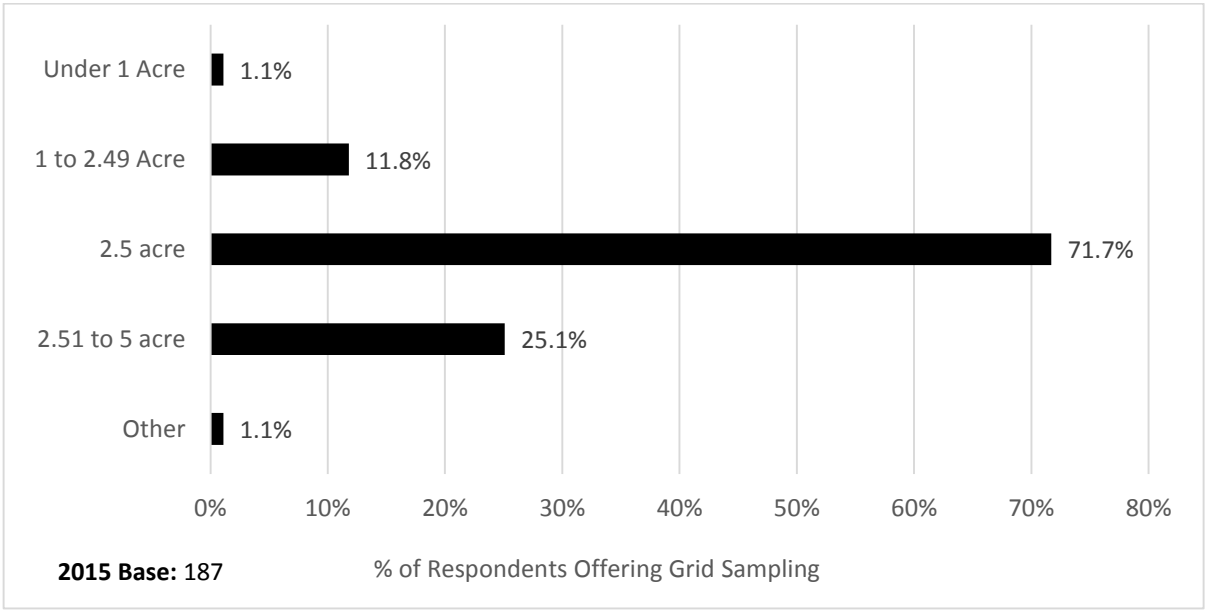

Figure 16. Grid Sizes Used in Grid Sampling.

VARIABLE RATE APPLICATION

Applying the correct products in the correct place at the correct rate has been one of the benefits of precision technology. This is typically accomplished with the use of variable rate technology (VRT). In the current survey, respondents were asked about the VRT services offered, Figure 17. Data are shown for current offerings of VRT services (2015) and anticipated planned offerings in three years (2018).

The most widely offered VRT service was single nutrient fertilizer application with nearly 70 percent currently offering. Close behind was multiple nutrient fertilizer application (63.6 percent) and lime application (58.6 percent). Lagging further behind was VRT pesticide application.

Another VRT service evaluated was the prescription of seeding rates. Currently nearly half of respondents reported offering the service. Over the next three years, dealers estimate they will increase their offerings of variable rate seed prescriptions by nearly 10 percent.

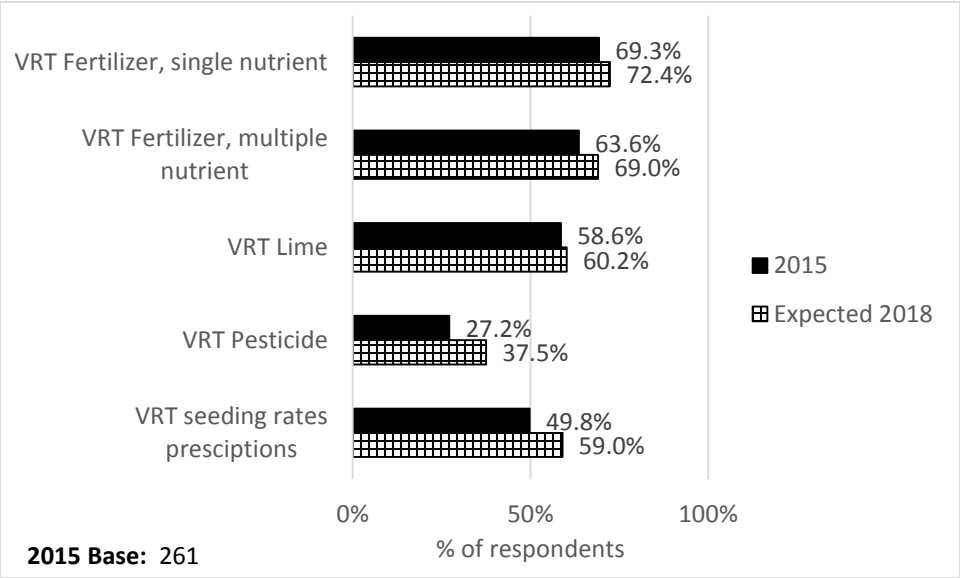

Figure 17. Variable Rate Application Offered.

ANALYSIS OF FARM DATA

Precision agriculture can provide an overwhelming amount of data from yield monitors, soil sampling, inputs applied to various fields and portions of fields, and other information. Often producers need assistance in gleaning these data for meaningful insights. In Figure 18, how dealers help customers manage farm-level data in decision-making is reported.

The most common way dealers report helping customers was printing maps, such as yield, soil electrical conductivity, and soil maps. Beyond printing maps, nearly 39 percent of dealers reported working with producers and using the data from their individual farms.

In addition to the farmer's individual data, nearly 20 percent of respondents reported working with farmers by using data aggregated from other producers within their dealership. 12 percent reported using data aggregated also from producers outside of the dealership.

Only 9.2 percent of respondents reported not helping customers with their precision farming data.

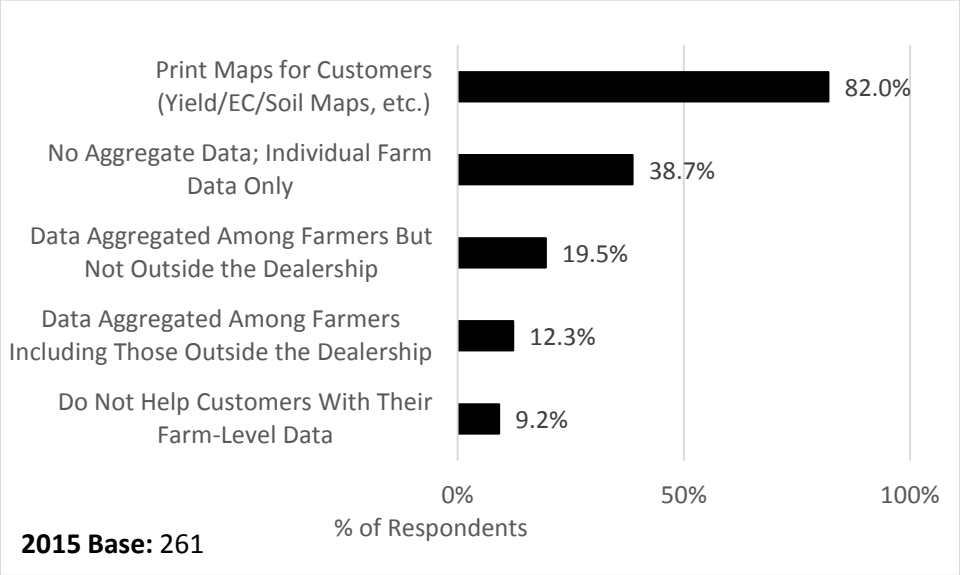

Figure 18. Managing Farm-Level Data to Assist Customers in the Decision Making.

PROFITABILITY OF PRECISION SERVICE OFFERINGS

Figure 19 Dealerships were asked to report on the profitability of the precision technology services they offer, Figure 19 and Figure 20. Respondents were asked to select the following categories that best matched the precision services they offer:

- I am not breaking even;
- I am breaking even;
- I am generating a profit; or
- I do not know.

Overall, 60 percent of respondents reported that they generate a profit from their total precision agriculture program, all components (Figure 19). This is less than the percentage of respondents that reported generating a profit from non-precision custom application services, 75.7 percent (Figure 19).

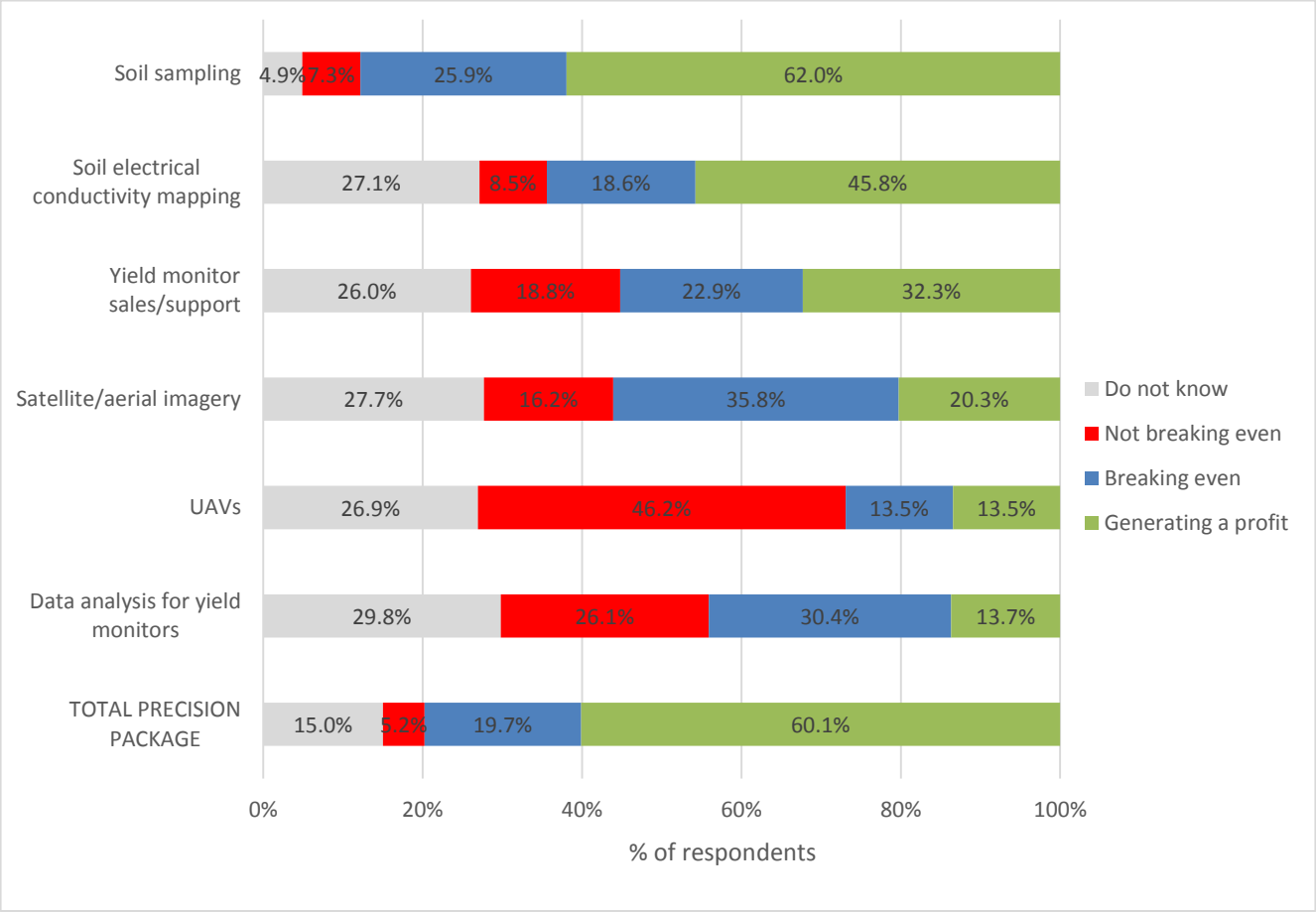

Figure 19. Profitability of Precision Service Offerings.

For specific precision services, nearly three-quarters of respondents reported generating a profit from the VRT application of fertilizer, both single and multiple nutrients (Figure 20). A majority of respondents, 62.0 percent, also reported generating a profit on soil sampling services.

The remaining services had less than 50 percent of respondents reporting a profit. Currently, UAV service is the precision service where dealers struggled the most to generate a profit (46.2 percent not breaking even,

Figure 19) followed by data analysis for yield monitors (26.1 percent not breaking even,

Figure 19), and VRT seeding prescriptions (18.7 percent not breaking even, Figure 20).

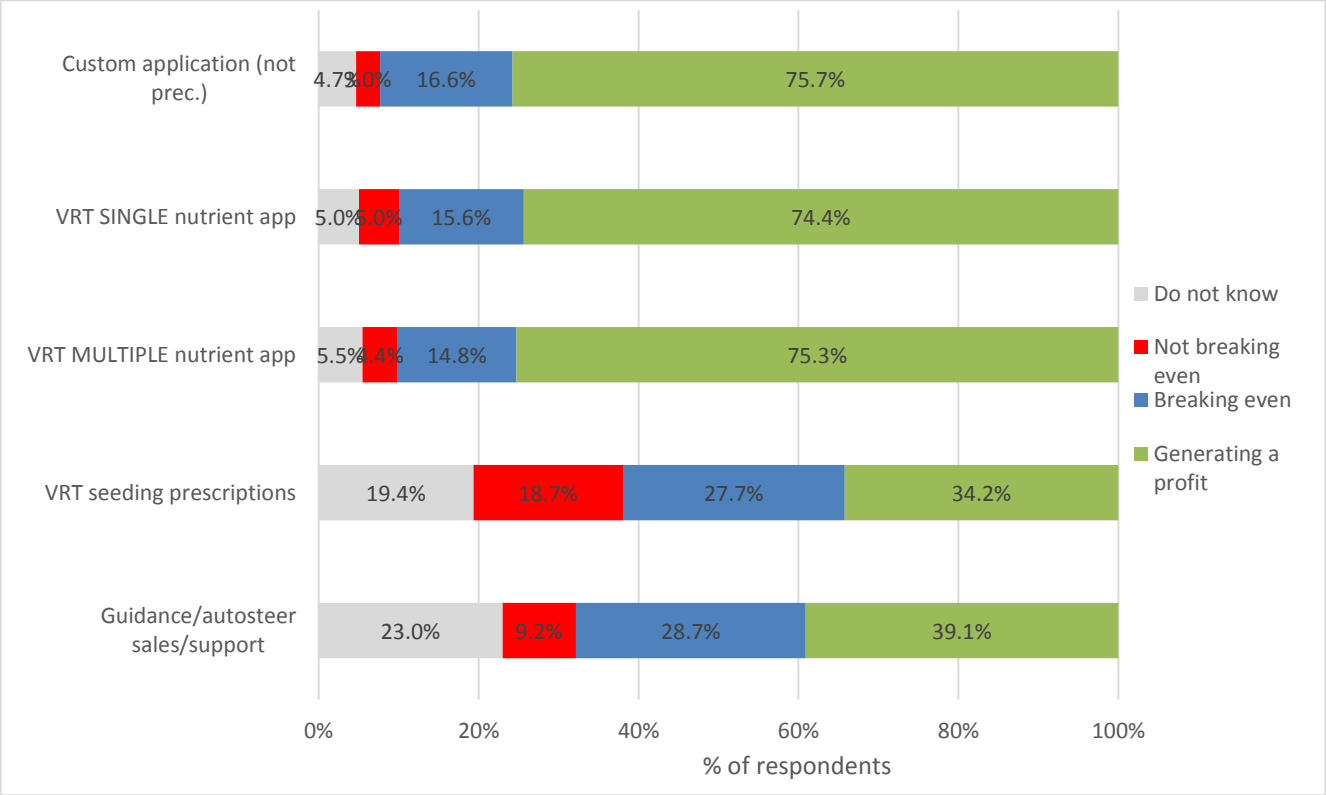

Figure 20. Profitability of Precision Service Offerings (cont.).

These data have been collected over time, Figure 21. For most services, a higher share of respondents have reporting generating profits over time. However, satellite imagery and yield monitor data analysis have shown a downward trend with fewer respondent generating a profit over time.

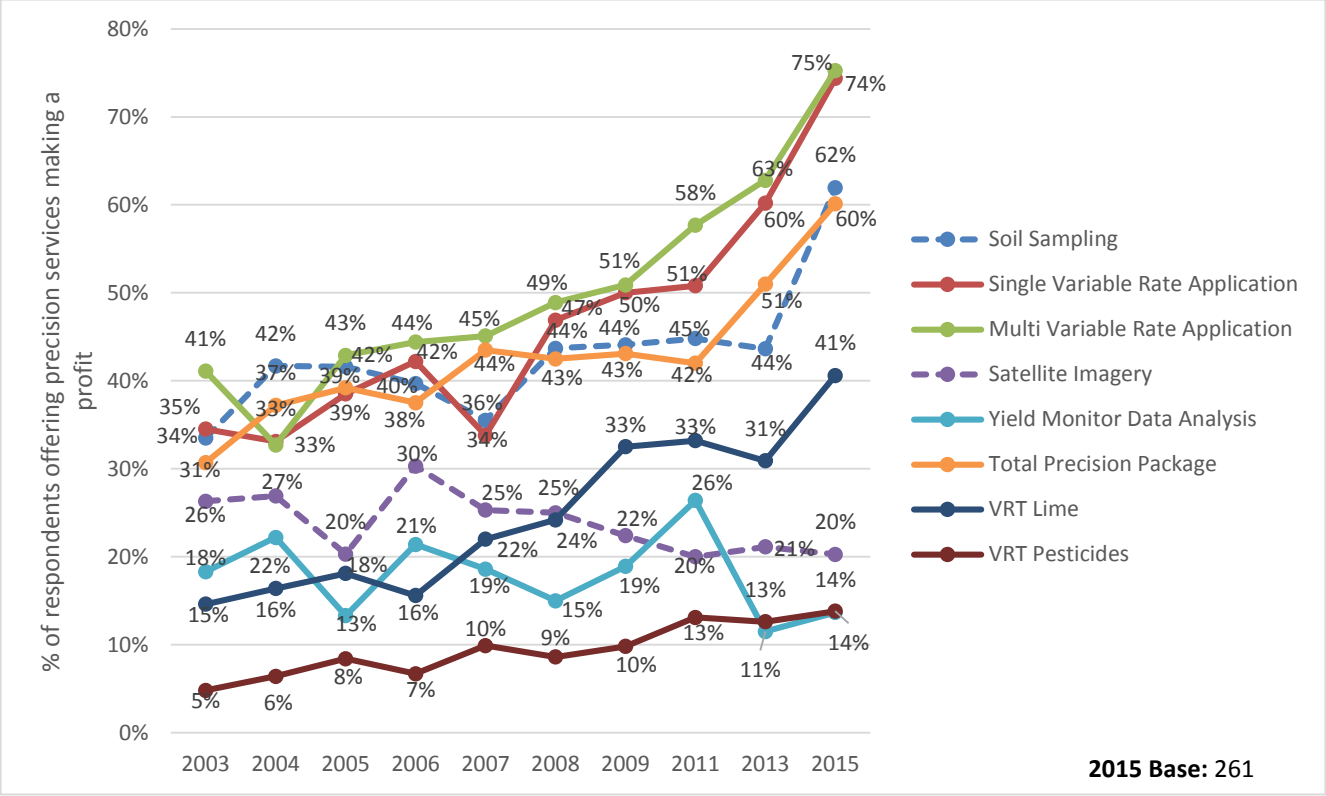

Figure 21. Respondents Generating a Profit from Precision Services.

PRODUCER'S USE OF PRECISION TECHNOLOGIES

While the survey focuses primarily on the technologies used and services offered by precision agricultural dealers, these dealer's insights into their customer's practices offers a different look into the adoption of precision technologies. As part of the survey, respondents were asked to report on the share of acres in their market area that are utilizing various precision technologies, both now and in the future.

In Figure 22 the mean estimated share of acres using various application services, both in 2015 and estimated for 2018, are shown. Overall, VRT lime application was the highest reported usage; this is a deviation from what was observed from what dealers are offering in Figure 17.

Figures 23 to 25 highlight dealers' estimation of producer usage of other precision technologies. Figures 26 to 28 show the estimated use of precision technology across acres for select technologies over time.

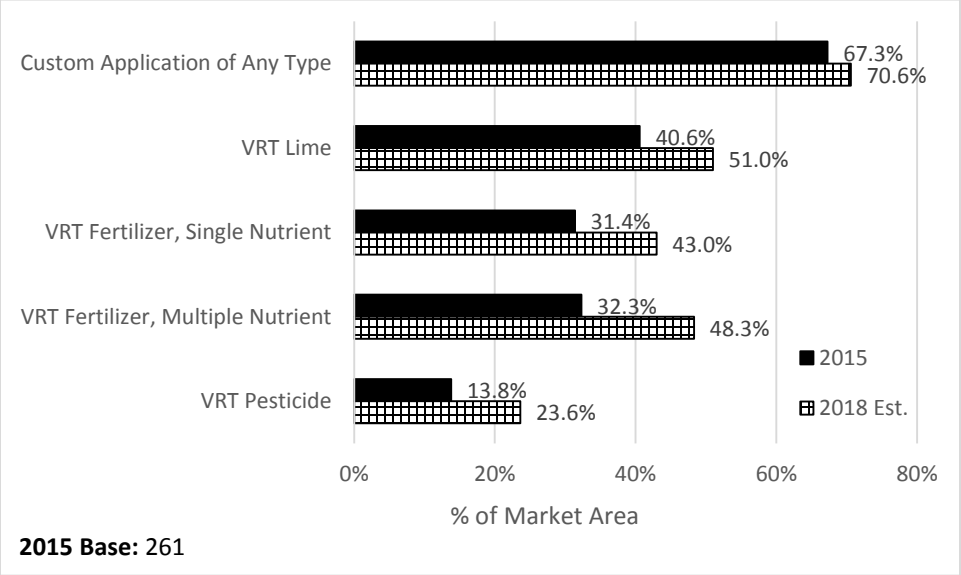

Figure 22. Estimated Market Area Using Application Services, 2015 and Estimated for 2018.

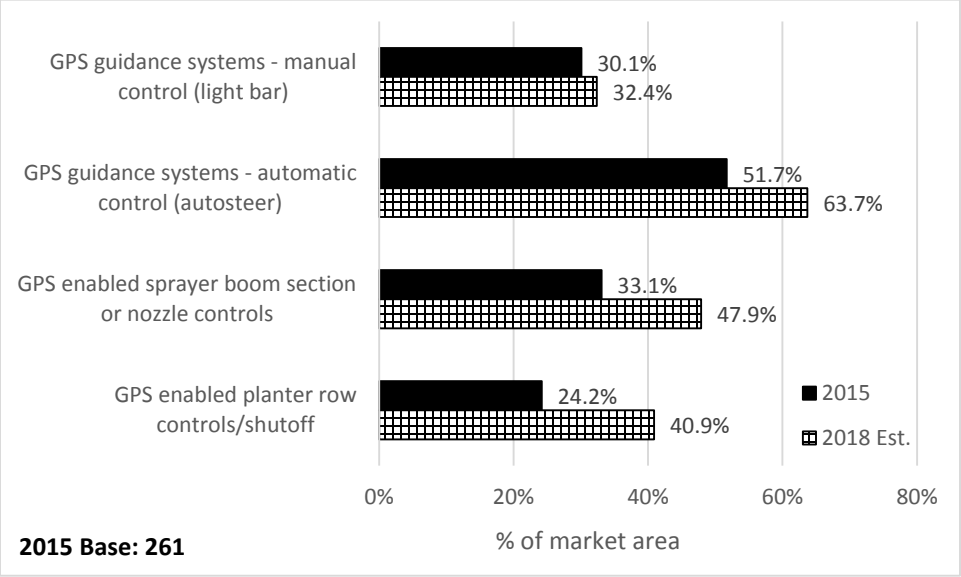

Figure 23. Estimated Market Area Using Precision Guidance and Control, 2015 and Estimated for 2018.

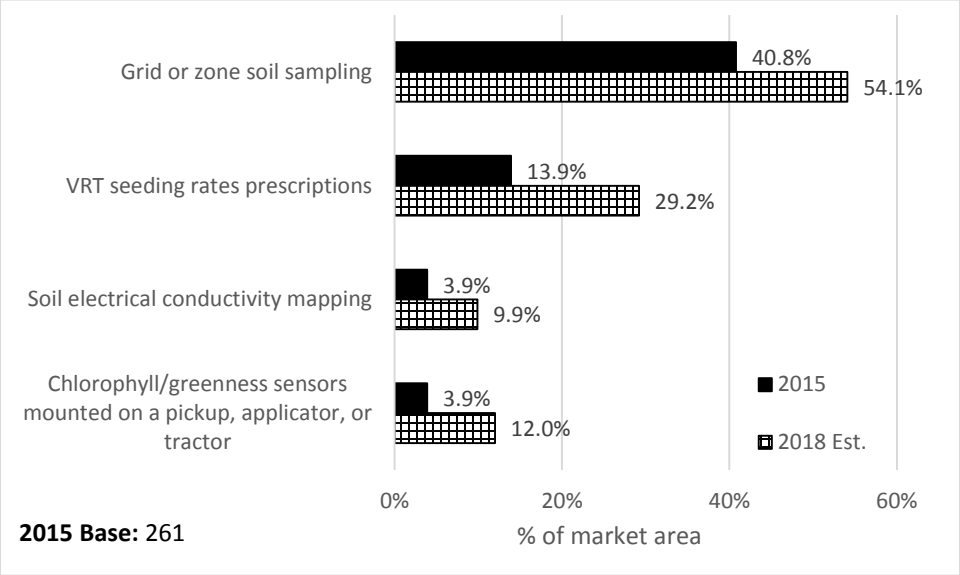

Figure 24. Estimated Market Area Using Precision Sensors and Variable Seeding.

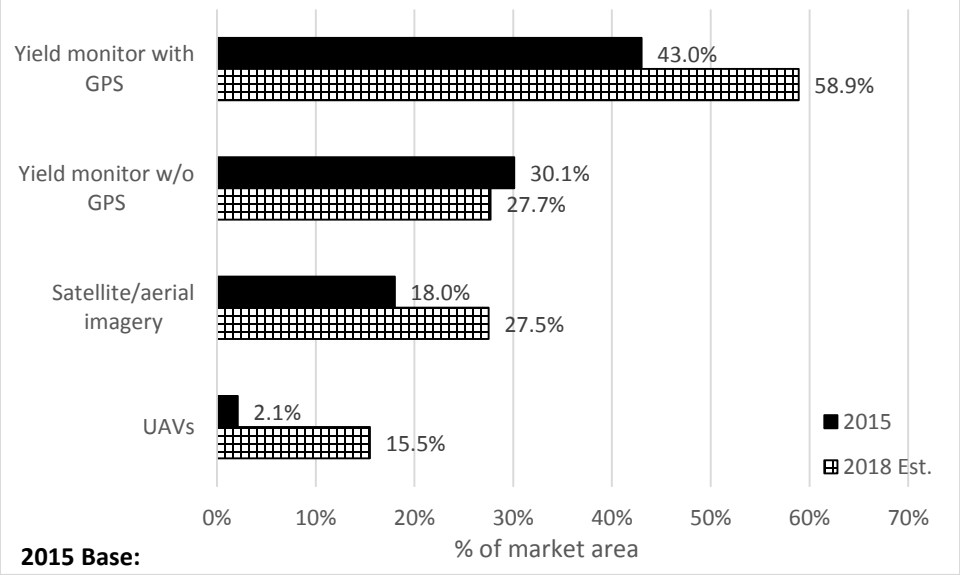

Figure 25. Estimated Market Area Using Field Mapping, Yield Monitors, and Satellite Imagery.

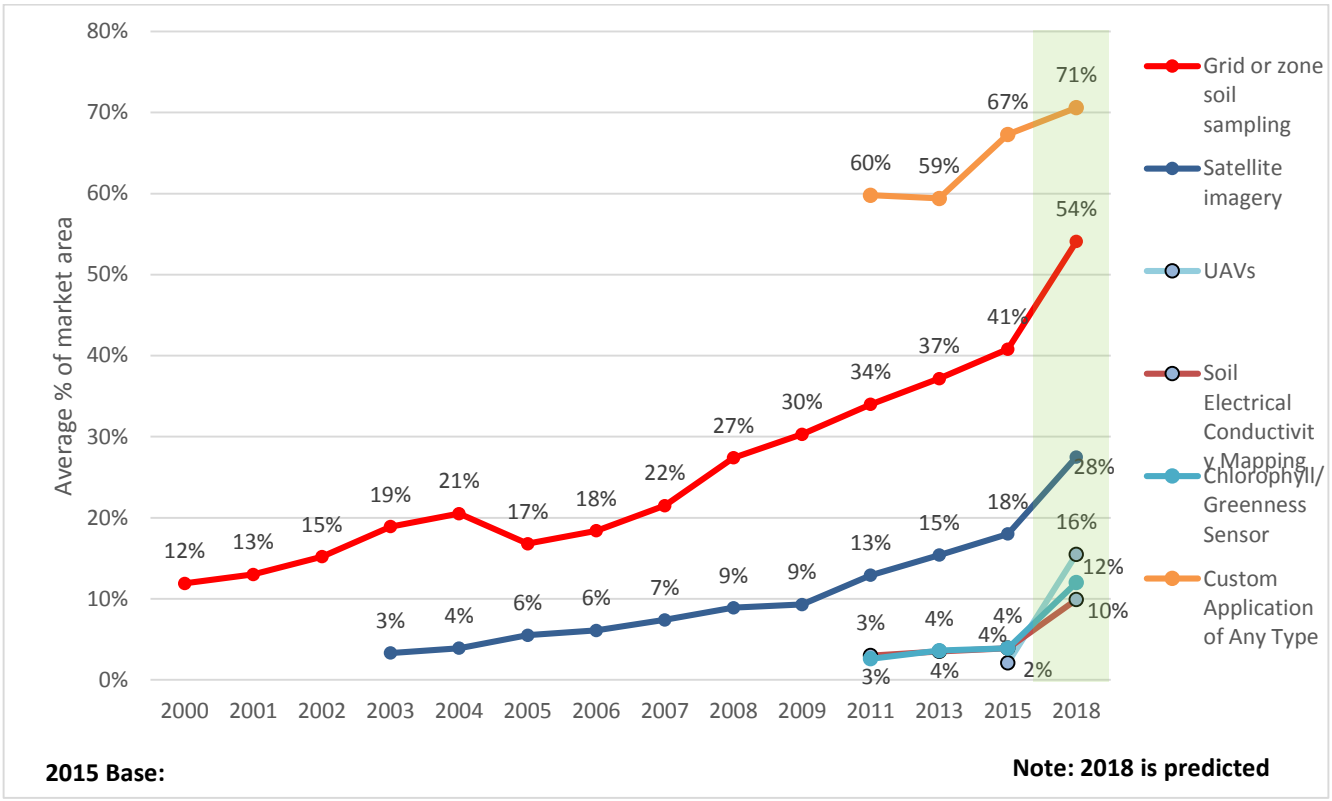

Figure 26. Estimated Market Area Using Precision Services over Time.

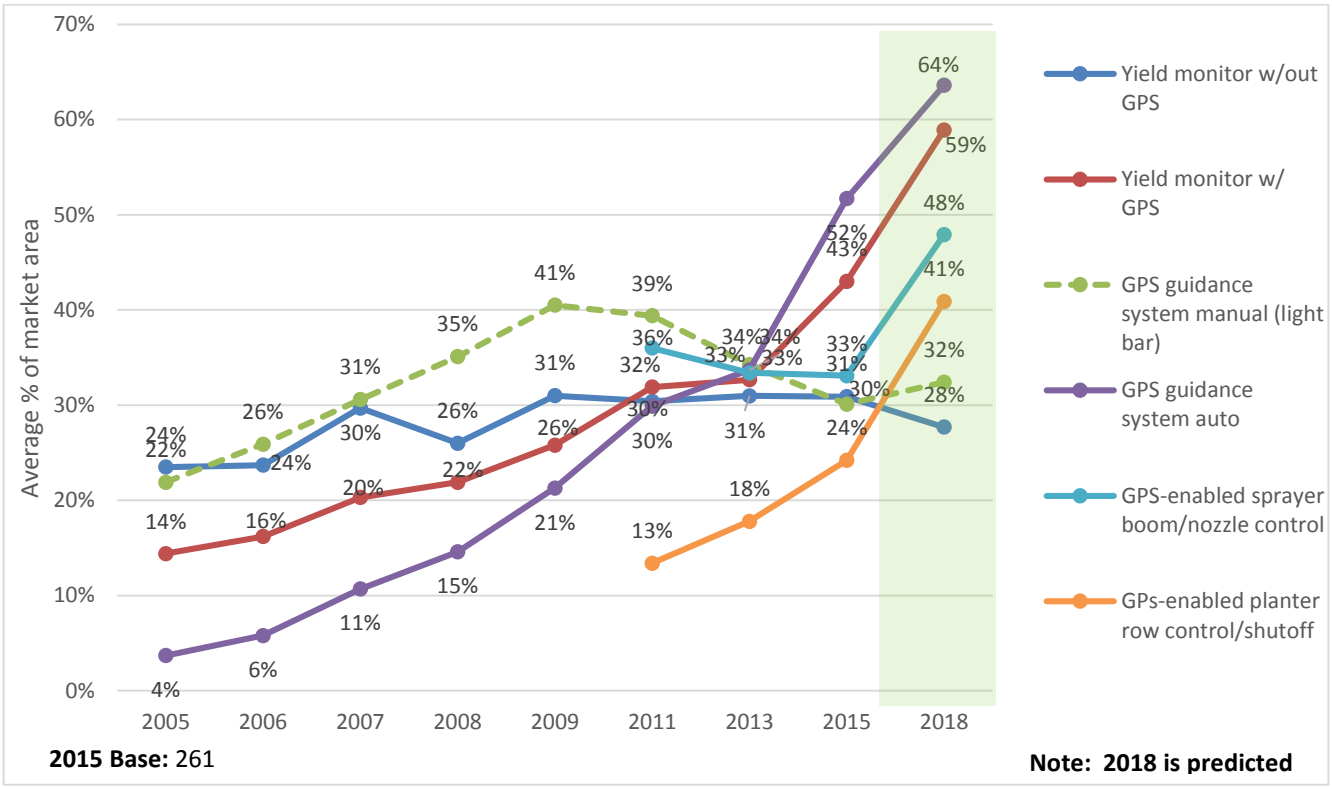

Figure 27. Estimated Market Area Using Yield Monitors and Guidance Systems over Time.

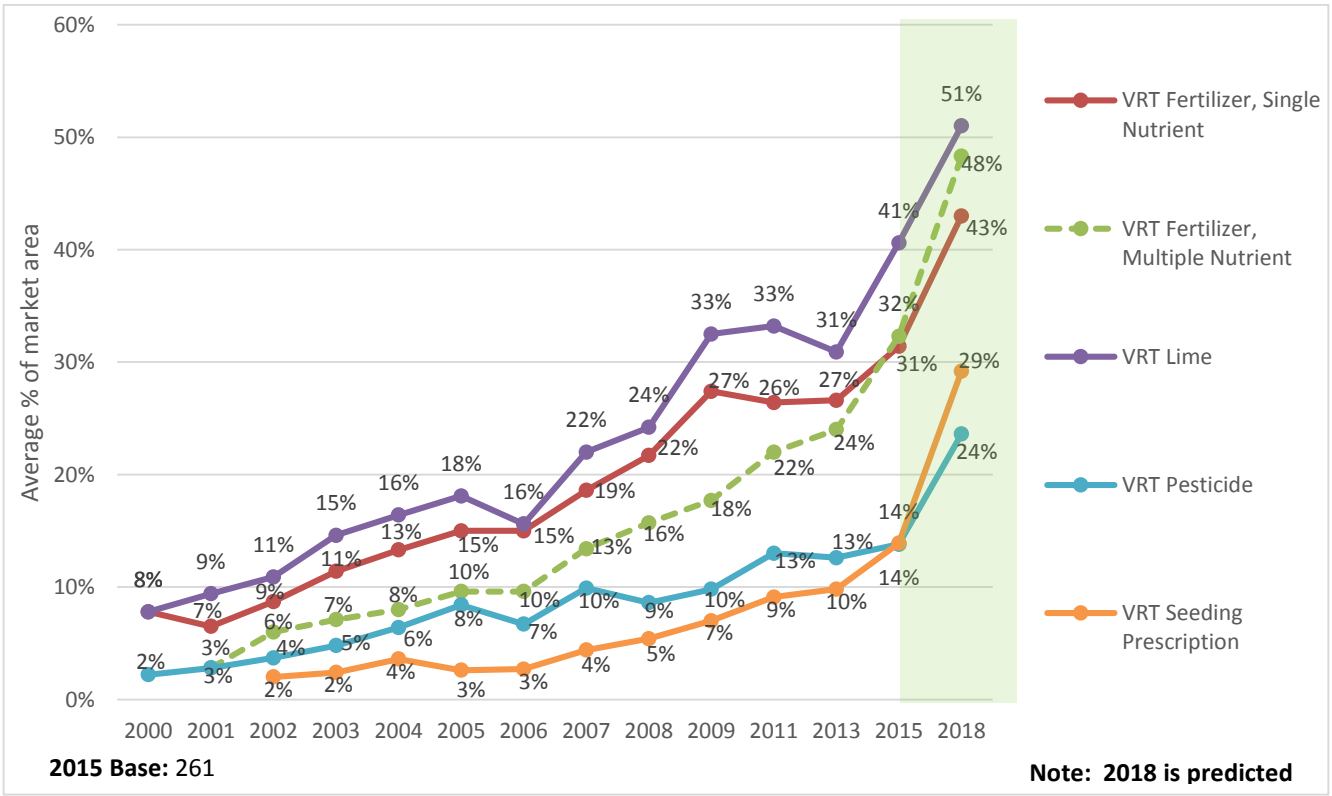

Figure 28 Estimated Market Area Using VRT Technology Over Time.

FUTURE INVESTMENT PLANS

Producers were asked about their investment plans in 2015 for precision technologies. Respondents were asked to select the investment range that fits their plans,

Figure 29. Across the board, plans for investment in precision agriculture in 2015 are up. Those planning no investment are at survey lows while those planning larger investments, more than $25,000, are at survey highs.

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

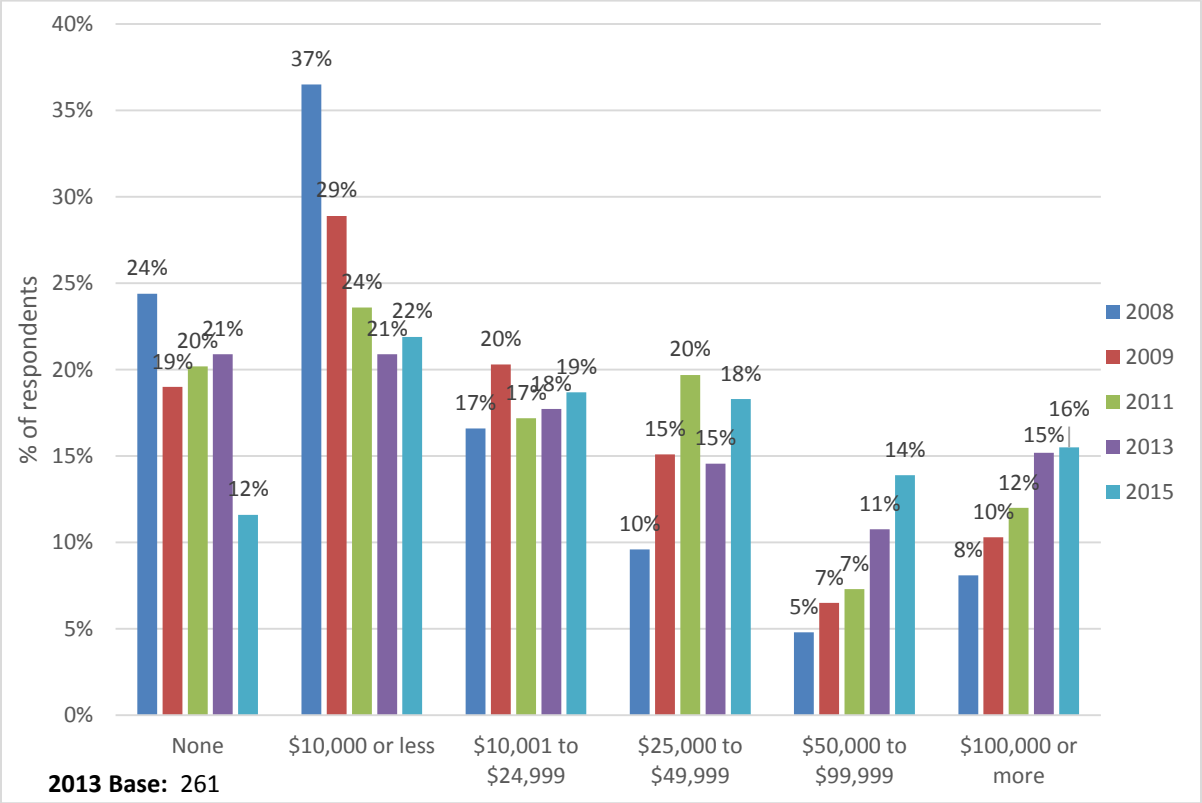

Figure 29. Expected Investment in Precision Technology.

BARRIERS TO GROWTH AND EXPANSION

Across the survey we've seen that adoption rates for precision technologies and related services are always less than 100% of the market and the adoption rates 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. There barriers were evaluated at the aggregated precision agriculture level; specific technologies were not evaluated.

Producer Barriers

In Figure 30 dealer perception of potential producer barriers to expanded use of precision agriculture is shown. The share of respondents that agree (agree/strongly agree) and disagree (disagree/strongly disagree) are shown.

The only evaluated barrier in which more respondents agreed than disagreed is farm income pressure. 49 percent agreed while only 20 percent disagreed income was an adoption barrier. This is a sharp departure from the other evaluated barriers.

Additionally, farm income pressure stands out when the barriers are evaluated over time, Figure 31. Farm income pressure ticked-up significantly since 2013 and is rivaling 2009 levels.

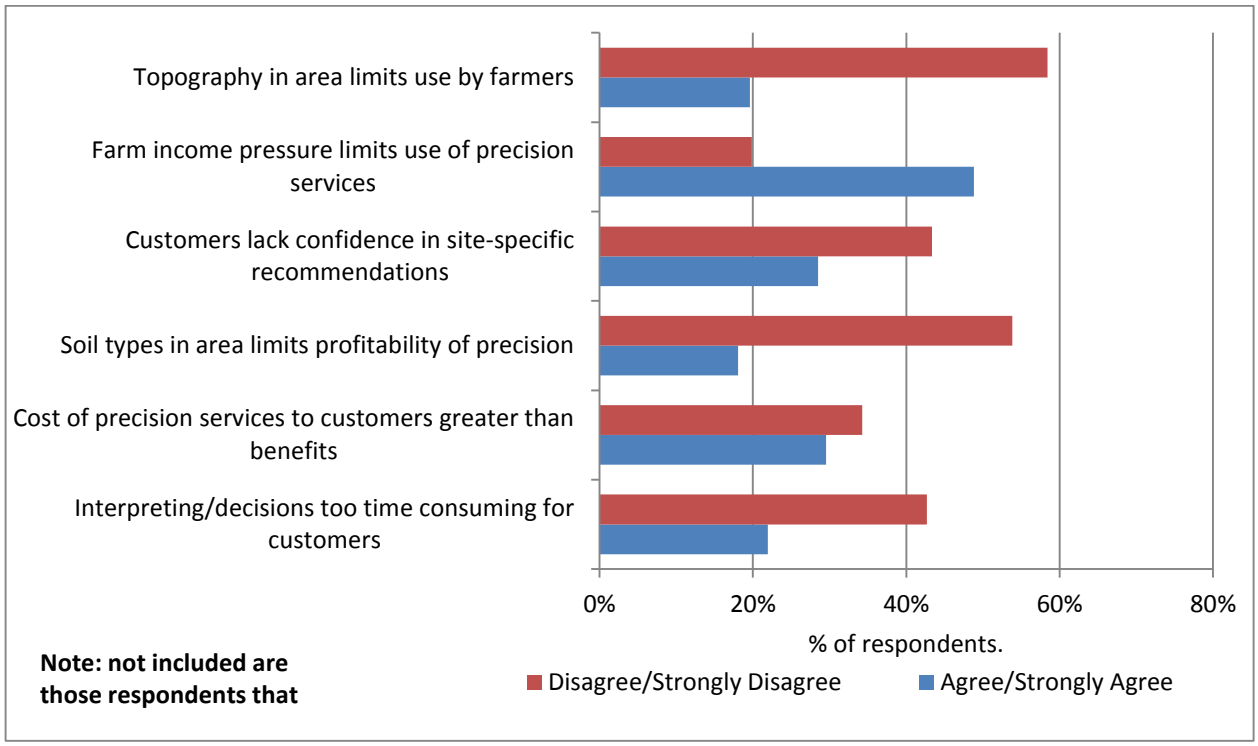

Figure 30. Customer Issues that Create a Barrier to Expansion/Growth in Precision Agriculture.

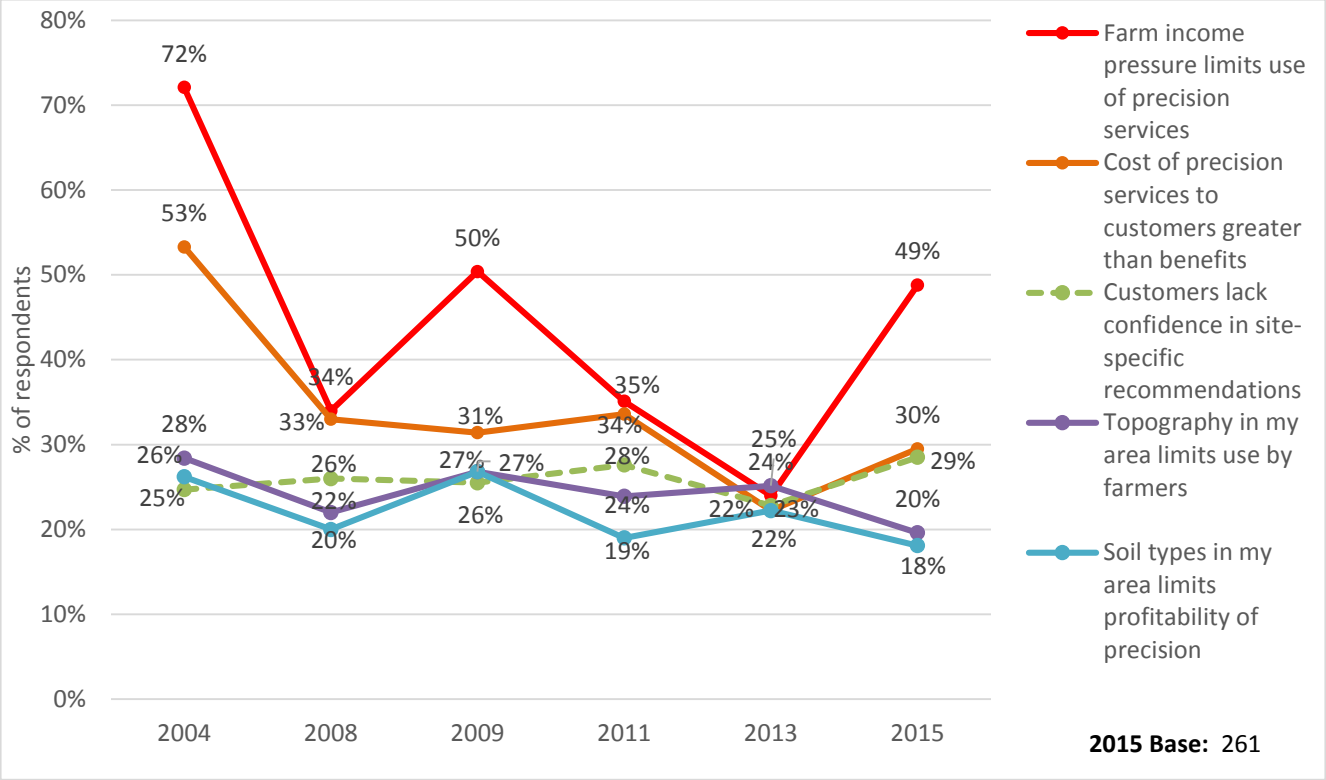

Figure 31. Percent of Respondents who Agree/Strongly Agree that Customer Issues Create a Barrier to Expansion/Growth in Precision Agriculture Over Time.

Dealer Barriers

When asked about the barriers dealers face, a range of responses were reported. In Figure 32, the barriers in which the respondents most agreed are with equipment needs changing quickly, inability to charge high enough fees, incompatibility across equipment, and finding employees. The barriers they disagreed the most with are challenges creating a better program with precision technology (compared to traditional programs) and a lack of manufacturer support.

When evaluated over time, Figure 33, changes in precision agriculture equipment occurring too quickly had a large increase since the previous survey (45% in 2013 to 56% in 2015).

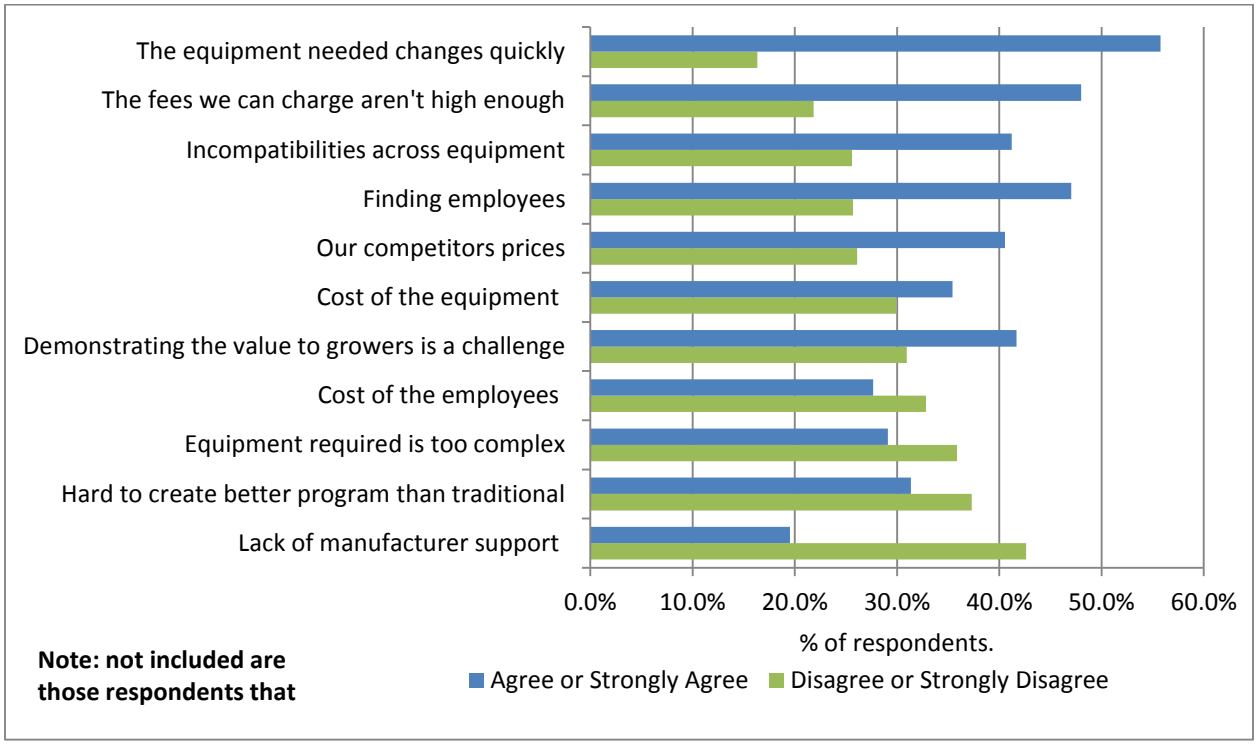

Figure 32. Dealer/Technology Issues that Create a Barrier to Expansion/Growth in Precision Agriculture.

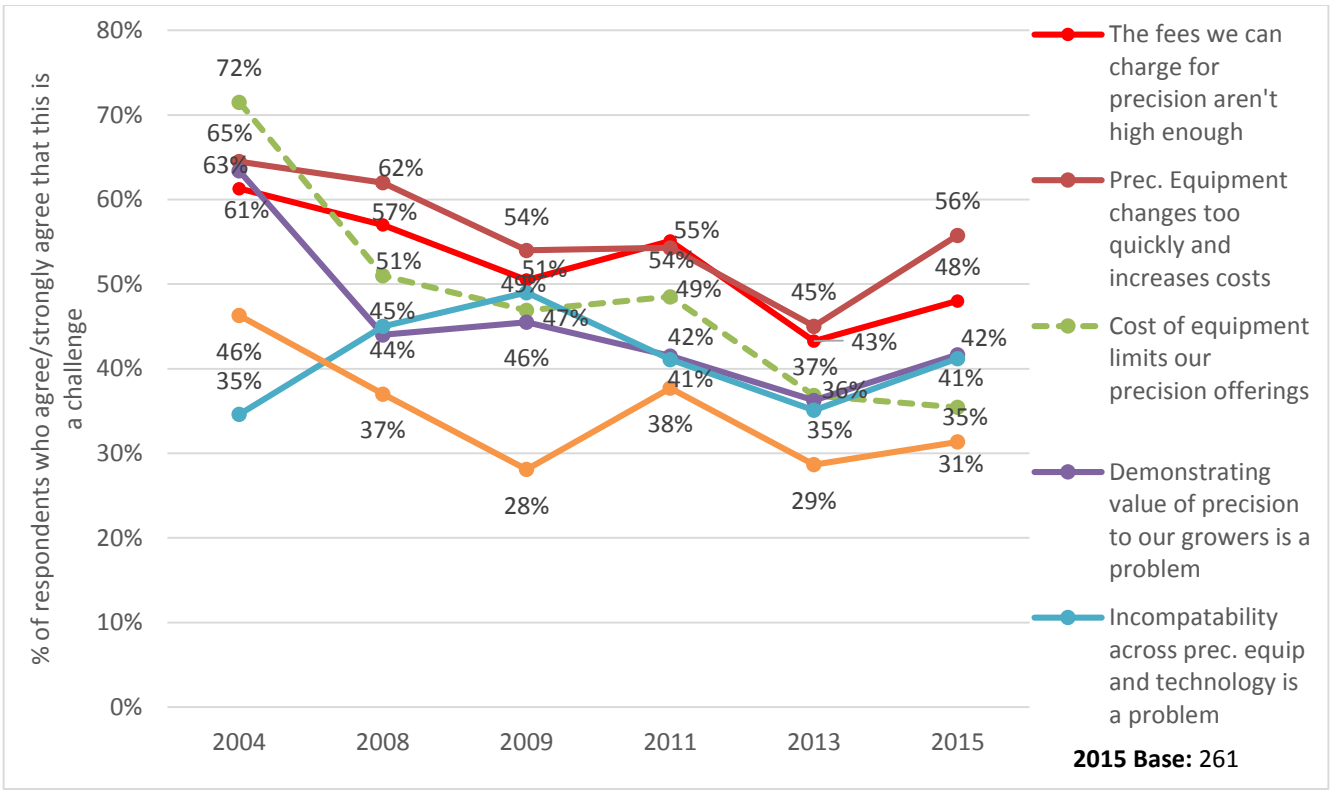

Figure 33. Dealer/Technology Issues that Create a Barrier to Expansion/Growth in Precision Agriculture Over Time (Share agree/strongly agree).

THE HUMAN ELEMENT OF PRECISION AGRICULTURE

An addition to this year's survey was a look into the human resources side of precision farming. We have long asked dealers to what extent they felt finding employees to work in precision agriculture was a barrier to their adoption of precision technologies and their offerings to customers. But this year questions regarding the skills and capacities of precision agriculture employees were evaluated. Figure 34 reports the mean scores of importance for various pre-selected skills for a new hire working in precision agricultural services at a dealership. Figure 35 shows the share of respondents reporting the skills as important or essential (blue) or having little or no value (red).

Overall dealers valued the skills related to agronomic knowledge and communicating precision concepts more than technical skills related to working with precision farming, such as the ability to calibrate a monitor or run the software. But there was a fair amount of disagreement in the importance of some factors among dealers. The highest variation in responses was the value of being a Certified Crop Adviser, a certification related to agronomic skills (Figure 36).

To get at the heart of issues related to skills, we offered dealers an ultimatum question. Would you prefer a candidate with a strong technology background, but weak agriculture experience, or a candidate with a strong agriculture background but weak technology experience? Two-thirds of respondents reported a preference for the candidate with a strong agricultural background, Figure 37.

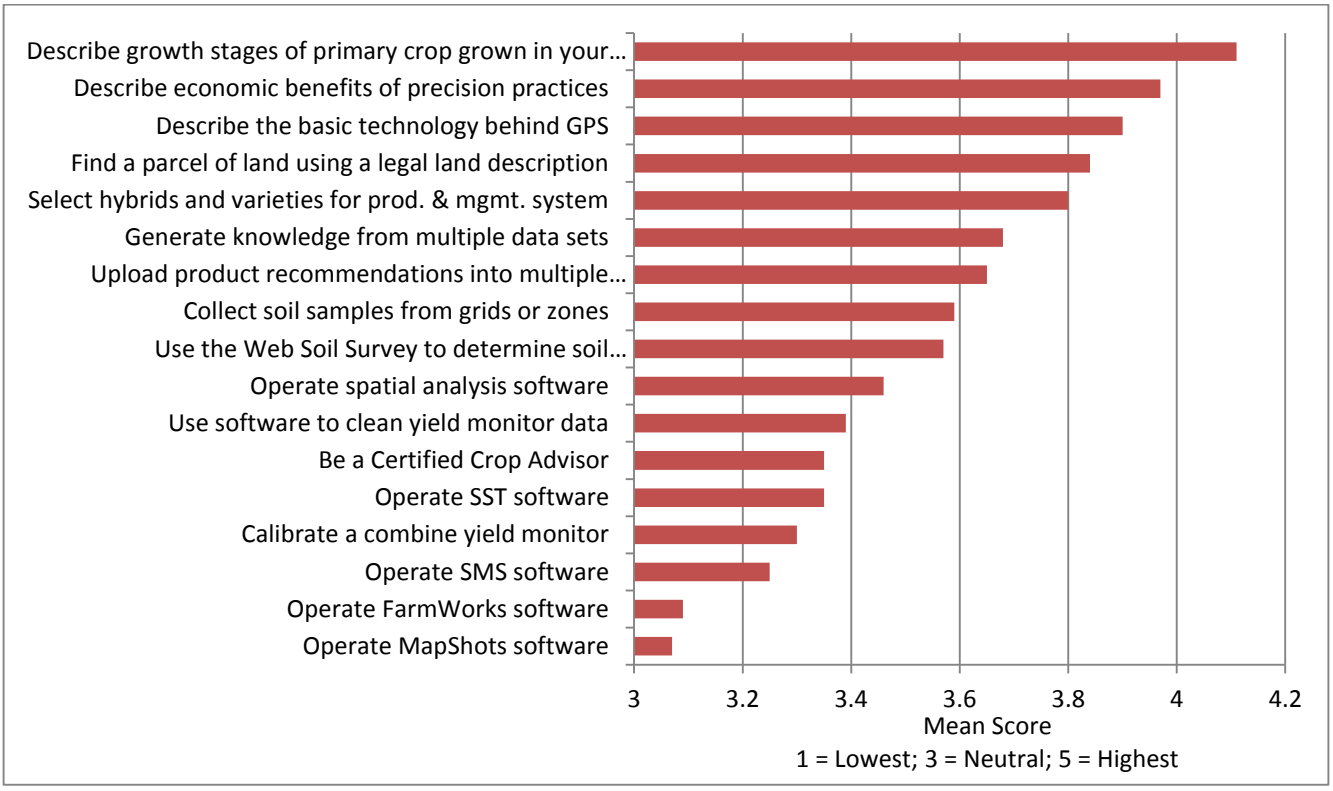

Figure 34. Evaluation of Skill for an Entry-Level Precision Agriculture Position. Mean Scores.

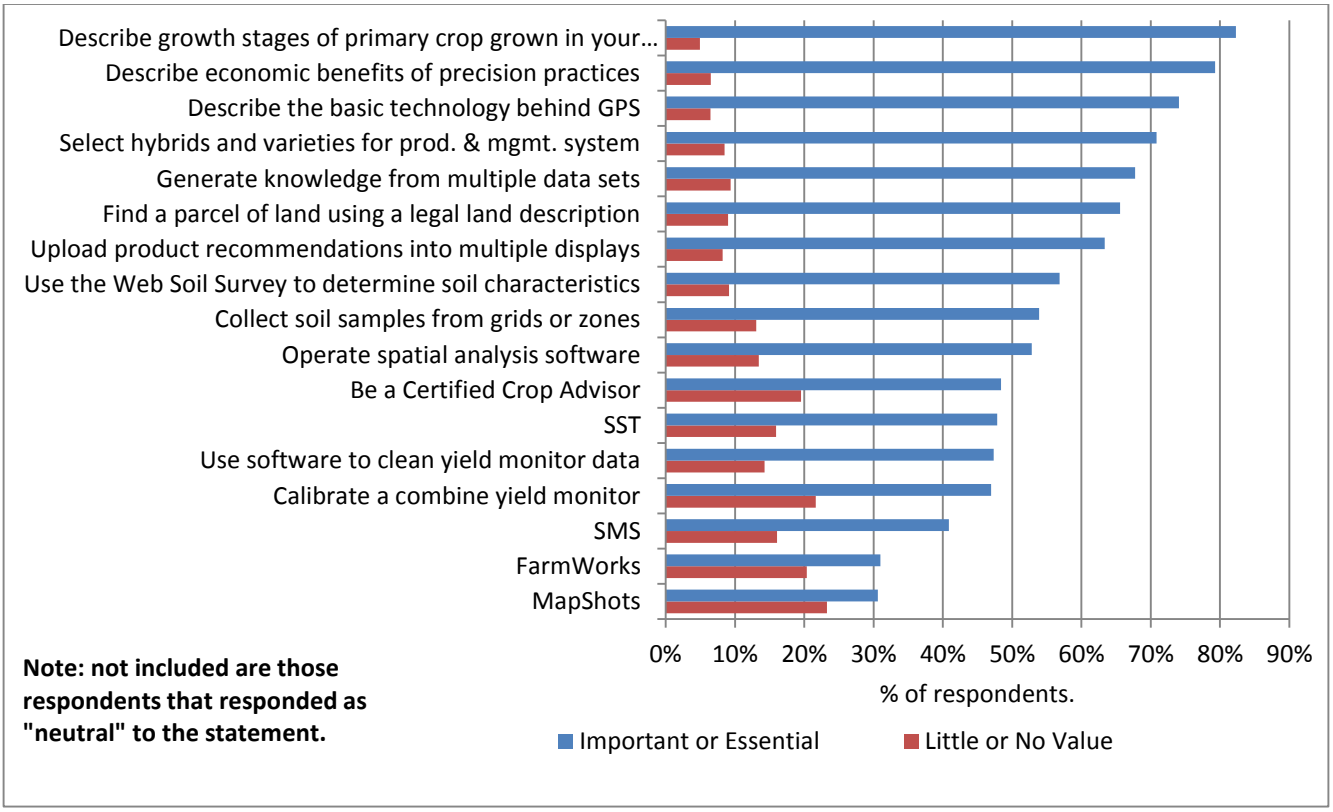

Figure 35. Evaluation of Skill for an Entry-Level Precision Agriculture Position.

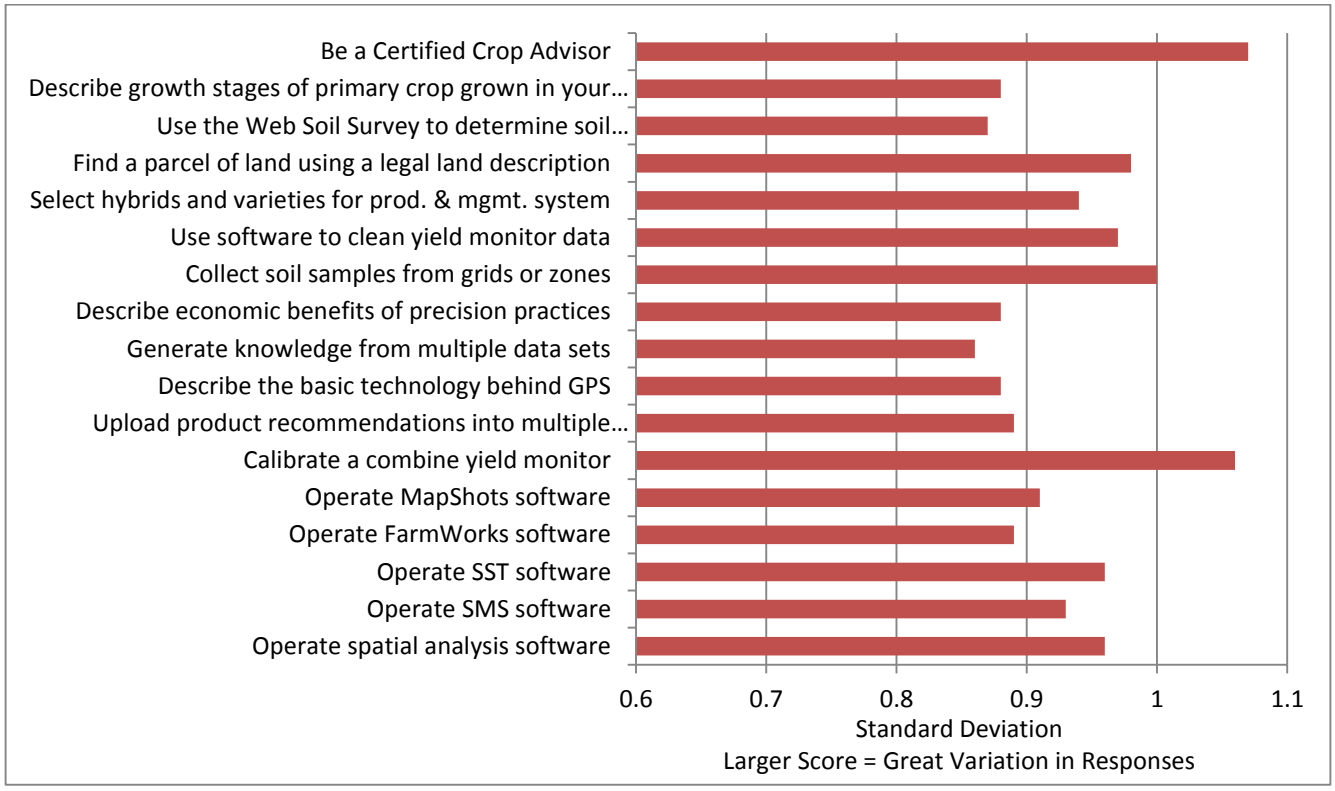

Figure 36. Evaluation of Skills for an Entry-Level Precision Agriculture Position. Standard Deviation in Responses.

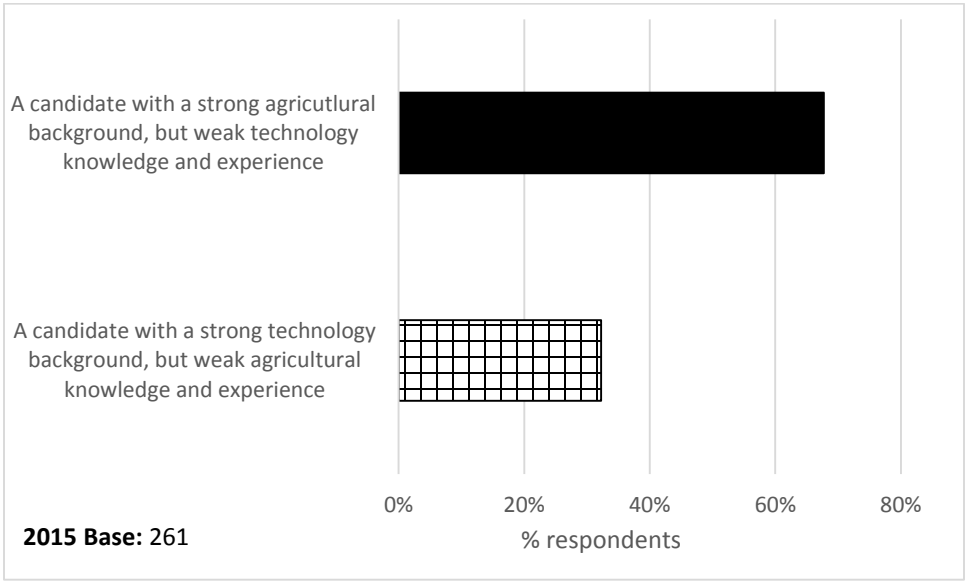

Figure 37. Priority of Entry-Level Precision Agriculture Position.

SUMMARY

Precision farming is a set of related technologies that aims to increase the exactness of field operations related to crop production, with benefits realized in increased efficiency of crop inputs and higher crop productivity. This survey spans the entire two decades since agricultural retailers 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 spatial variability in fields.

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 ubiquitous among farms and dealerships in the U.S. And the automated technologies of sprayer boom section and row controllers on planters that are an offshoot of guidance.

While autoguidance and autocontrols on inputs are now mostly standard, the information side of precision farming continues to struggle in demonstrating value. Guidance and section controllers don't depend on site-specific information to extract value, only location, and for the most part they help reduce input costs with a usually low amount of input needed by the dealer or farmer. But taking 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—this has been a greater challenge than many would have predicted two decades ago.

The 2015 survey, though, shows significant upticks in the adoption of site-specific, information intensive technologies. Not only technologies related to the collection of this information, but in technologies related to site-specific application, such as variable rate technologies. Some of this increase may be related to our increased capability to store, move, and analyze all of this information compared to twenty years ago. This includes much lower costs and much greater capacity to store data, through locally connected devices or the cloud. Better connectivity using telematics via cell phone networks or through increasingly common fiber optic connections. Computers with processing speeds that are multiples of just a few years back. And an emerging labor force working in ag retail that has never known a world without cell phones and the Internet.

Appendix I: GPS Guidance Terminology

GPS: (Global Positioning System) – The satellite-navigation network maintained by the United States Department of Defense. Also, the term "GPS" is often treated more generically to refer to any device that depends on navigation satellites for functionality. The entire world's system is referenced as the Global Navigation Satellite System, or GNSS.

RTK: (Real Time Kinematic) – refers to highly-accurate, highly-repeatable positioning. With RTK, a base station receiver is placed on a stable mount, allowing multiple GPS rover receivers to utilize this type of correction within a limited range of the base station.

DGPS: (Differential GPS) - refers to techniques used to enhance accuracy, integrity, reliability, and availability of GPS data. The following are all examples of DGPS:

WAAS (Wide Area Augmentation System):

- Free service offered through Federal Aviation Administration (FAA)
- Ground-based reference stations plus 2 geostationary satellites
- Point accuracy: 9-15 feet; Pass-to-pass accuracy: 6-12 inches

RTK array/cluster (Deere, Trimble, etc.):

- Annual subscription
- Cost and point accuracy varies by the service and technologies being used

Satellite correction (OmniSTAR XP, StarFire 2, etc.)

- Service offered by several companies using a correction
- Some services are free while others require a subscription and the receiver in the tractor to be specific to the company offering the service

Personal RTK base station (fixed or portable)

- Line of sight correction
- Grower positions stationary base station in the best location to cover his acreage, or moves a portable base around with from field to field to get the best signal
- Can be more expensive than using a service but better positioned for an individual's needs

RTN (real time network)

- Generic term for a correction service offering more reliability than a single-station RTK.
- Several CORS or RTK base stations are connected in a "mesh" so correction data can be used from multiple locations to increase accuracy, reliability, and the distance covered.
- Offered by several companies, however often associated with a subscription fee.

CORS (Continually Operating Reference Station)

- Coordinated by National Geodetic Survey of National Oceanic and Atmospheric Administration (NOAA)
- Survey-grade GPS receiver is positioned in a fixed position providing continuous RTK-correction for receivers with Internet-accessible capabilities

Appendix II: 2015 Precision Ag Survey

17th PRECISION AG SURVEY

CropLife • Purdue Center for Food and Agricultural Business• • Purdue Department of Agronomy • PURDUE UNIVERSITY

Play a part in agricultural history! *Please fill out and return this brief survey in the enclosed pre-addressed, postage-paid envelope, and send to:*

CropLife, *37733 Euclid Ave., Willoughby, OH 44094; Fax: 440-942-0662.*

PLEASE RETURN BY FEBRUARY 20, 2015.

1. Your primary responsibility: [*check one*]

☐ Owner/general manager/location manager ☐ Departmental manager
☐ Precision manager ☐ Application manager
☐ Technical consultant/agronomist ☐ Sales/sales management
☐ Other: _____(Please specify)

2. Are you a: [*check one*]

☐ Cooperative ☐ Independent dealership
☐ Part of a national or regional (multi-state) chain of retail dealerships (not a cooperative)
☐ Other: _____(Please specify)

3. What were the **total annual retail sales** (in dollars) of agronomic products and services (fertilizer, chemicals, seed, services) **at this location** in 2012?

☐ Under $1,000,000 ☐ $3,000,000 - under $5,000,000
☐ $1,000,000 - under $2,000,000 ☐ $5,000,000 – under 7,000,000
☐ $2,000,000 - under $3,000,000 ☐ $7,000,000 or more

4. How many total retail outlets does ***your company*** own or manage? [*check one*]

☐ None ☐ 1 ☐ 2-5 ☐ 6-15 ☐ 16-25 ☐ More than 25

5. In a typical year how many total acres do you custom apply **at your location** (fertilizer, chemicals, seeding – total acres including multiple applications)? [*check one*]

☐ None >go to Question 9
☐ Under 10,000 acres ☐ 25,001 to 50,000 acres ☐ 75,001 acres to 100,000 acres
☐ 10,001 to 25,000 acres ☐ 50,001 to 75,000 acres ☐ Over 100,000 acres

6. In 2014, approximately what proportion of your total fertilizer sales were custom applied? _____%

7. In 2014, approximately what proportion of your total herbicide/pesticide sales were custom applied? _____%

8. In 2014, approximately what proportion of your total custom application (total acres, all products) used:

GPS guidance systems with manual control (light bar)? _____% "0" if None
GPS guidance systems with automatic control (autosteer)? _____% "0" if None
Auto sprayer boom section or nozzle control _____% "0" if None

9. Do you offer soil sampling — traditional, following a grid pattern and/or by management zone? (check all that apply)

☐ Traditional ☐ **Don't offer soil sampling**
☐ Grid pattern — Grid size most commonly used?
☐ < 1 acre ☐ 1 ac. - 2.49 ac. ☐ 2.5 ac. ☐ 2.51 ac. - 5 ac. ☐ Other:_____
☐ Management Zone
☐ By soil mapping unit ☐ By electrical conductivity
☐ By yield map ☐ By other (specify): _____

10. In which of the following ways does your dealership use precision technology? (check 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
☐ Satellite/aerial imagery for internal dealership purposes
☐ UAV or drones
☐ Soil electrical conductivity mapping
☐ Other soil sensors for mapping, mounted on a pickup, applicator or tractor (example: pH sensor)

10 continued. In which of the following ways does your dealership use precision technology? (check all that apply)

- ☐ 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
- ☐ Auto sprayer boom section or nozzle control
- ☐ **Do not use precision technology**

11. Answer the following only if you use GPS guidance systems with automatic control (autosteer) for fertilizer/ chemical applications:

What type of GPS correction do you use for your guidance applications? (check any/all that apply)

- ☐ Utilize WAAS (Wide Area Augmentation System)
- ☐ Purchase satellite correction (i.e., OmniSTAR XP or HP, StarFire 2)
- ☐ Personal RTK base station (fixed or portable)
- ☐ Purchase correction from RTK array/cluster (i.e., Deere, Trimble)
- ☐ Utilize CORS (Continually Operating Reference Stations)
- ☐ Purchase RTN (Real Time Network) connection (i.e., Trimble ARS Now, Leica iMAX)
- ☐ **No GPS guidance system with automatic control**
- ☐ Other (specify)

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

Service	By Fall 2015	Offer by 2018	Never/ Don't Know	Don't offer now but did
Field mapping (with GIS)	☐	☐	☐	☐
Variable rate technology (VRT)				
Fertilizer, single nutrient	☐	☐	☐	☐
Fertilizer, multiple nutrient	☐	☐	☐	☐
Lime	☐	☐	☐	☐
Pesticide	☐	☐	☐	☐
Yield monitor sales/support/rental	☐	☐	☐	☐
Yield monitor data analysis	☐	☐	☐	☐
VRT seeding prescriptions	☐	☐	☐	☐
Satellite/aerial imagery	☐	☐	☐	☐
UAV or drones	☐	☐	☐	☐
Guidance/autosteer sales & support	☐	☐	☐	☐
Grid or zone soil sampling	☐	☐	☐	☐
Soil electrical conductivity mapping	☐	☐	☐	☐

13. 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? (Check any/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
- ☐ Other (specify)_____
- ☐ Do not help customers with their farm-level data

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

	I am not breaking even	I am breaking even	I am generating a profit	I do not know	I do not offer service
Custom application (not-precision)	☐	☐	☐	☐	☐
Data analysis for yield monitors	☐	☐	☐	☐	☐
VRT seeding prescriptions	☐	☐	☐	☐	☐
Satellite/aerial imagery	☐	☐	☐	☐	☐
UAV or drones	☐	☐	☐	☐	☐
Grid or zone soil sampling	☐	☐	☐	☐	☐
Yield monitor sales/support	☐	☐	☐	☐	☐
Guidance/autosteer sales/support	☐	☐	☐	☐	☐
VRT single nutrient application	☐	☐	☐	☐	☐
VRT multiple nutrient application	☐	☐	☐	☐	☐
Soil electrical conductivity mapping	☐	☐	☐	☐	☐
Total precision program, all components	☐	☐	☐	☐	☐

15. **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 site-specific agricultural practices? Approximately what percentage of the total acreage will be using these practices in three years (the year 2018)?

% of market acres (fill in blank with a percentage; *indicate 0 if none*)

Practice	Currently	3 years from now (2018)
Custom application of any type	_____%	_____%
Field mapping (with GIS)	_____%	_____%
Variable rate technology (VRT)	_____%	_____%
Fertilizer; single nutrient	_____%	_____%
Fertilizer; multiple nutrient	_____%	_____%
Lime	_____%	_____%
Pesticide	_____%	_____%
Seeding	_____%	_____%
GPS guidance systems with manual control (light bar)	_____%	_____%
GPS guidance systems with automatic control (autosteer)	_____%	_____%
Auto sprayer boom section or nozzle controls	_____%	_____%
Auto planter row controls/shutoff	_____%	_____%
Chlorophyll/greenness sensors mounted on a pickup, applicator, or tractor. (CropSpec, Greenseeker, OptRx, etc.)	_____%	_____%
Yield monitor without GPS	_____%	_____%
Yield monitor with GPS	_____%	_____%
Satellite/aerial imagery	_____%	_____%
UAV or drones	_____%	_____%
Grid or zone soil sampling	_____%	_____%
Soil electrical conductivity mapping	_____%	_____%

16. Evaluate the following skills for an entry-level position at your organization working with farmer customers in precision agriculture.

How important is it that your new hire is able to:	Of No Value	Not Important	Neutral	Important	Essential
Ability to operate special analysis software	1	2	3	4	5
SMS	1	2	3	4	5
SST	1	2	3	4	5
FarmWorks	1	2	3	4	5
MapShots	1	2	3	4	5
Calibrate a combine yield monitor	1	2	3	4	5
Upload product recommendations into multiple displays	1	2	3	4	5
Describe the basic technology behind GPS	1	2	3	4	5
Generate knowledge from multiple data sets	1	2	3	4	5
Describe economic benefits of precision practices	1	2	3	4	5
Collect soil samples from grids or zones	1	2	3	4	5
Use software to clean yield monitor data	1	2	3	4	5
Select hybrids and varieties for specific production/management systems	1	2	3	4	5
Find a parcel of land on a map using a legal land description	1	2	3	4	5
Use the Web Soil Survey to determine soil characteristics of a field	1	2	3	4	5
Describe growth stages of primary crops grown in your area	1	2	3	4	5
Be a the Certified Crop Advisor (CCA)	1	2	3	4	5

17. Assume you were to hire an entry-level position in your organization for the position to work with your farm customers' precision agriculture needs. Given the two potential candidates below, which one would you choose to hire? Select only one.

- ☐ A candidate with a strong agricultural background, but weak technology knowledge and experience.
- ☐ A candidate with a strong technology background, but weak agricultural knowledge and experience.

18. 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 actual use of precision services	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
• 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 agriculture to be profitable	1 2 3 4 5
Finding employees who can deliver precision agricultural services limits our ability to provide these services	1 2 3 4 5
The fees we can charge in our market 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 of offering precision services	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

19. Of your farmer-customers who use a yield monitor with GPS, how do they use their yield monitor information/ field maps? (check all that apply)

☐	Document yields	☐	Divide crop production shares
☐	Monitor crop moisture	☐	Negotiate new crop leases
☐	Conduct field experiments	☐	Communicate with landowners or business partners
☐	Tile drainage decisions	☐	Do not collect data or use in decision making
☐	Irrigation decisions		

20. How much will your location be investing in precision/site-specific technology during 2013?

☐ None
☐ $1 - $10,000
☐ $10,001-$24,999
☐ $25,000 - $49,999
☐ $50,000-$99,999
☐ More than $100,000

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

_____

_____

_____

22. What is your ZIP code? _____ **23.** What state are you located in? _____

Thank you for your cooperation! PLEASE SEND YOUR COMPLETED SURVEY TO:

CropLife, 37733 Euclid Ave., Willoughby, OH 44094, Fax: 440-942-0662.

17th PRECISION AG SURVEY