2020 PRECISION AGRICULTURE DEALERSHIP SURVEY

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Departments of Agricultural Economics and Agronomy, Purdue University

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LIST OF FIGURES AND TABLES AND REFERENCE TO SURVEY QUESTION

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ABOUT THE SURVEY, RESPONDENTS, AND RESPONDENT'S COMPANY/ORGANIZATION

In February 2020 CropLife magazine and the Departments of Agricultural Economics and Agronomy at Purdue University conducted the 20th 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.

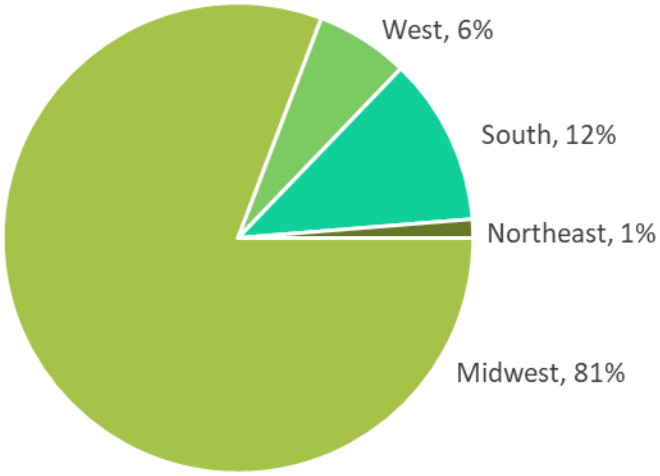

Figure 1, Q6: Respondent location by region.

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 online in QuestionPro was sent via email from a subset of CropLife's email list. The paper version survey instrument is at the end of this report. Paper surveys were entered into QuestionPro, then the responses were extracted and tallied. 189 surveys were completed/entered, of which 169 were used. Surveys without a ZIP code in Question 6 were not used. Most survey responses were from Midwest states (Figure 1), similar to previous reports. Response by state is shown in Table 1.

Table 1, Q6: Respondent location by state.

State	% of Respondents	State	% of Respondents	State	% of Respondents
Illinois	12%	Kansas	5%	North Dakota	4%
Indiana	11%	Minnesota	5%	Texas	3%
Ohio	11%	Missouri	5%	Oregon	3%
Iowa	10%	Nebraska	4%	Alabama	2%
Wisconsin	7%	South Dakota	4%	Tennessee	2%

1% or less: California, Georgia, Idaho, Kentucky, Maryland, Michigan, Mississippi, Montana, New Mexico,

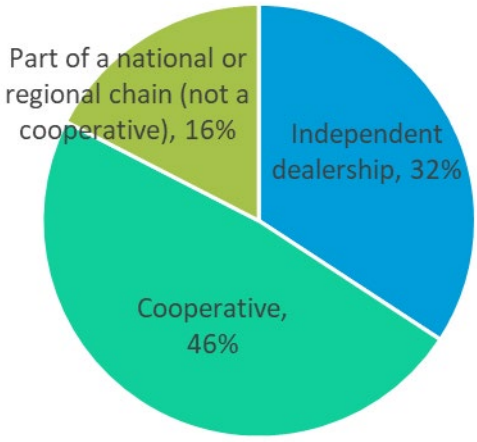

Figure 2, Q4: Organization type represented by respondents.

Respondents were asked several questions about the organization they represent. Eighty-nine percent of respondents were agricultural retail input suppliers, 4% consultants, 2% were farm equipment dealers, and 5% other. Of the ag input retailers 16% indicated they represent a cooperative, 32% an independent dealership and 46% are part of a national or regional dealership (not a cooperative), Figure 2.

The organizations the respondents represent are primarily multiple-retail locations, Figure 3. Seven percent of the respondents did not own or manage a retail outlet. Twenty-one percent of respondents reported having only one retail outlet. The number of respondents that owned or managed five stores or less was 46%. The number of respondents that owned or managed six or more stores was 55%.

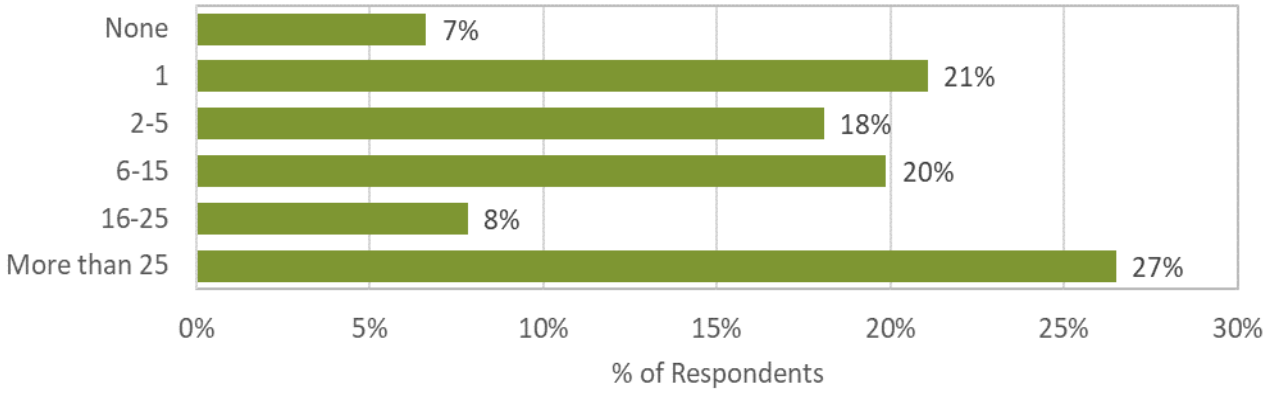

Figure 3, Q2: Number of retail outlets owned or managed by company.

The survey asked about the position the respondent held within their organization. Forty-eight percent reported being the owner or location manager, and 21% were in sales or sales management. Other common job responsibilities for respondents were department manager (7%), precision manager (8%), and technical consultant/agronomist (10%). Overall the respondents of the survey are those that lead and manage the organization, or work directly with customers (Figure 5).

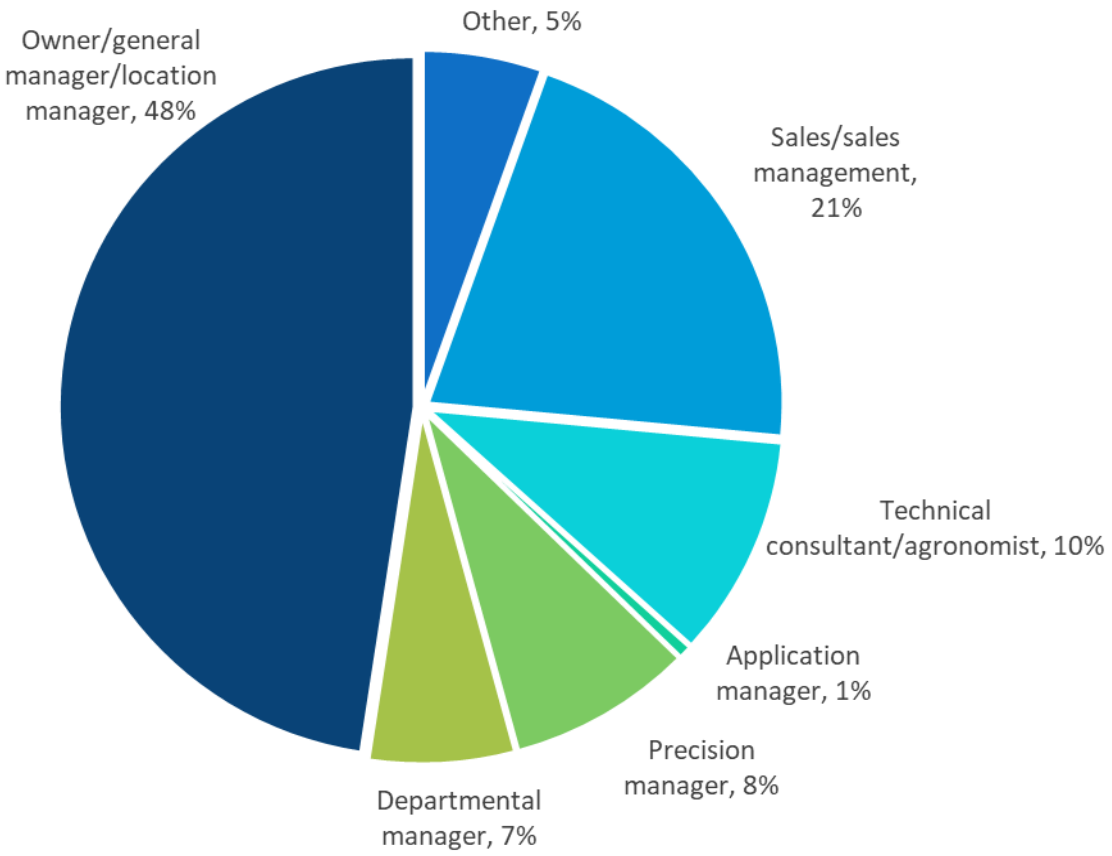

Figure 4, Q3: Responsibility of survey respondent.

DEALER USE OF PRECISION TECHNOLOGIES

Dealers get utility from the precision technologies they use for their own business purposes, such as guidance and section/nozzle controllers on their applicators, as well as the precision products and services they offer to customers detailed in the next section.

Table 2, Q7: Retailer use of precision technology for their business.

Precision Ag Technology	2017	2019	2020
GPS guidance systems with automatic control (autosteer) for fertilizer/chemical application	78%	90%	81%
Auto sprayer boom section or nozzle control	73%	75%	75%
Satellite/aerial imagery for internal dealership purposes	52%	68%	67%
GPS guidance systems with manual control (light bar) for fertilizer/chemical application	55%	59%	56%
Field mapping with GIS to document work for billing/insurance/legal purposes	43%	48%	53%
Smart scouting using an app on a mobile device to record field situations and locations	44%	45%	54%
UAV or drone for internal dealership purposes	34%	40%	42%
GPS to manage vehicle logistics, tracking locations of vehicles, and guiding vehicles to the next site	34%	38%	47%
Telematics to exchange information among applicators or to/from office	24%	31%	37%
Soil electrical conductivity (EC) mapping	22%	27%	17%
Y drops on fertilizer applicators	19%	26%	27%
Sprayer turn compensation	22%	23%	31%
Other soil sensors for mapping, mounted on a pickup, applicator or tractor (example: pH sensor)	9%	9%	4%
Chlorophyll/greenness sensors mounted on a pickup, applicator or tractor	9%	7%	13%
Do not use precision technology	5%	4%	7%

Between autoguidance and manual guidance, 94% of dealers are using some type of guidance system on at least some of their equipment. Coming in next at 75% adoption is automatic sprayer boom section or nozzle controllers. And then satellite/aerial imagery at 67% for the dealers' own use in their business in providing products and services, not as a product sold to customers, which is reported in the next section. 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. Fifty-four percent of dealers are using an app on a mobile device to assist in field scouting, and 42% are using UAV's to assist with their delivery of products and services. Seventeen percent of dealers are using soil electrical conductivity mapping, but fewer are using other on-the-go sensors such as for soil pH or leaf greenness. About a quarter of dealers use Y-drops to apply fertilizers on some/all of their acres.

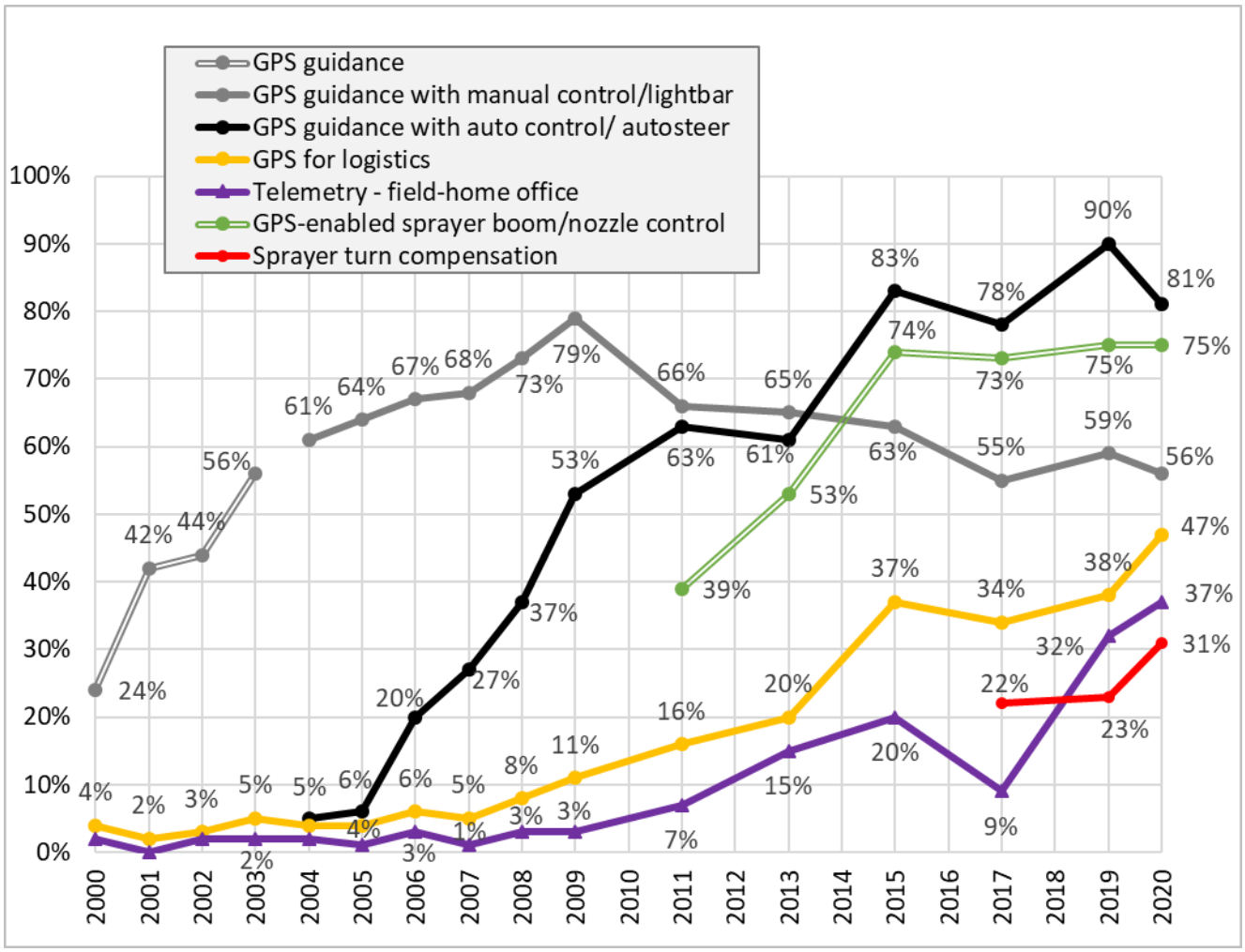

Figure 5, Q7: Use of precision technology over time by retailers, automated technologies.

Dealers were asked an open-ended question about what emerging precision technologies had the greatest potential to impact their business, Question 12. Respondents most commented on both UAV/drones and variable rate applications, with at least 18 mentions of each. The drone comments included scouting, imagery, and input applications, with VRT comments including seeding, fertilizers, and pesticides. Other technologies mentioned more than a few times included profit mapping, continued enhancements to planters, and autonomous vehicles.

Retailer's use of precision ag technology over time is reported in Figure 5 with automated technologies and Figure 6 with sensing-related technologies. Note that the survey went from every year to every other year from 2009 to 2019. For automated technologies, all were down in 2017 compared to 2015, but all rebounded for 2019. Telemetry, sprayer turn compensation, and using GPS for logistics/route scheduling continued up, but guidance, and sprayer boom nozzle controllers stayed level or down. Automated technologies have 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 the recent dip. Note the overall downward trend for GPS guidance with manual control (lightbar), peaking at nearly three fourths of dealers a decade ago but with current usage rates down almost to half. 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 then.

Telemetry dipped in the 2017 survey, but strongly rebounded for 2019 and 2020. The uncertainty in adoption of telematics may be related to poor signal strength, the amount of time needed to transfer the data, lack of connectivity with hardware and software packages, and/or the hardware or software ease of 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 file extensions for the various platforms that are available.

For sensing technologies (Fig. 8), the long-term trend for remote sensing using satellite/aerial imagery or UAV's is decidedly upward. Use of on-the-go vehicle-mounted sensors such as for soil EC, other soil sensors, and chlorophyll remain relatively low.

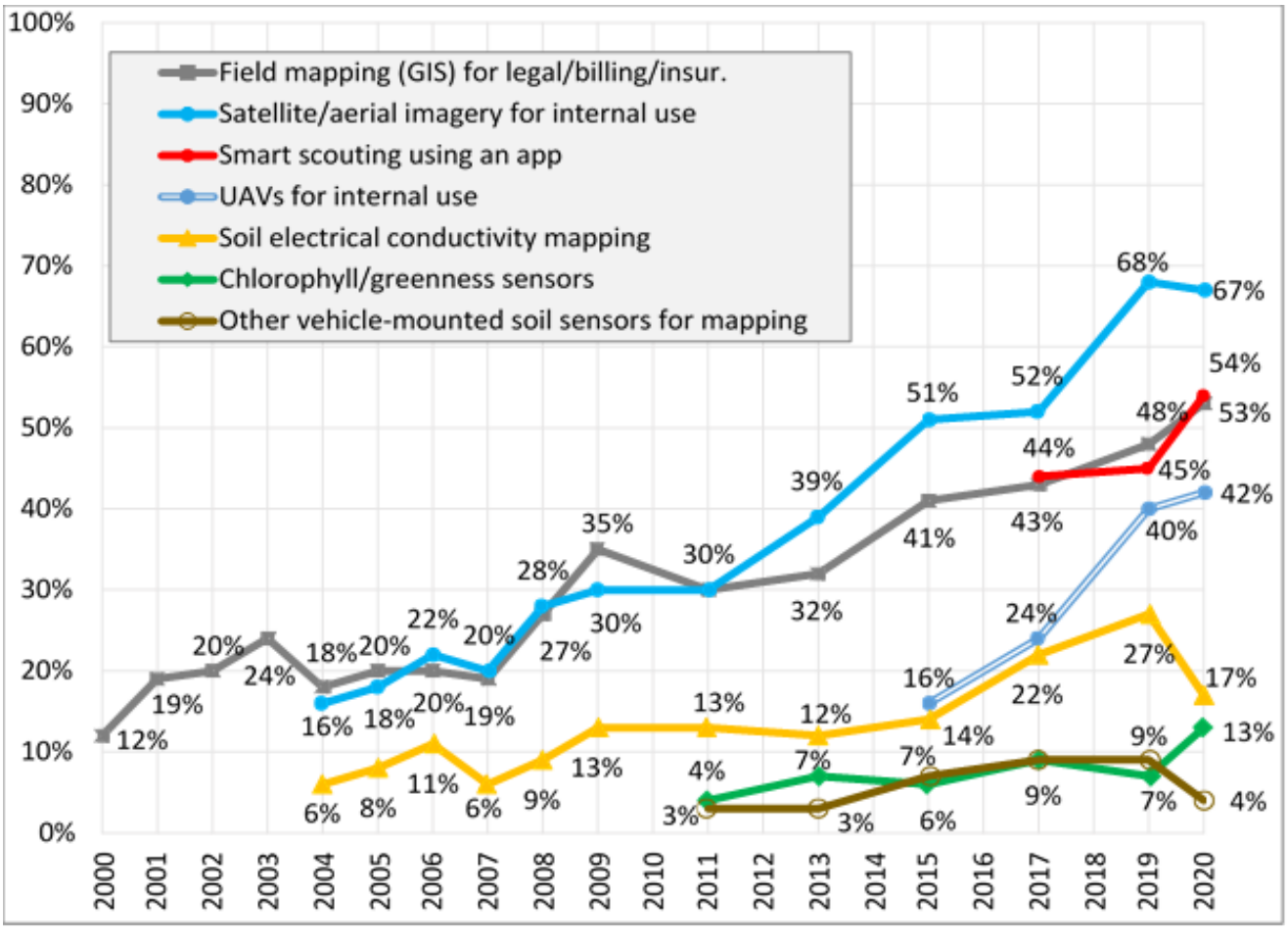

Figure 6, Q7: Use of precision technology over time by retailers, sensing-related technologies.

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 2023 (Figure 7).

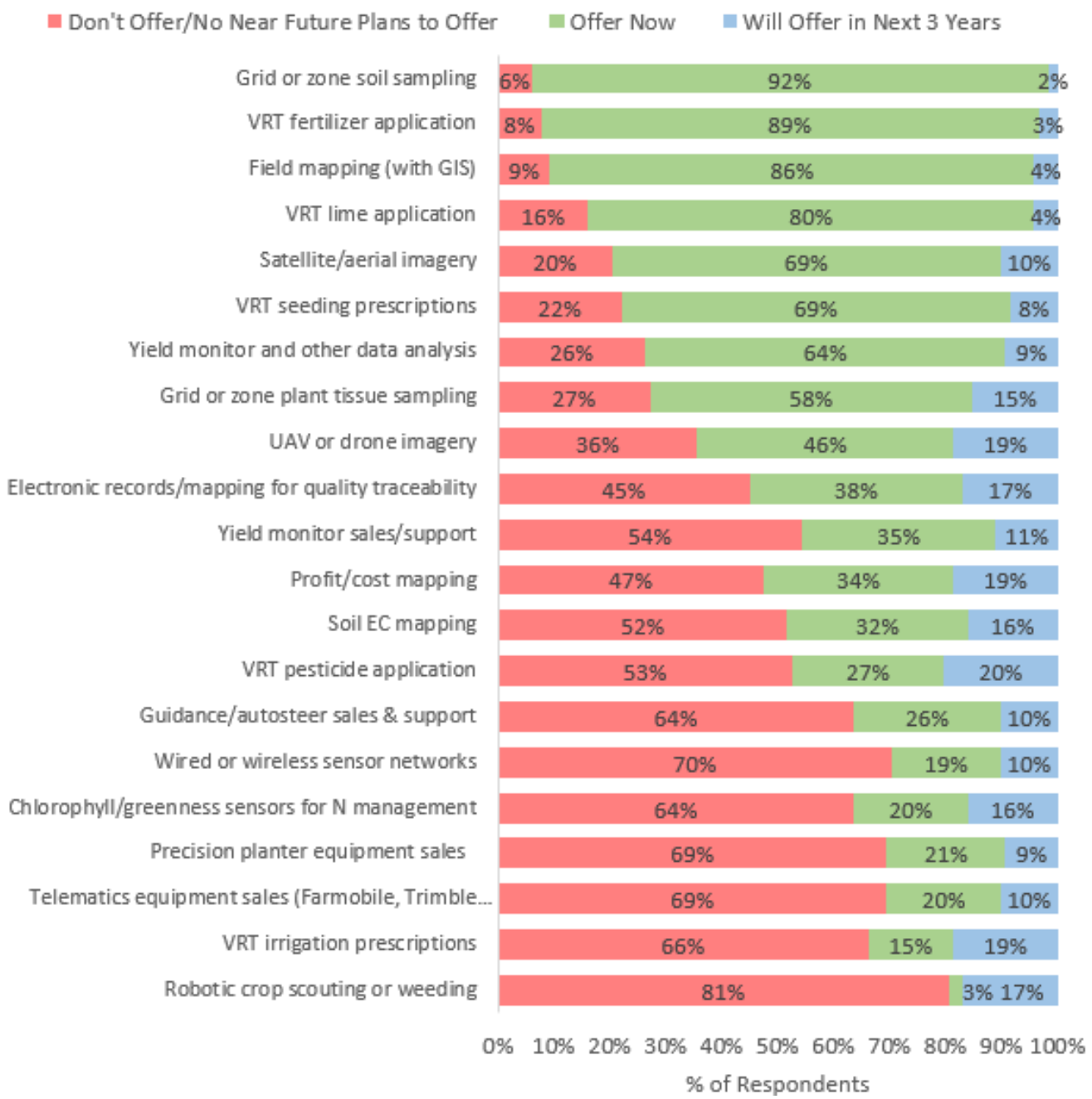

Figure 7, Q10: Dealer offerings of precision services. Due to rounding, rows may not total 100%.

Site-specific services that dealers now offer most include technologies related to precision fertilizers and soil amendments-- grid or zone soil sampling, VRT fertilizer or lime applications, and field mapping services. Over the next 3 years, the technologies respondents are planning the most growth are in VRT pesticide application (20% of respondents will add), UAV/drone imagery (19%), profit/cost mapping (19%), VRT irrigation prescriptions (19%), electronic records/mapping for quality traceability (17%), robotic crop scouting or weeding (17%), chlorophyll/greenness sensors for N management (16%), soil EC mapping (16%), and grid or zone plant tissue sampling (15%). In many past surveys, dealers have optimistically overestimated their precision offerings plans compared to the actual numbers the survey showed in years following.

Figure 8 shows the adoption of service and sensor-related precision ag services over time, with dealers also projecting into the future (dotted lines). The 2023 projections are calculated as the sum of question 10 responses for each technology for "offer now" plus "will offer in next 3 years."

UAV/drone imagery had the greatest increase in the percentage of dealers offering, going from 38% in 2019 to 46% in 2020, and the greatest increase since 2017, growing 14%. UAV/drone imagery is also expected to experience rapid growth in the next three years, with 19% of dealers expecting to add this to their offerings portfolio. In the last three years grid or zone soil sampling and satellite/aerial imagery each grew around 10%.

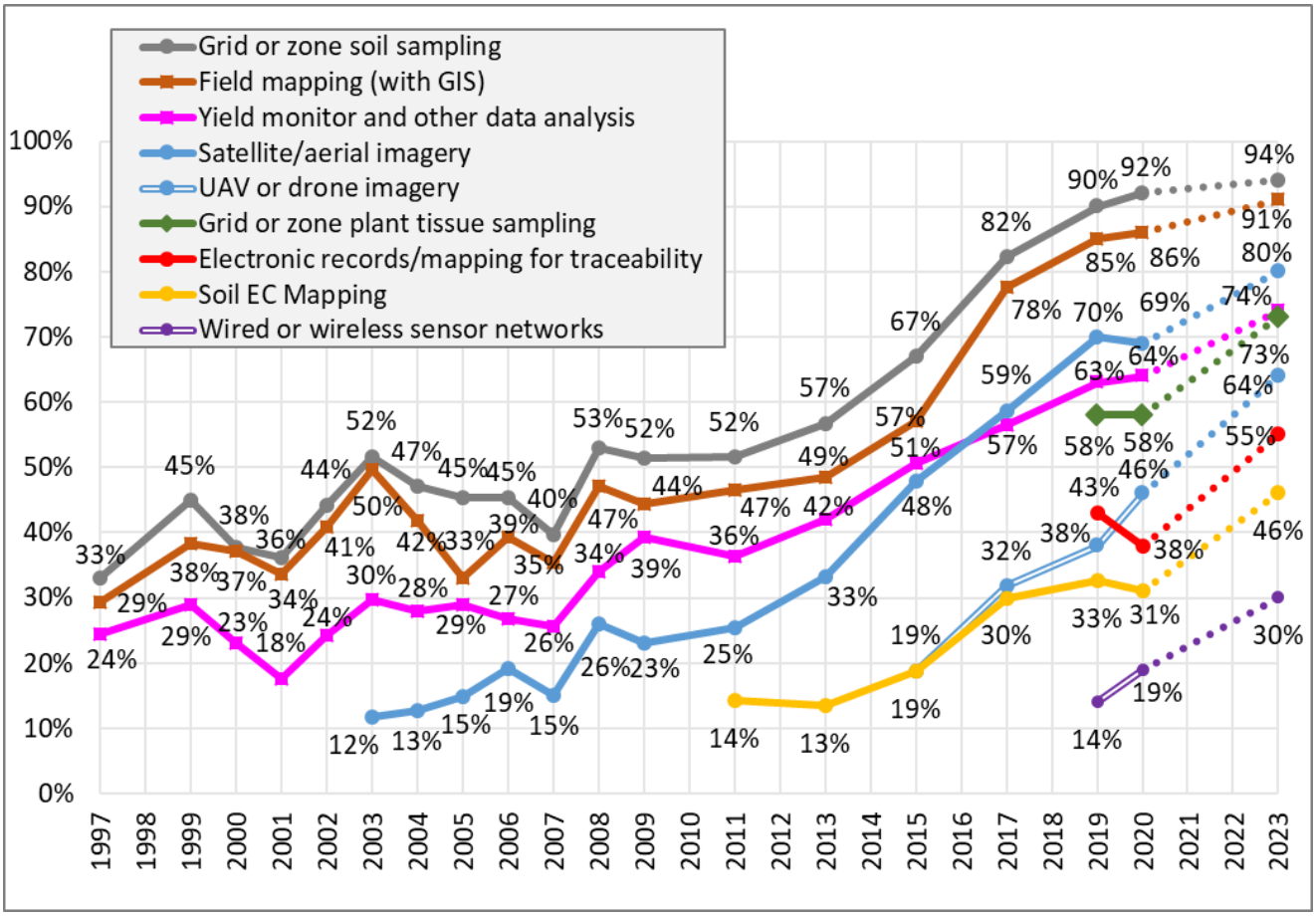

Figure 8, Q10: Dealer offerings of precision services over time, sensing-related technologies. 2023 are projections.

Figure 9 shows the dealer offerings of variable rate technology (VRT) services over time, with dealers also projecting into the future (dotted lines). As with Figure 8, the 2023 projections are calculated as the sum of question 10 responses for each technology for "offer now" plus "will offer in next 3 years." All these site-specific services showed growth compared to 2017 and 2019. VRT pesticide application had a 10% decrease from 2015 to 2017, but rebounded in 2019. More dealers (20%) plan to add this as an offering in the next three years than anything else. As you can see, 2013 was an inflection point for all VRT offerings, following a decade of stagnation.

Starting in 2017 the survey no longer separately asks about VRT single fertilizer applications from multiple product applications—thus the multiple red lines in Figure 9. Also note that small changes in the adoption numbers reported may reflect the inherent variability and error present in any survey, and this survey is a different pool of respondents each time. In other words, a few percentage points difference may not signify a trend or a real difference from another technology.

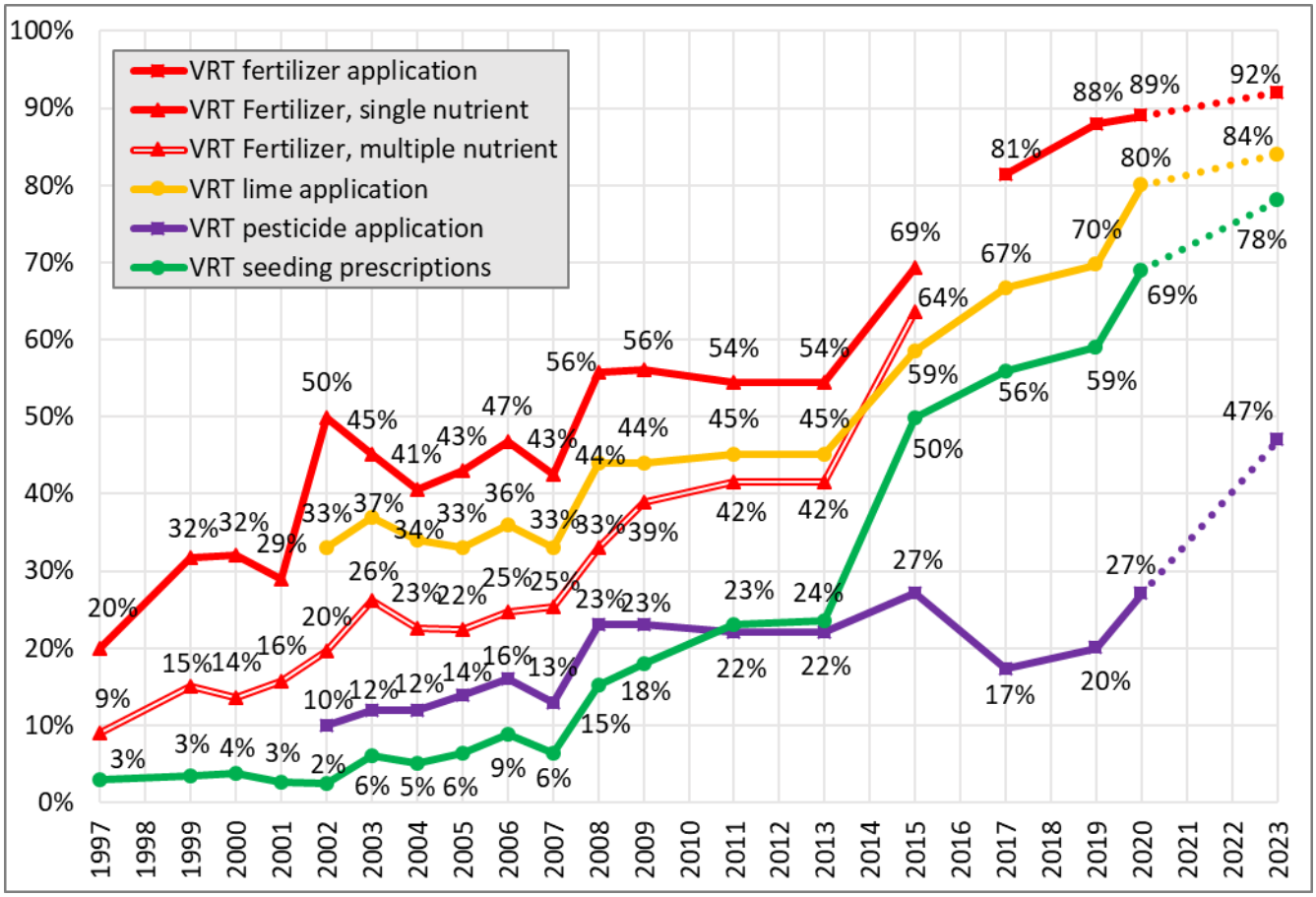

Figure 9, Q10: Dealer offerings of precision services over time, variable rate technologies. Starting at 2017 the survey stopped asking separately about single and multiple fertilizer applications. 2023 are projections.

ANALYSIS OF DATA

Precision agriculture can provide an overwhelming amount of data from yield monitors, soil sampling, machine operations across fields, as-applied amounts, and remote sensors, to name a few. Often producers need assistance in analyzing these data in the hopes they can be turned into meaningful insights.

Figure 10 reports how dealers help customers manage farm-level data in decision-making. The most common way dealers are helping customers was printing maps, such as yield, soil electrical conductivity, and soil maps. Beyond printing maps, 67% of dealers are archiving and managing yield, soil test, and other data for future use. Half or less of respondents work with farmers individually. Respondents could mark any or all that apply.

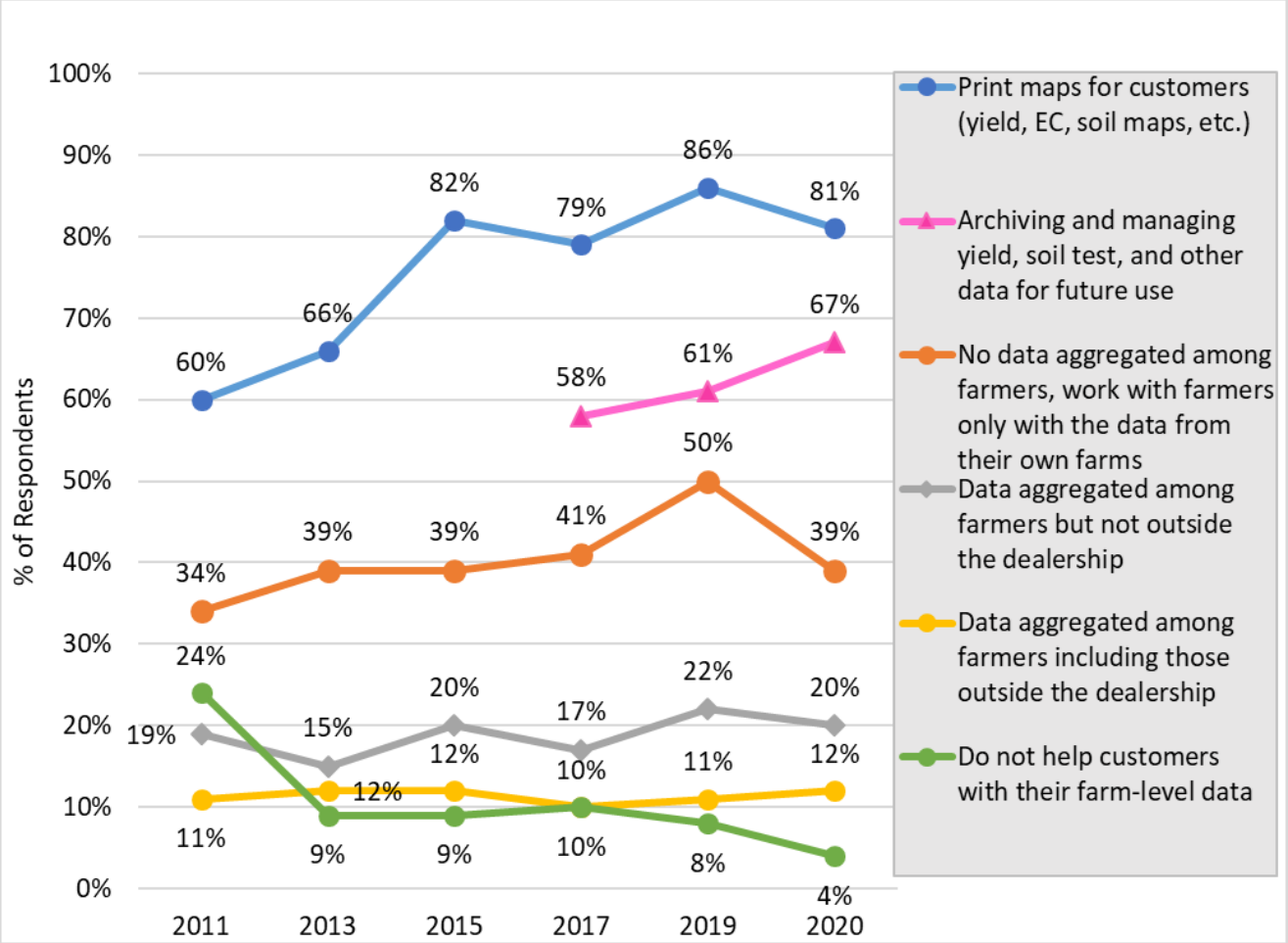

Figure 10, Q8: Managing farm-level data to assist customers in decision making over time.

In addition to the farmer's individual data, 20% of the respondents reported working with farmers by using data aggregated among farmers within the dealership. Twelve percent reported using data aggregated among farmers including those outside the dealership. Only four percent of the respondents do not help farmers with their farm-level data. Fifty-eight percent of dealers have a customer data privacy statement and/or data terms & conditions agreement, up from 45% in 2017 and 47% in 2019 (Question 13).

Figure 11 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. Following close behind are overall decisions about hybrid and variety selection and overall planting rates.

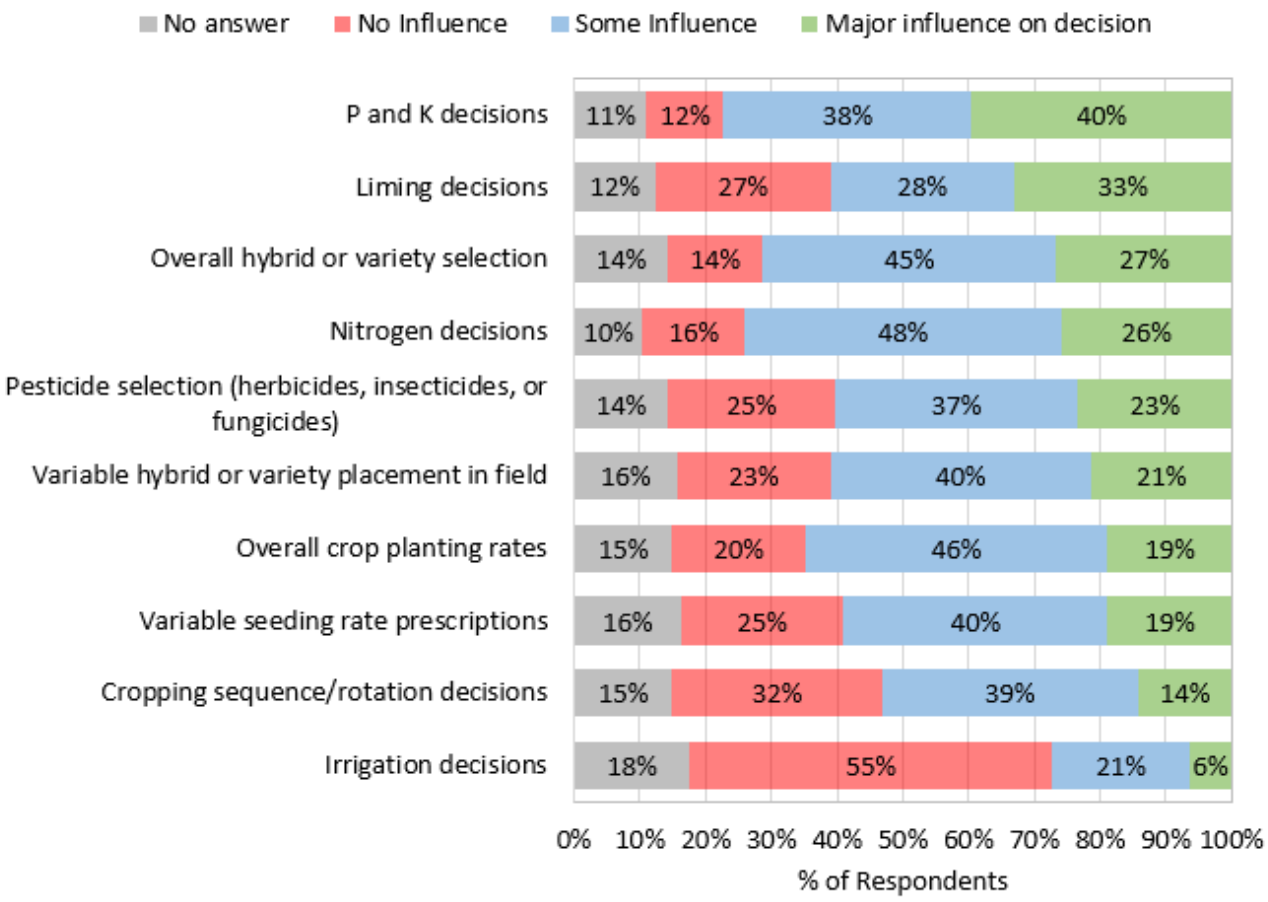

Figure 11, Q9: Crop management decisions influenced by pooled data from customer's farms. Due to rounding, percentage numbers for a technology may not total 100.

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 18.

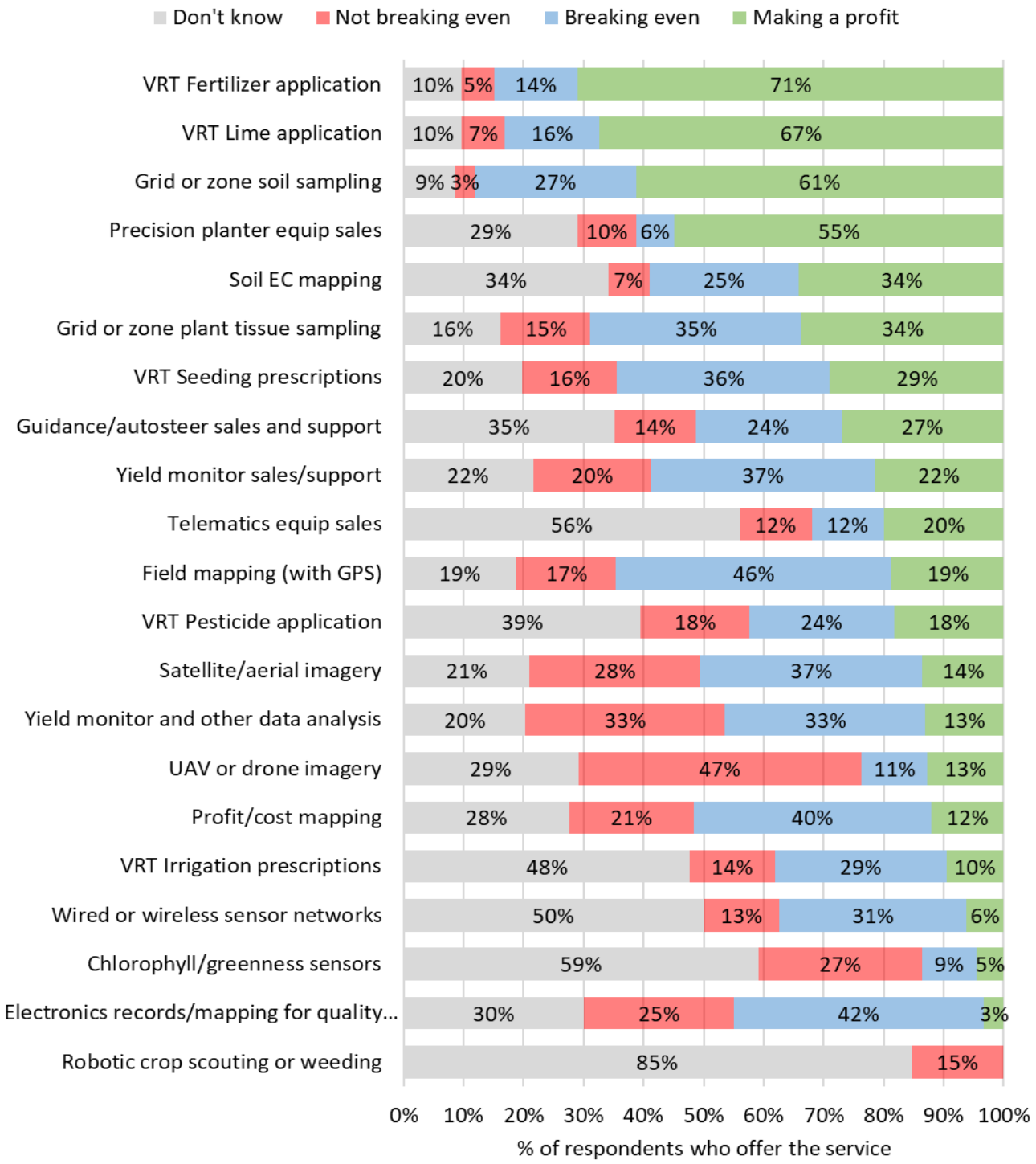

Figure 12, Q14: Profitability of precision service offerings for retailers. Due to rounding, percentages for each technology may not total 100.

Overall, the categories with the greatest percent of respondents making a profit are VRT fertilizer applications (71%), VRT lime applications (67%), grid or zone soil sampling (61%), precision planter equipment sales (55%), and telematics equipment sales (56%). These four offerings stand apart from the others for profitability. On the other end of the spectrum UAV or drone imagery is a service area where dealers struggle the most with almost half of dealers reporting they are not breaking even. With many technologies a third to a half of dealers report that they don't know—some of these being newer products and services. Including those that report just breaking even with profitability, over half of dealers report favorable bottom lines with grid or zone plant tissue sampling (69%), variable seeding prescriptions (65%), field mapping (65%), precision planter equipment sales (61%), EC mapping (59%), yield monitor sales/support (59%), profit mapping (52%), guidance/autosteer sales and support (51%), and satellite/aerial imagery (51%).

Figure 13 shows the percent of respondents making a profit in certain precision ag services over time. More dealers report making a profit with VRT fertilizer applications and grid soil sampling as compared to a decade past. Dealers reporting profits in satellite and aerial imagery and yield monitor and other data analysis have not had similar increases in that same time.

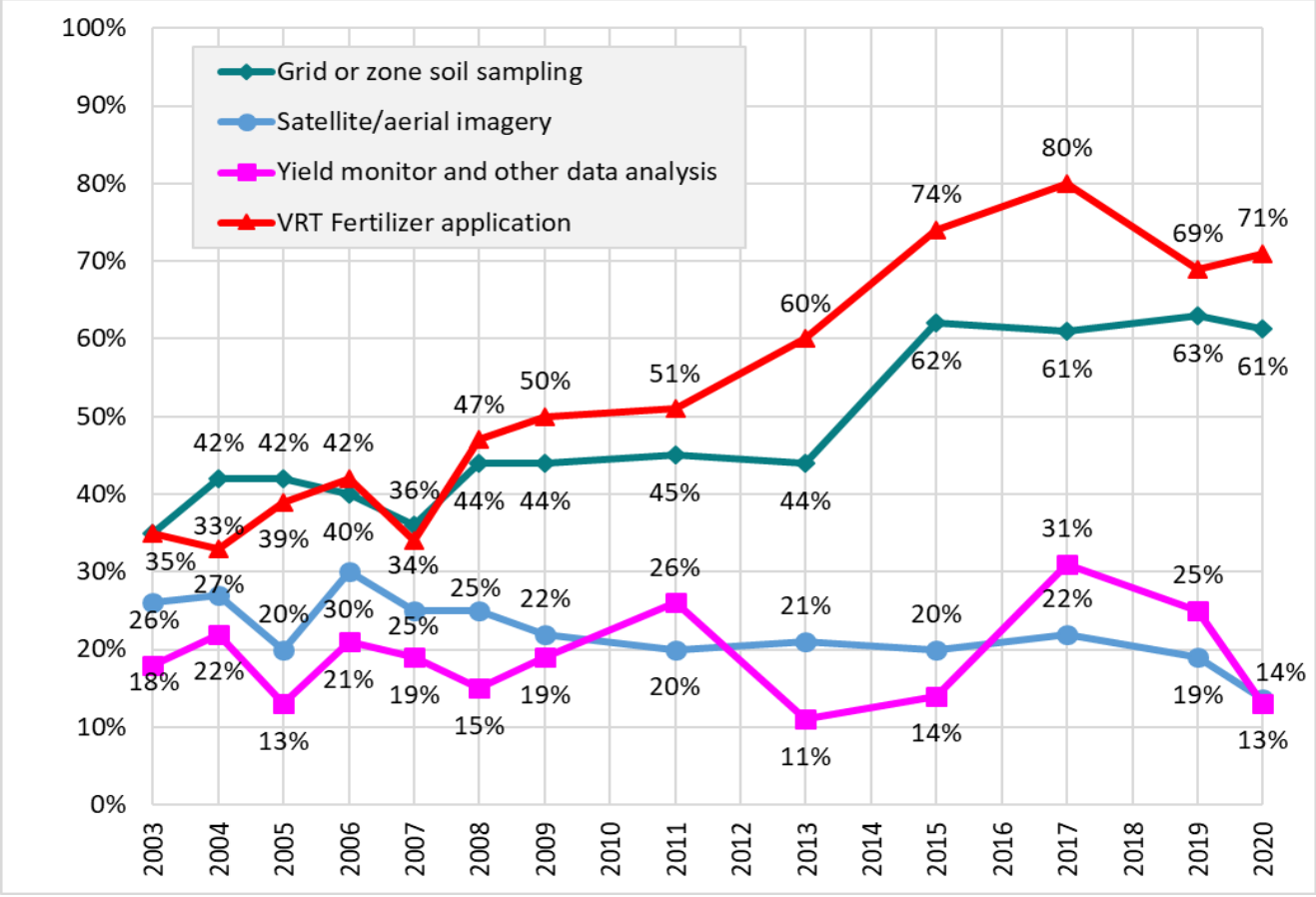

Figure 13, Q14: Profitability of precision services over time for retailers.

PRODUCER'S USE OF PRECISION TECHNOLOGIES

While the survey focuses primarily on the technologies used and precision services offered, dealers' insights into their customers' practices offer 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.

Table 3 shows the estimated market area of an array of precision technologies in 2017, 2019, and 2020. Yield monitors and GPS guidance with automatic control have the highest farmer adoption, with dealers reporting around two thirds of the acres in their market areas using these. Yield monitors are standard equipment on most combines now, and there are many benefits to autosteer including less operator fatigue, more time focused on operating equipment and less waste of applied inputs. By mistake, yield monitors were not on the survey in 2017. Coming in next are sprayer boom section controllers, field mapping, VRT fertilizer applications, and grid/zone soil sampling, at over 50% adoption each. Dealers report that not quite half of the farmland in their areas was planted with row shutoffs. On the opposite end, the much-discussed coming technologies of robotics automation have not yet materialized to any extent on U.S. farms. This was the second year the survey asked about VRT irrigation, where dealers indicated just 5% of their market area was using this. This number comes with some consideration, as most responders were from the Midwest where in most areas irrigation is the exception. This was also the second year to ask about selective harvest, where dealers report it occurs on 7% of the acres in their trade areas.

Table 3, Q11: Farmer use of precision technologies, market area estimated by retailers.

	2017	2019	2020
Guidance/Autosteer	60%	66%	66%
Yield Monitor	-	69%	65%
Sprayer Section Controllers	-	56%	62%
Field Mapping (with GIS)	45%	58%	57%
VRT Fertilizer Application	38%	39%	57%
Grid or Zone Soil Sampling	45%	52%	52%
Planter Row or Section Shutoffs	-	45%	46%
VRT Lime Application	40%	41%	44%
Variable Down Pressure on Planter	14%	29%	31%
Satellite or Aerial Imagery	19%	26%	31%
Cloud Storage of Farm Data	14%	21%	29%
Any Data Analysis Service	13%	26%	25%
Electronic Records/Mapping for Quality Traceability	-	20%	21%
VRT Seeding	13%	19%	19%
Variable Hybrid Placement Within Fields	7%	11%	17%
Soil EC Mapping	9%	10%	14%
Telematics	5%	10%	13%
UAV or Drone Imagery	6%	9%	12%
Y Drops on Fertilizer Applicator	6%	10%	11%
VRT Pesticide Application	3%	8%	7%
Selective Harvest for Quality Improvement	-	4%	7%
Chlorophyll/Greenness Sensors for N Management	3%	5%	5%
VRT Irrigation	-	4%	5%
Robotics/Automation for Harvesting	-	0%	1%
Robotics/Automation for Weeding	-	0%	0%

In Figures 14 and 15, you can see the changes over time in the percent of the market area of various precision ag technologies used by farmers. The two time-scale graphics do not include all technologies due to lack of room and visual clarity—see Table 4 or previous reports. As with the dealer information, starting in 2017 the survey did not ask separately about single and multi-nutrient VRT fertilizer applications on farms. All precision ag practices show growth in recent years, with the exception of VRT pesticide applications which fell back in 2017 but rebounded in 2019 and 2020 to the levels of a decade ago.

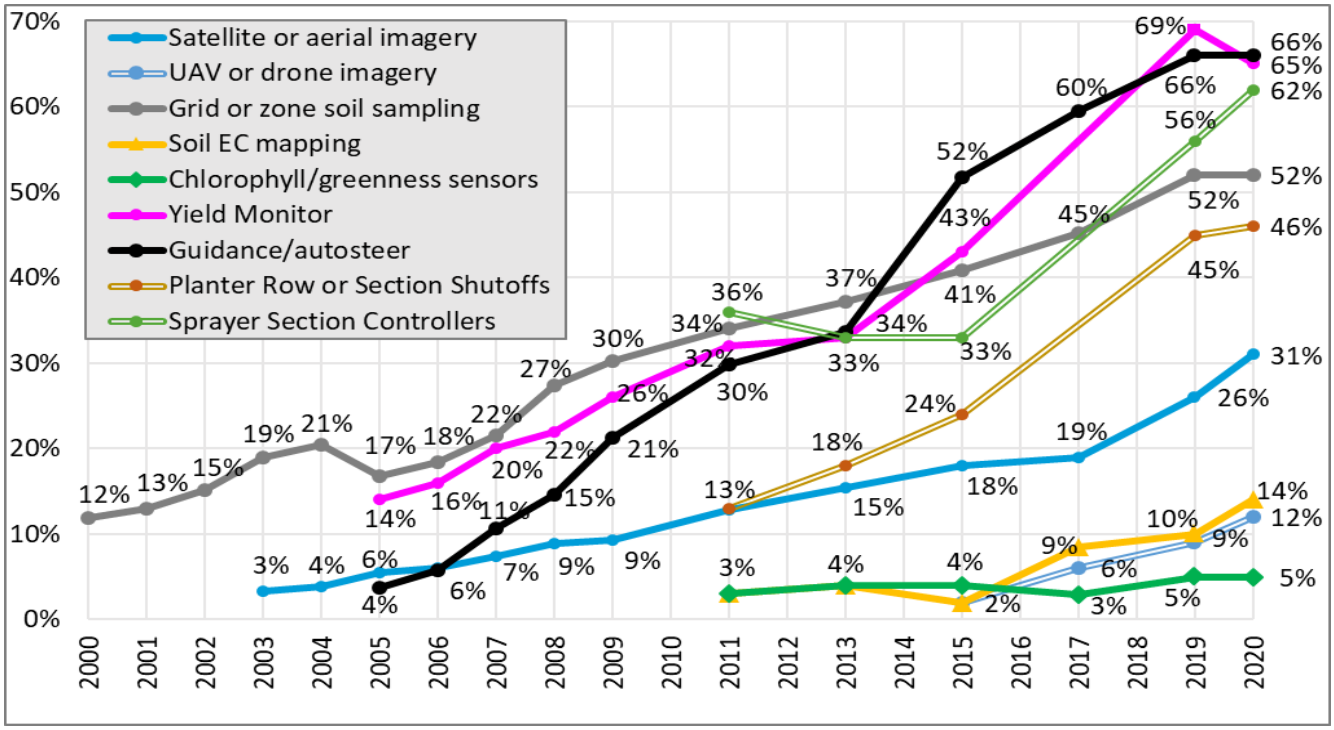

Figure 15, Q11: Producer use of precision technologies, retailers estimate of their market area. Yield monitor, sprayer section controllers, and planter row/section shutoffs were inadvertently omitted in the 2017 survey.

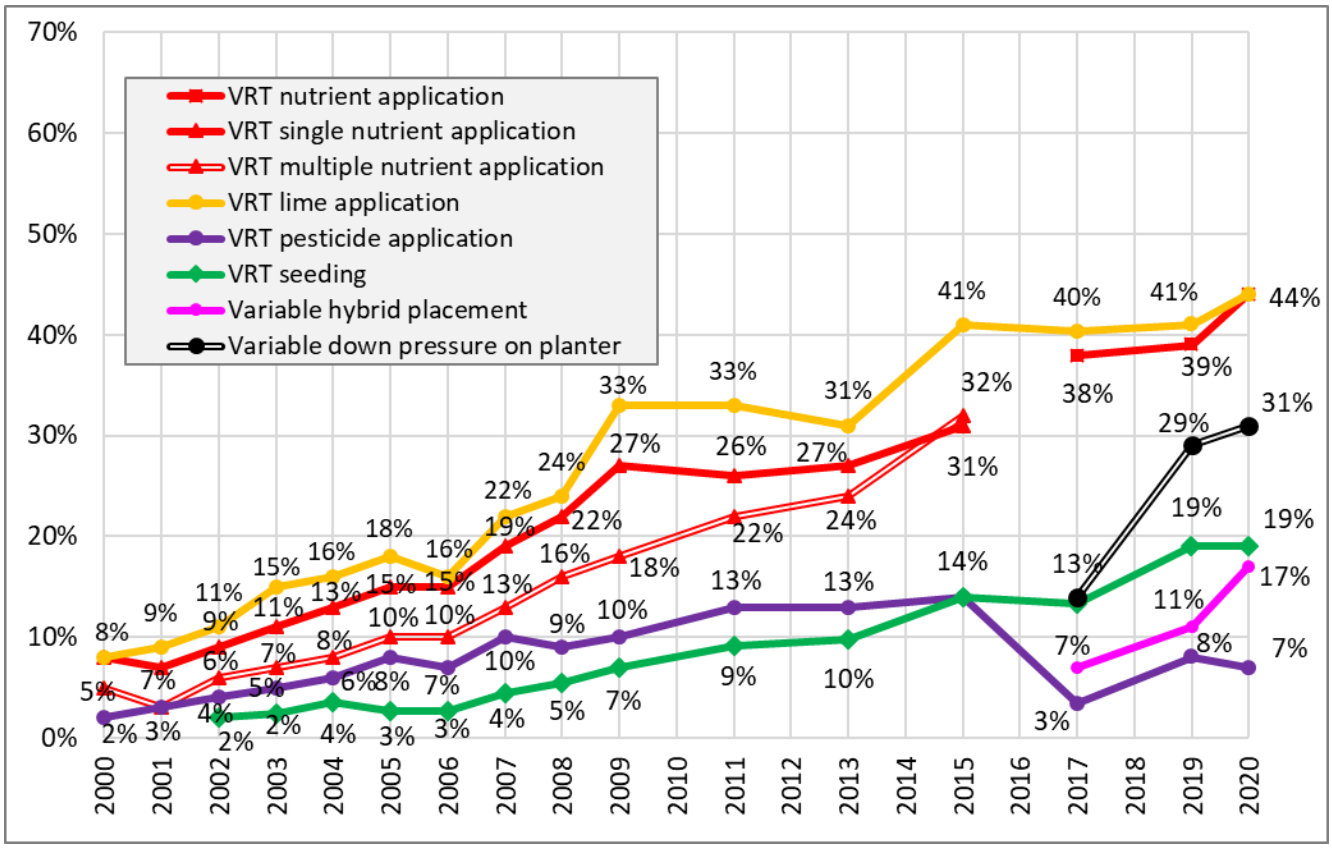

Figure 14, Q11: Farmer use of variable rate technologies (VRT), market area estimated by retailers. Starting at 2017 the survey stopped asking separately about single and multiple fertilizer applications.

Some variation in survey results from year to year is to be expected, as survey respondents are not the same each year.

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 analyzes variability to detect correlations and trends for informing inputs--with the payoff hoped in more exact and tailored applications of seeds, fertilizers, pesticides, and other inputs. The overall goal is to increase the efficiency of the production process through better-utilized inputs and/or enhanced productivity. This survey spans the more than 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 over 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 lag 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 2020 survey shows another increase in dealer use of most data collection technology such as greenness sensors and UAV's by dealers, but some were also down compared to 2019. Correspondingly more dealers are offering VRT liming, fertilizing, and seeding prescriptions. Respondents continue to struggle with generating a profit with the higher end precision ag tools and services. More dealers are helping their customers with data overall, with nutrient decisions most influenced by data. Some of these increases may be from improved hardware and software compatibly, greater ability to move, store, and analyze data, and increasing familiarity with some of these new technologies. Farmers in the market areas of the dealers continue to adopt more precision ag practices. Those used on the most acres include yield monitors, guidance, sprayer boom section controllers, and VRT fertilizers. Practices growing fastest in the last few years and continuing the increase in 2020 include VRT fertilizers, sprayer section controllers, and variable down pressure on planters.

SURVEY INSTRUMENT

CropLife

20th Precision Agriculture Services Dealership Survey

PURDUE AGRICULTURE

IRB APPROVAL 1702018754

Dear agricultural retailer,

The CropLife/Purdue survey is the longest-running, most widely used survey that chronicles the development and adoption of precision agriculture! We depend on your continued input. Please complete by March 27, 2020. Two ways to participate:

1. **Fill out and return in postage paid envelope, or Fax it back: 440-942-0662.**
2. **Or, complete the survey online at https://2020precisionsurvey.questionpro.com Thank you for your participation!**

Bruce Erickson & Jess Lowenberg-DeBoer *Purdue University* | Paul Schrimpf *CropLife/Meister Media*

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

[ ] Agricultural retail input supplier
[ ] Farm equipment dealer
[ ] Agricultural consultant
[ ] Other: *[please specify]* _____

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

[ ] Independent dealership
[ ] Cooperative
[ ] Part of a national or regional chain (not a cooperative)
[ ] Other: *[please specify]* _____

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

[ ] Owner/general manager/location manager
[ ] Departmental manager
[ ] Precision manager
[ ] Application manager
[ ] Technical consultant/agronomist
[ ] Sales/sales management
[ ] Other: *[please specify]* _____

4. 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

5. Rank the following crop types according to the value of products and services you provide to each

[1=highest, 2 next highest, etc. Leave blank if less than 2% of your business.]

[ ] field crops (corn, soy, wheat, rice, cotton, milo, sugar beets, dry beans, etc.)
[ ] hay and forages
[ ] nursery or greenhouse
[ ] vegetables (incl. potatoes, melons, lettuce, tomatoes)
[ ] tree fruits & nuts
[ ] berries (strawberries, blueberries, raspberries, etc.)
[ ] grapes
[ ] Other: *[please specify]* _____

6. For your retail location, what state are you located in?

_____. What is your ZIP code? _____.

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

[ ] Any precision agronomic services for customers
[ ] GPS guidance systems with manual control (light bar)
[ ] GPS guidance systems with automatic control (autosteer)
[ ] 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
[ ] Chlorophyll/greenness sensors mounted on a pickup, applicator or tractor (CropSpec, GreenSeeker, OptRx etc.)
[ ] Other soil sensors for mapping, mounted on a pickup, applicator or tractor (example: pH sensor)
[ ] Field mapping with GIS to document work for billing/insurance/legal purposes
[ ] Telematics to exchange information among applicators or to/from office locations
[ ] GPS fleet management for 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

8. How do you help manage the farm-level data (i.e., yield maps, soil tests, EC, 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 dealership
[ ] Data aggregated among farmers including those outside dealership
[ ] Archiving and managing yield, soil test, and other data
[ ] Other *[please specify]* _____
[ ] Do not help customers with their farm-level data

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

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

_____

10. Which "site-specific" (precision) services/products do you offer now? If you don't offer now, will you in three years? If you don't offer now and have no plans for the near future, leave the row blank.

	Offer now	Will offer by 2023
Field mapping (with GIS)	[ ]	[ ]
VRT fertilizer application	[ ]	[ ]
VRT lime application	[ ]	[ ]
VRT pesticide application	[ ]	[ ]
VRT seeding prescriptions	[ ]	[ ]
VRT irrigation prescriptions	[ ]	[ ]
Yield monitor sales/support	[ ]	[ ]
Yield monitor and other data analysis	[ ]	[ ]
Satellite/aerial imagery	[ ]	[ ]
UAV or drone imagery	[ ]	[ ]
Guidance/autosteer sales & support	[ ]	[ ]
Grid or zone soil sampling	[ ]	[ ]
Grid or zone plant tissue sampling	[ ]	[ ]
Soil EC mapping	[ ]	[ ]
Chlorophyll/greenness sensors for N management	[ ]	[ ]
Precision planter equipment sales	[ ]	[ ]
Telematics equipment sales (Farmobile, Trimble DCM-300. etc.)	[ ]	[ ]
Profit/cost mapping	[ ]	[ ]
Electronic records/mapping for traceability	[ ]	[ ]
Wired or wireless sensor networks	[ ]	[ ]
Robotic crop scouting or weeding	[ ]	[ ]

11. Approximately what percentage of the total acreage in your market area (all growers, not just your current customers) is currently using the following practices?

Field mapping (with GIS)	_____%
VRT fertilizer application	_____%
VRT lime application	_____%
VRT pesticide application	_____%
VRT seeding	_____%
Variable hybrid/variety placement within fields	_____%
Variable rate irrigation	_____%
Satellite or aerial imagery	_____%
UAV or drone imagery	_____%
Guidance/autosteer	_____%
Sprayer section controllers	_____%
Planter row or section shutoffs	_____%
Variable down pressure on planter	_____%
Grid or zone soil sampling	_____%
Soil EC mapping	_____%
Chlorophyll/greenness sensors for N management	_____%
Yield monitor	_____%
Telematics	_____%
Cloud storage of farm data	_____%
Y drops on fertilizer applicator	_____%
Any data analysis service (Granular, FieldView, FBN, FarmServer, etc.)	_____%
Robotics/automation for weeding	_____%
Robotics/automation for harvesting	_____%
Electronic records/mapping for traceability	_____%
Selective harvest for quality improvement	_____%

12. 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? _____

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

14. 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
	please mark only one column per row				
Field mapping (with GIS)	[ ]	[ ]	[ ]	[ ]	[ ]
VRT fertilizer application	[ ]	[ ]	[ ]	[ ]	[ ]
VRT lime application	[ ]	[ ]	[ ]	[ ]	[ ]
VRT pesticide application	[ ]	[ ]	[ ]	[ ]	[ ]
VRT seeding prescriptions	[ ]	[ ]	[ ]	[ ]	[ ]
VRT irrigation prescriptions	[ ]	[ ]	[ ]	[ ]	[ ]
Yield monitor sales/support	[ ]	[ ]	[ ]	[ ]	[ ]
Yield monitor and other data analysis	[ ]	[ ]	[ ]	[ ]	[ ]
Satellite/aerial imagery	[ ]	[ ]	[ ]	[ ]	[ ]
UAV or drone imagery	[ ]	[ ]	[ ]	[ ]	[ ]
Guidance/autosteer sales & support	[ ]	[ ]	[ ]	[ ]	[ ]
Grid or zone soil sampling	[ ]	[ ]	[ ]	[ ]	[ ]
Grid or zone plant tissue sampling	[ ]	[ ]	[ ]	[ ]	[ ]
Soil EC mapping	[ ]	[ ]	[ ]	[ ]	[ ]
Chlorophyll/greenness sensors for N management	[ ]	[ ]	[ ]	[ ]	[ ]
Precision planter equipment sales	[ ]	[ ]	[ ]	[ ]	[ ]
Telematics equipment sales	[ ]	[ ]	[ ]	[ ]	[ ]
Profit/cost mapping	[ ]	[ ]	[ ]	[ ]	[ ]
Electronic records/mapping for quality traceability	[ ]	[ ]	[ ]	[ ]	[ ]
Wired or wireless sensor networks	[ ]	[ ]	[ ]	[ ]	[ ]
Robotic crop scouting or weeding	[ ]	[ ]	[ ]	[ ]	[ ]

THANKS AGAIN FOR YOUR INPUT! USE POSTAGE PAID ENVELOPE TO RETURN, OR FAX BACK AT 440-942-0662.