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2011 PRECISION AGRICULTURE SERVICES

DEALERSHIP SURVEY RESULTS

by

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Introduction

In the spring of 2011, *Crop Life* magazine and Purdue University's Center for Food and Agricultural Business conducted the 15th annual survey of crop input dealers (skipping 2010 and 2012). Consistent with previous surveys, dealerships were asked questions about the types of precision services they offer and/or use in their businesses, how quickly their customers are adopting precision agriculture practices, and how profitable they are finding precision services to be in their businesses. In 2011, additional questions were asked about use of specific types of GPS correction, how dealers manage farm-level data for decision-making, and what emerging precision technologies will impact dealers' businesses most substantially in the future.

Questionnaire Logistics and Data Analysis Notes

In February 2011, a questionnaire was mailed to 2500 *Crop Life* retail crop input dealership readers across the US. (See Appendix I to this report for a copy of the questionnaire.) A total of 262 questionnaires were returned, with 244 being usable. This provided an effective response rate of 9.8 percent. Response rates have ranged from a high of 38 percent in 1996 to a low of 9.4 percent in 2009.

As in other years, questionnaires were deemed "unusable" for several reasons. Some questionnaires were not filled out completely; others were from wholesalers who did not sell directly to farmers; some respondents sold only seed, while a few were from farmers. This year there were 18 unusable questionnaires from the 262 returned.

The analysis in this report is based on unweighted data. In 2000, 2001, and 2007 the data were statistically weighted to have the same demographics as previous years' demographics in order to make year-to-year comparisons more meaningful. These demographics included the region, organizational type and outlet size in terms of sales. Several procedural changes in the survey process in 2000 and 2001 made this necessary (timing of the survey, survey length, etc.). In 2007, the sample demographics did not reflect the same profile as other years, resulting in the need to weight by demographics once again. This year, despite the low response rate, the sample demographic profile was similar to previous years and therefore no weighting was necessary.

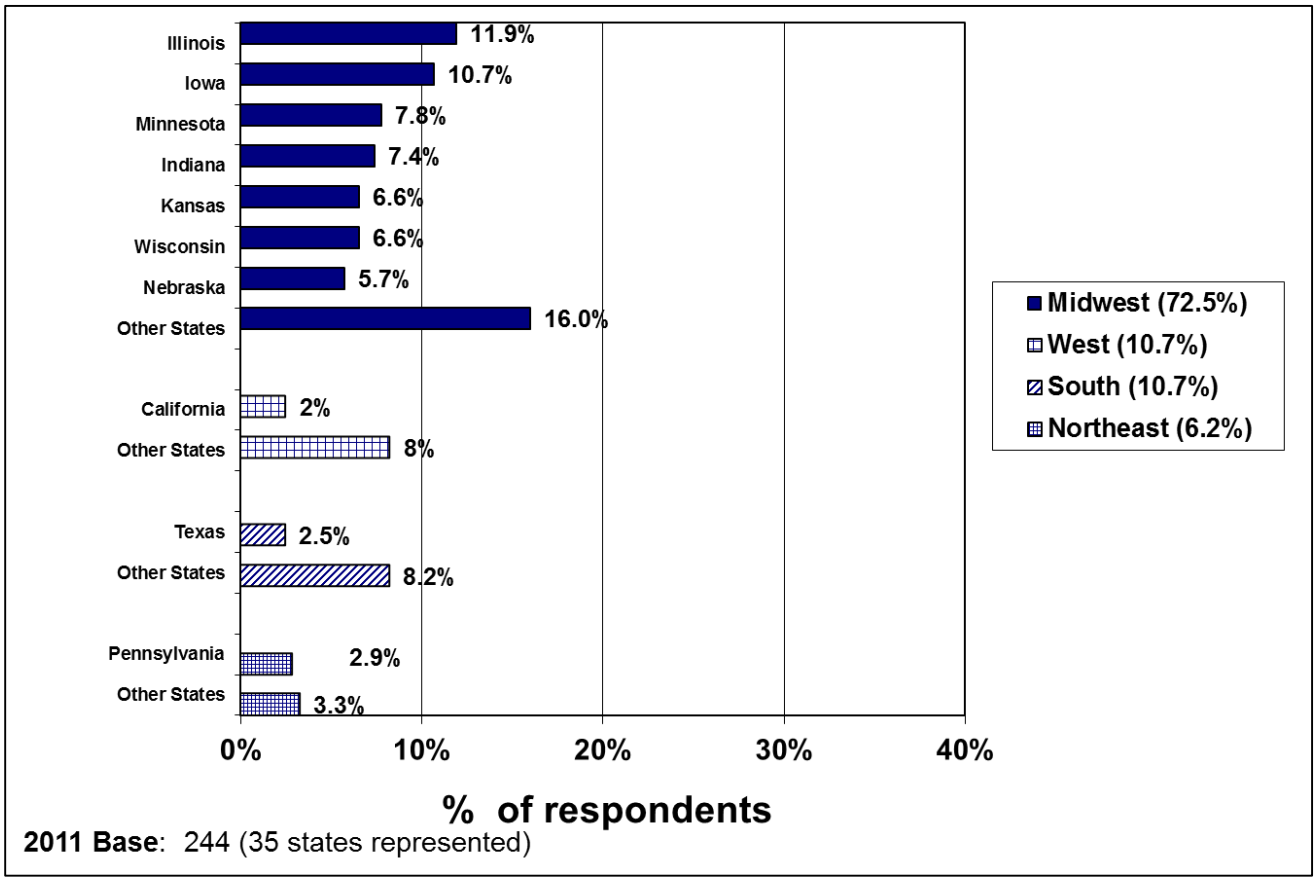
The data were analyzed to identify statistical differences by region (Midwest versus other states) and differences between organizational types within the Midwest (cooperative, local independent, regional/national). Where charts or data are provided for these breakouts, differences are statistically different at $p < .05$ unless specifically stated otherwise.

The Respondents

The 244 survey respondents represented 35 states, with the most returns from Illinois, accounting for 11.9 percent of the respondents, and Iowa with 10.7 percent of the respondents

(Figure 1). By region, the Midwest was heavily represented in the sample, with 73 percent of the respondents being from the Midwest states of Indiana, Illinois, Iowa, Kansas, Wisconsin, Minnesota, Michigan, Missouri, Nebraska, North and South Dakota, and Ohio. Eleven percent of the respondents were from the South, 11 percent were from the West, and 6 percent were from the Northeast.

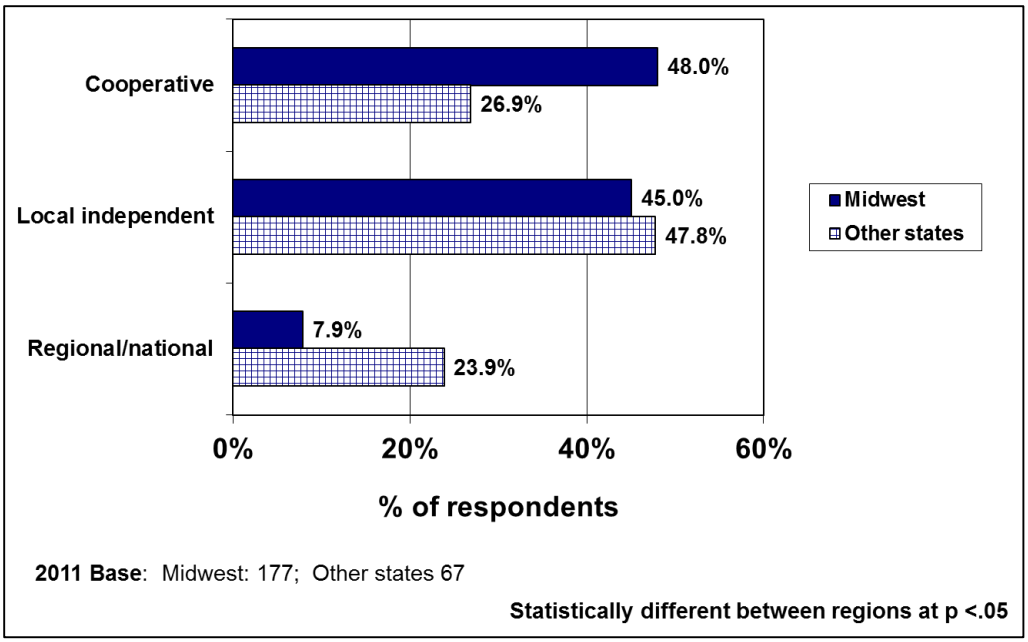
Figure 1. States Represented



Responding dealerships represented a variety of organizational types with more than 4 out of 10 of the sample respondents representing local independents (45 percent), 42 percent representing cooperatives, and 13 percent being part of a national or regional chain of dealerships.

Figure 2 shows the organizational types for the Midwest and non-Midwestern respondents. Cooperatives and local independents each accounted for just under half of the participants from the Midwest (48 percent each) the non-Midwestern states had a similar proportion of local independents (48 percent) but an equal number of cooperative and regional/national dealerships (approximately a quarter each).

Figure 2. Organization Types by Region



The size of the participating dealerships was smaller this year (2011) than in some of the previous years. Responding dealerships ranged from one outlet (36 percent of the respondents) to more than 25 outlets (14 percent of the respondents) compared to 2009 survey where only 27 percent of the respondents represented dealerships with only one outlet and 19 percent represented dealerships with over 25 outlets (Figure 3). This makes the overall sample more heavily weighted toward dealerships with 2 to 5 outlets instead of one outlet as in previous years.

When the number of retail outlets was broken out by region (Figure 4), respondents with only one retail outlet were almost equally common in Midwestern states (36 percent) and non-Midwestern states (35 percent), however, large dealerships with over 25 outlets were much more common in non-Midwestern states (29 percent of participants) compared to Midwestern participants (9 percent).

Figure 3. Number of Retail Outlets Owned or Managed

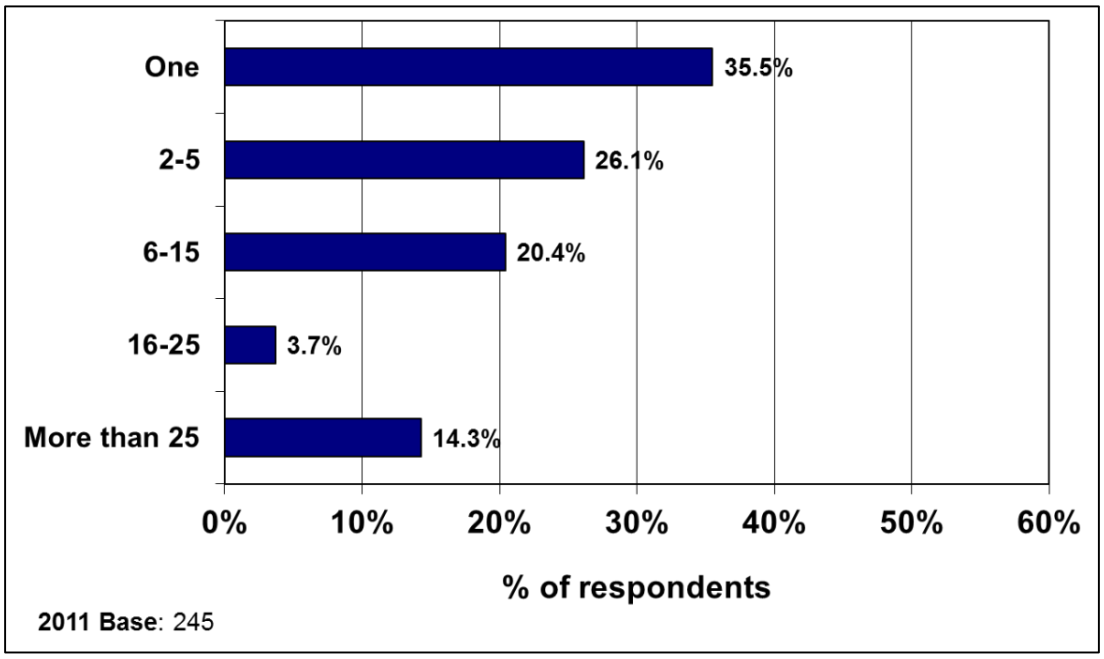
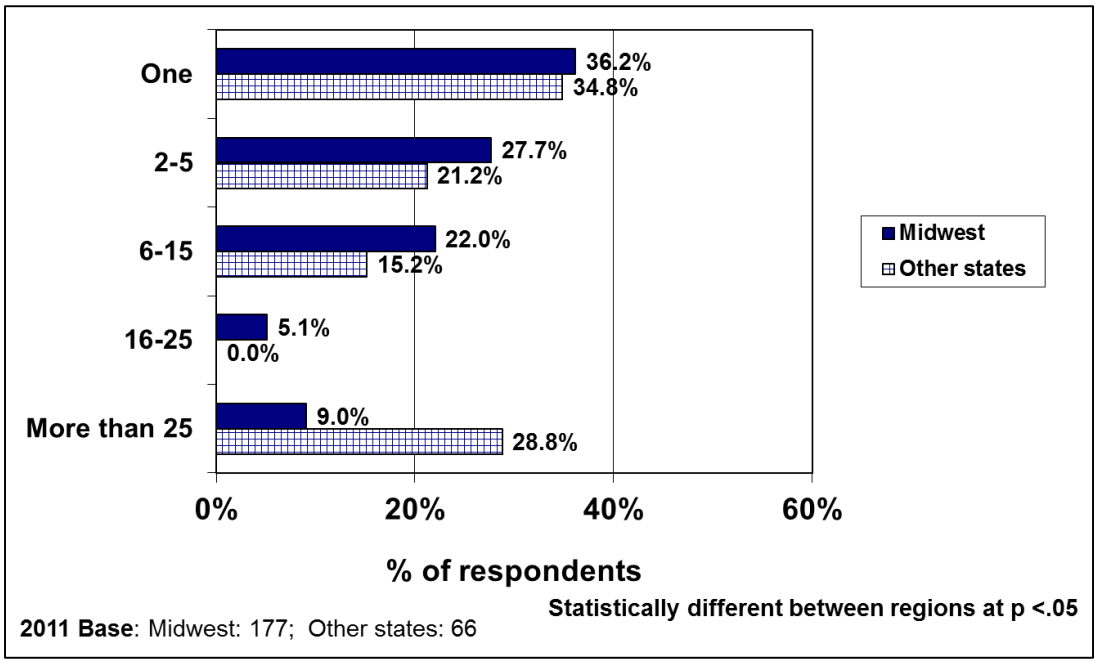


Figure 4. Number of Retail Outlets Owned or Managed by Region



In the Midwest, local independents were significantly more likely to have only one retail outlet (65 percent of the participants from Midwestern local independents compared to 14 percent of the cooperatives and regional/nationals) while the most common size for cooperatives was 2 to 15 outlets (73 percent) and the majority of the regional/national organizations had over 25 outlets (50 percent of these respondents).

Respondents also represented a range of outlet sizes. Fourteen percent (13.8 percent) of the 2011 respondents had annual crop input sales of less than $1 million at their location, slightly more than 2009, while 53 percent had $5 million or more in annual agronomy sales, similar to the 2009 results (Figure 5). Overall, there were no significant differences between outlet sizes in the Midwest compared to the non-Midwestern states (

Figure 6).

Figure 5. 2010 Annual Agronomy Sales at Location

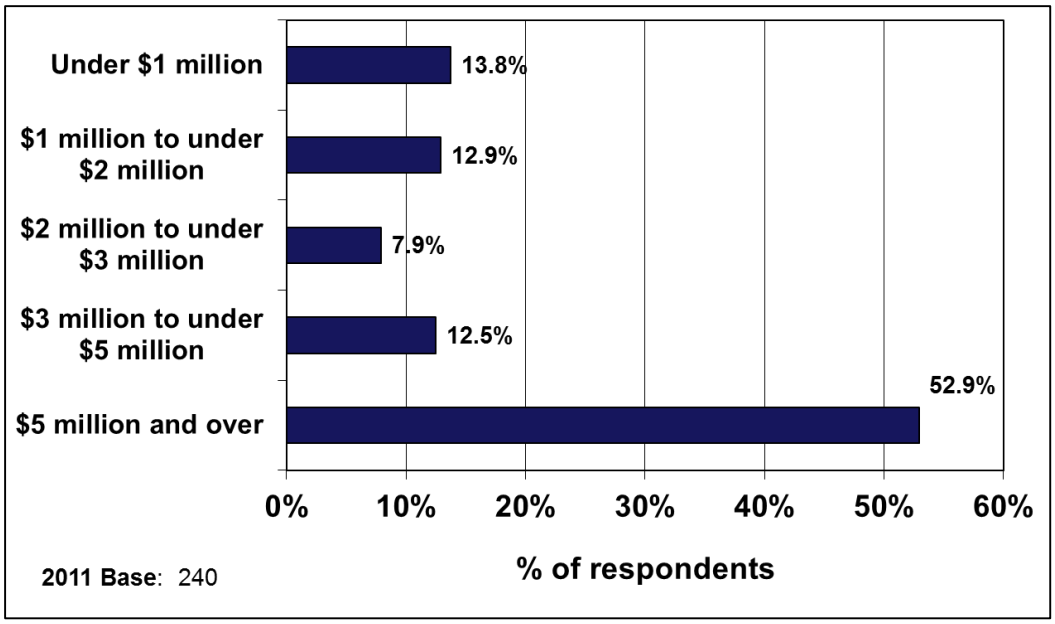
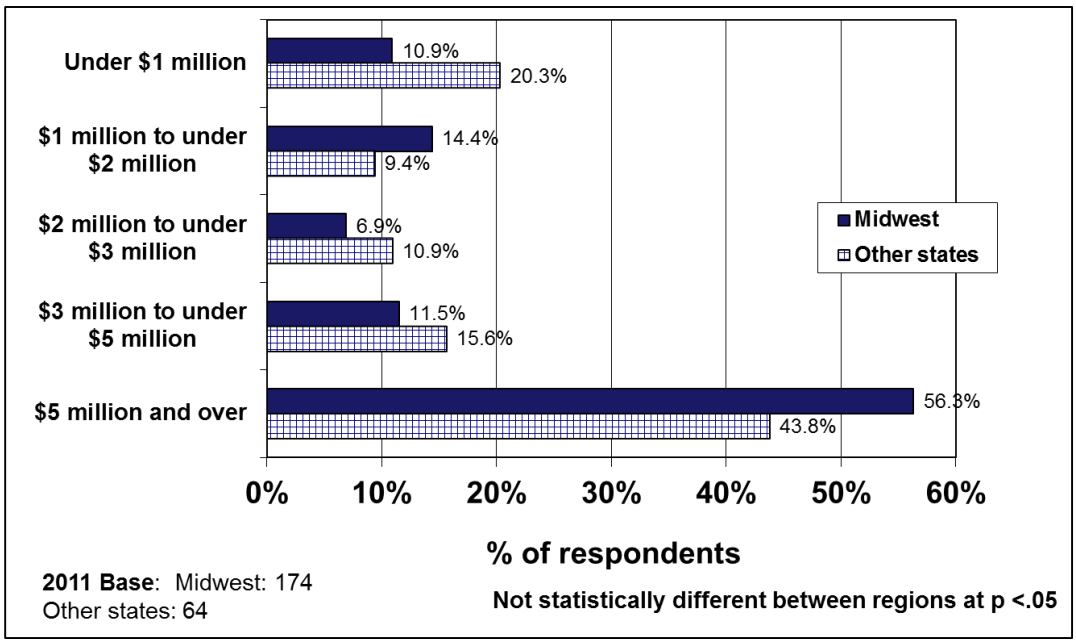


Figure 6. 2010 Annual Agronomy Sales at Location by Region

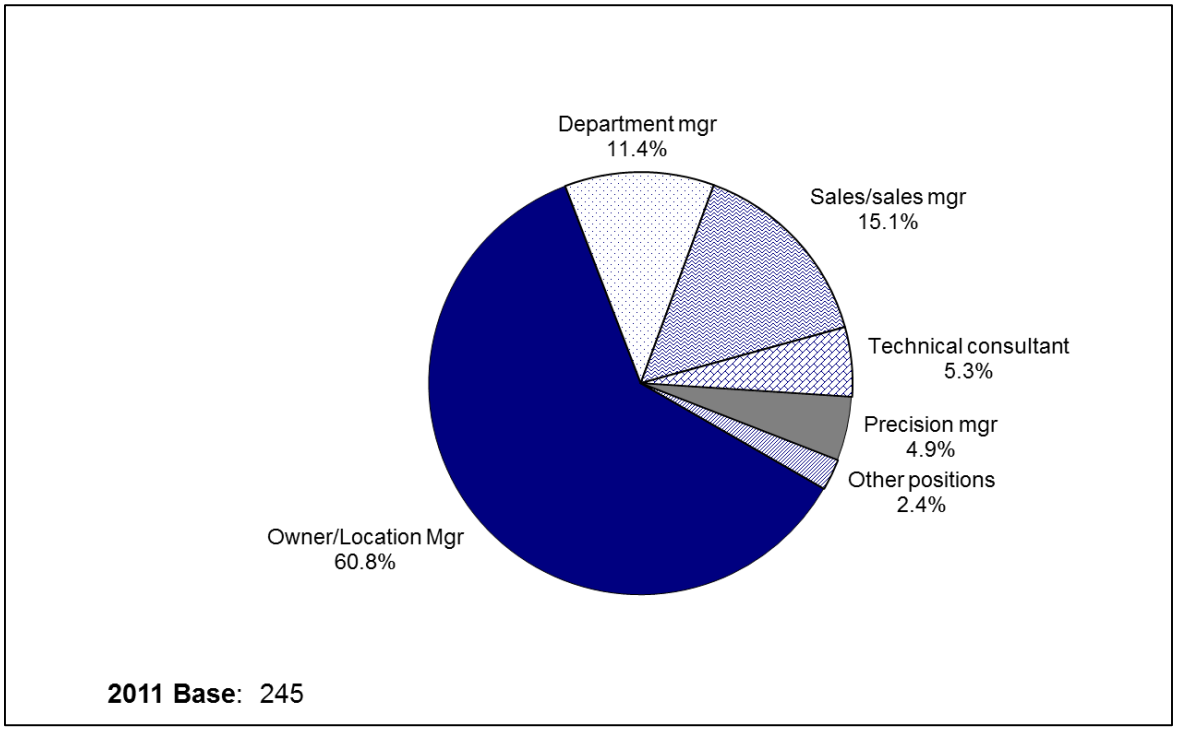


Within the Midwest, there were significant differences in annual crop input sales by organizational type. Local independents were not only smaller in terms of the number of outlets in their businesses, but their outlets were also significantly smaller in terms of crop input sales dollars per outlet. Only a third of the local independents had outlet sales of over $5 million, compared to over three-quarters of both the cooperatives and regional/national dealerships.

As to who was participating in the survey from the dealership, almost two-thirds of the questionnaires were completed by the owner or location manager (61 percent), sales and sales managers accounted for 15 percent of the respondents, while 11 percent of the respondents were departmental managers (Figure 7). Technical consultants and precision managers together accounted for 10 percent of the respondents. Across regions, respondents from the Midwest were most likely to be the owner/manager of the retail outlet (64 percent of the respondents from the Midwest) compared to only half of the respondents from non-Midwestern states (52 percent).

In the Midwest, the owner/manager was again the most common position held by respondents from all three types of organizations. Most of the respondents representing local independents owned or managed the location (87 percent), while 57 percent of those representing regional/national organizations were the owner/manager and 45 percent of the respondents representing cooperatives were the manager.

Figure 7. Responsibility of Survey Respondent



Custom Application

Custom application was offered by 83 percent of the respondents. (Custom application here is defined as dealership application of fertilizer, pesticides, and/or custom seeding.) Over half of the respondents custom applied more than 25,000 acres per year (59 percent) (Figure 8). Across the U.S. however, custom application was most common in the Midwest where 87 percent of the respondents offered custom application services compared to 71 percent of the respondents from other states (Figure 9).

Figure 8. Acres Custom Applied

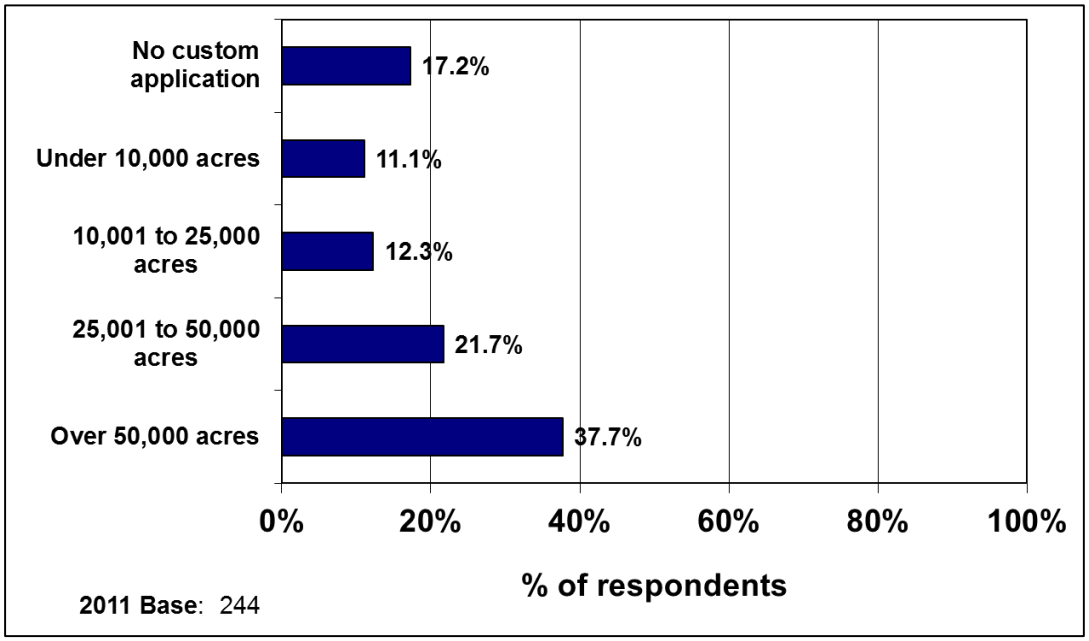
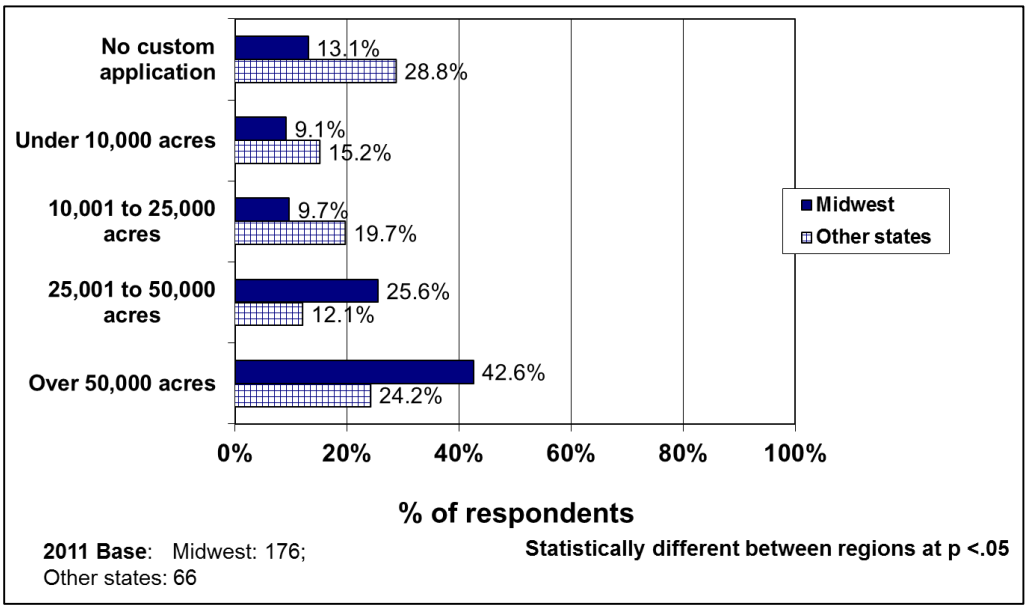
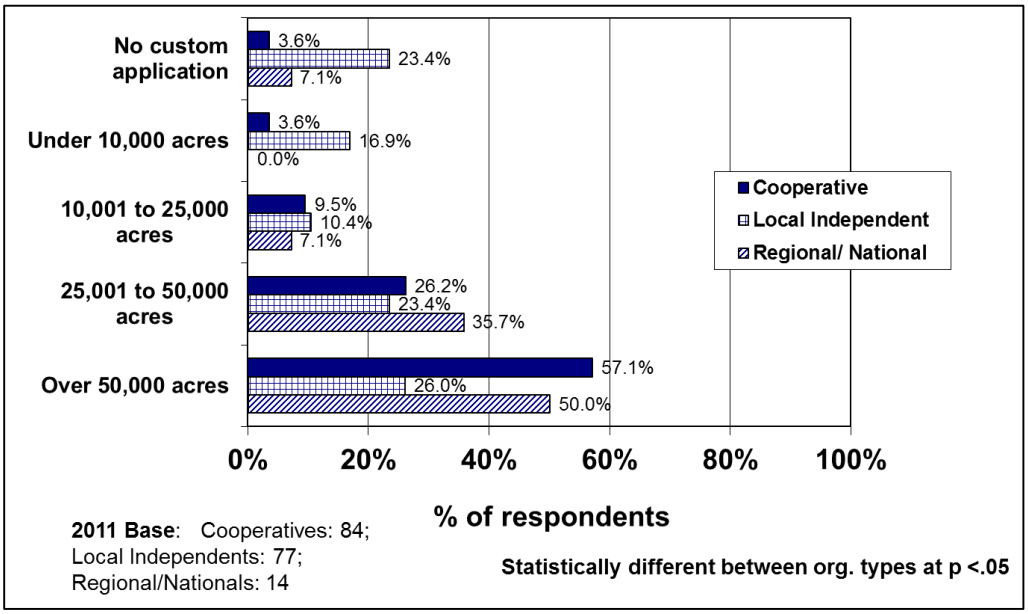


Figure 9. Acres Custom Applied by Region



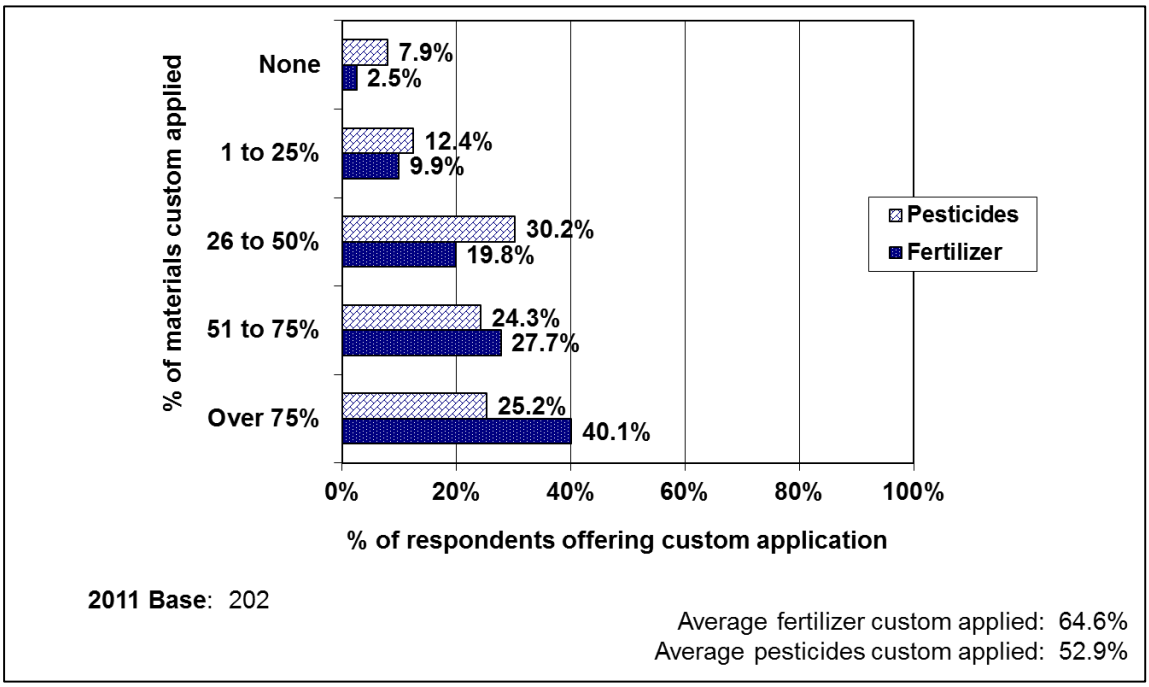
Similar to other years, local independents in the Midwest were less likely to offer custom application than were other organizations, with 23 percent of the local independents not offering custom application compared to only 4 percent of the cooperatives and 7 percent of the regional/nationals (Figure 10).

Figure 10. Acres Custom Applied by Organizational Type in the Midwest



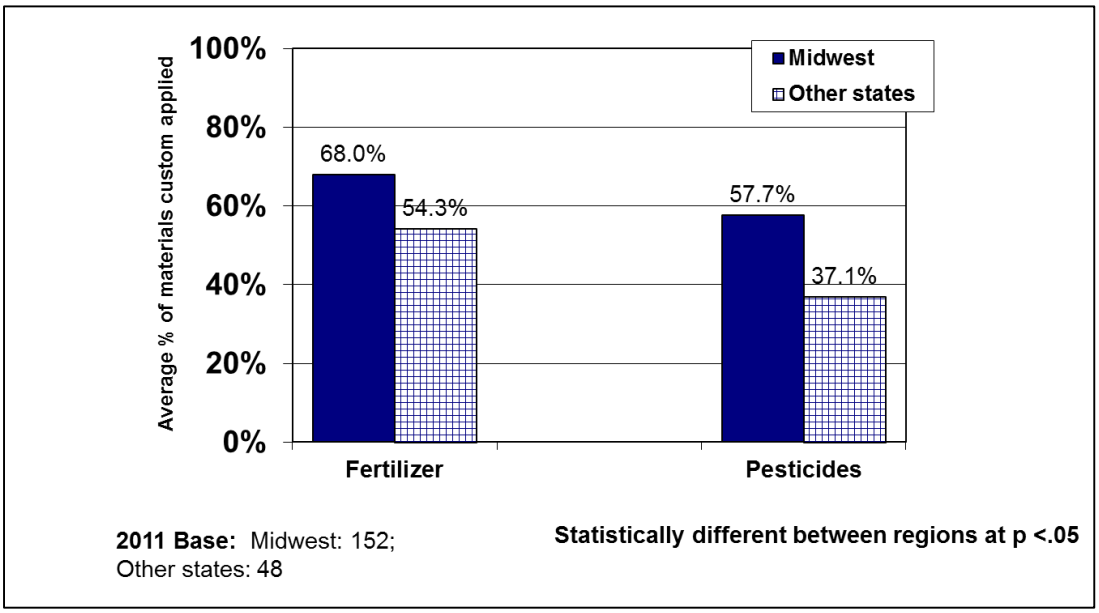
When asked specifically about custom application of fertilizer versus pesticides, respondents custom applied a slightly greater proportion of the fertilizer they sold relative to pesticides. On average, respondents who indicated their outlet offered custom application applied 65 percent of the fertilizer they sold and 53 percent of the pesticides they sold (Figure 11). A quarter of the respondents (25 percent) said their dealership custom applied over 75 percent of the pesticides sold. Over a third of the respondents (40 percent) said they custom applied over 75 percent of the fertilizer they sold.

Figure 11. Custom Application of Fertilizer and Pesticides



Those dealerships from the Midwest who offered custom application typically applied a greater proportion of the fertilizer and pesticides they sold. Midwestern respondents said they custom applied an average of 68 percent of the fertilizer they sold and 58 percent of the pesticides they sold while those from non-Midwestern states applied an average of 54 percent of the fertilizer sold and 37 percent of the pesticides sold (Figure 12). In the Midwest, there were no differences in the average amount of fertilizer or pesticides custom applied by organizational type.

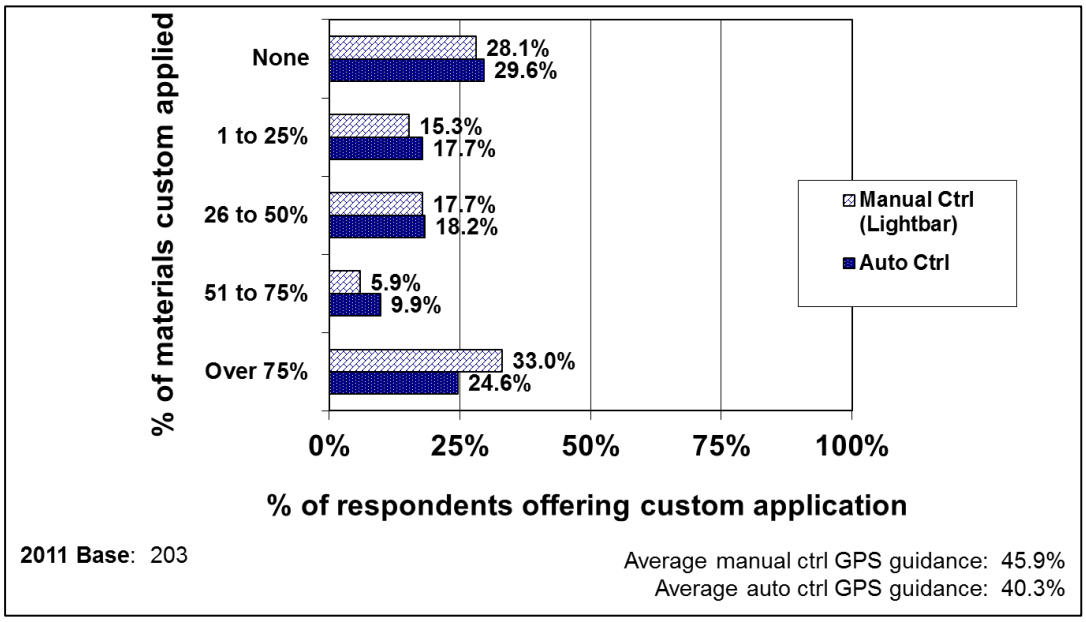
Figure 12. Custom Application of Fertilizer and Pesticides by Region



One of the important technology trends the past few years has been the use of GPS guidance systems for custom application. Manual control/light bar has been the most popular type of GPS guidance system but results suggest that use of manual control guidance peaked around 2008. In 2011, of those who offered custom application, 72 percent said they were custom applying at least some of the fertilizer/chemicals using a GPS guidance system with manual control/light bar, down from 92 percent in 2009 (Figure 13). This was off-set by an increase in auto control/auto steer guidance systems with, 70 percent of the 2011 participants indicating they used a GPS guidance system with auto control/auto steer for at least some of their custom application, up from 2009's 56 percent and 2008's 28 percent.

Looking at the average amount of materials custom applied with GPS guidance systems, an average of 46 percent of the materials custom applied were applied with GPS with manual control/light bar (compared to 78 percent in 2009) and 40 percent of the materials custom applied were applied with auto control GPS (compared to 22 percent in 2009).

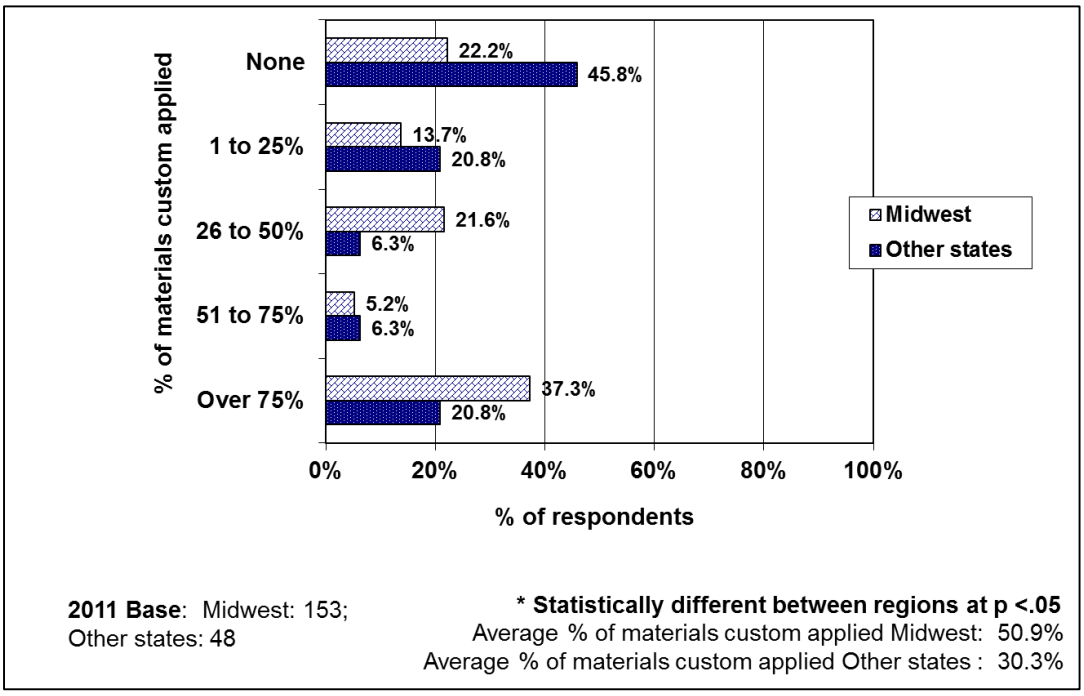
Figure 13. Use of GPS Guidance Systems for Custom Application



Looking more in-depth at manual control/lightbars, the use of GPS guidance systems with manual control/lightbars varied by region (Figure 14), with heavier use in the Midwest than in non-Midwestern states. However, both the Midwest and non-Midwestern states showed a similar decline in the reliance on manual control/lightbars. In 2011, fewer than 8 out of 10 of the respondents from the Midwest used some form of GPS guidance system with manual control (78 percent, down from 98 percent in 2009). In non-Midwestern states, 54 percent of the respondents used manual control/lightbar guidance, down from 74 percent in 2009.

Again, when considering the average amount of materials custom applied with specific types of GPS guidance systems, 51 percent of the materials being custom applied in the Midwest were applied with manual control GPS guidance systems (down from a high of 69 percent in 2008). Non-Midwestern dealerships applied an average of 30 percent of their fertilizer/pesticides with lightbars, down from a high of 49 percent in 2008.

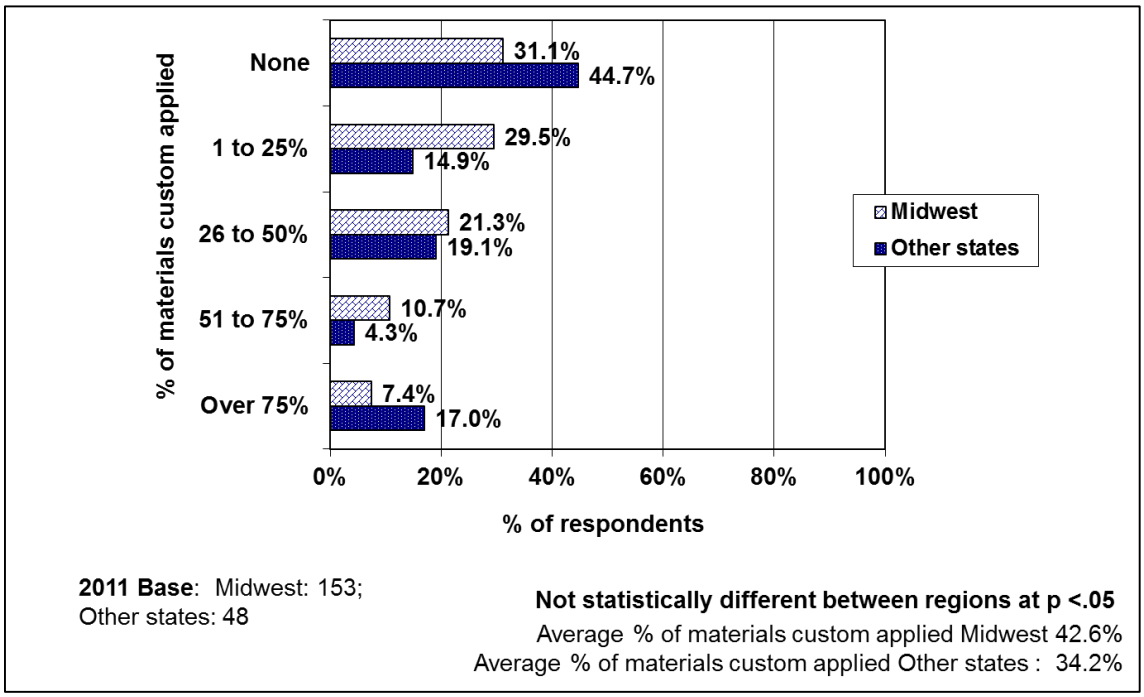
Figure 14. Use of GPS Guidance Systems for Custom Application by Region: Manual Control



Switching from the manual control/light bars to auto control/autosteer GPS guidance systems, unlike previous years, in 2011 auto control/autosteer GPS guidance systems were used statistically more intensively in the Midwest than in non-Midwestern states (Figure 15), with 43 percent of the fertilizer/pesticides being custom applied with auto control/autosteer GPS guidance systems in the Midwest and 34 percent in non-Midwestern states.

Not only was autocontrol/autosteer used more intensively in the Midwest, but it was also used by a larger proportion of the dealerships, with 75 percent of the Midwestern respondents using autocontrol/autosteer GPS guidance systems (up from 62 percent of the respondents in 2009) compared to 56 percent of the respondents in non-Midwestern states (up from 40 percent in 2009).

Figure 15. Use of GPS Guidance Systems for Custom Application by Region: Auto Control



2011 Base: Midwest: 153;
Other states: 48

Not statistically different between regions at p <.05

Average % of materials custom applied Midwest 42.6%

Average % of materials custom applied Other states : 34.2%

In the Midwest, there was no statistical difference across the organizational types in their use of either GPS guidance systems with manual control nor GPS guidance systems with autosteer (Figure 16 and Figure 17), though all types of organizations showed growth in the use of auto-control guidance systems and some decline in lightbar/manual control guidance.

Figure 16. Use of GPS Guidance Systems for Custom Application by Organizational Type in the Midwest: Manual Control

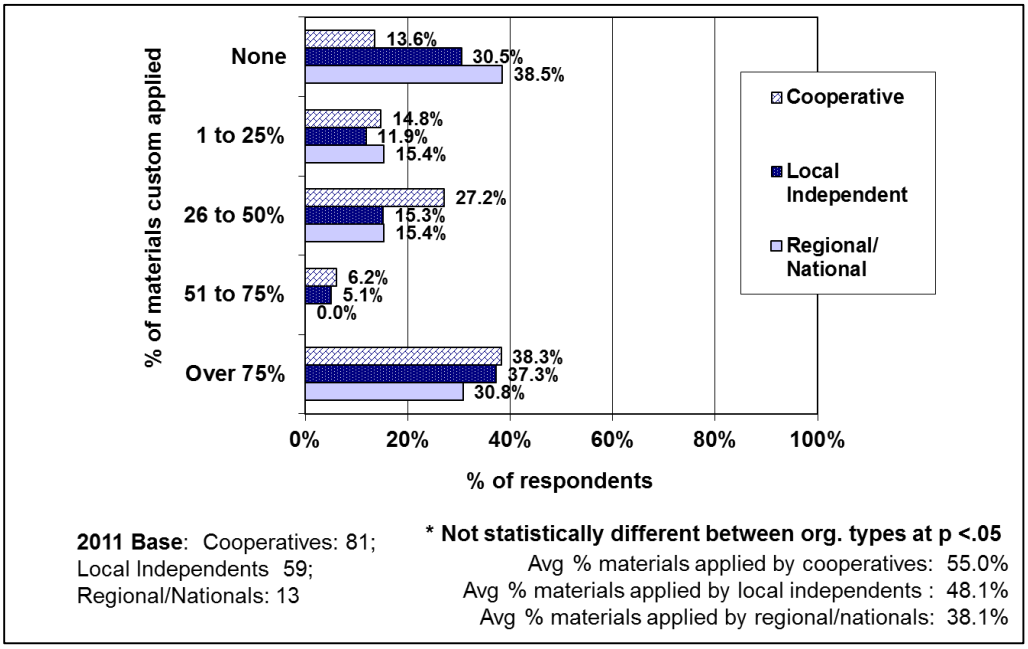
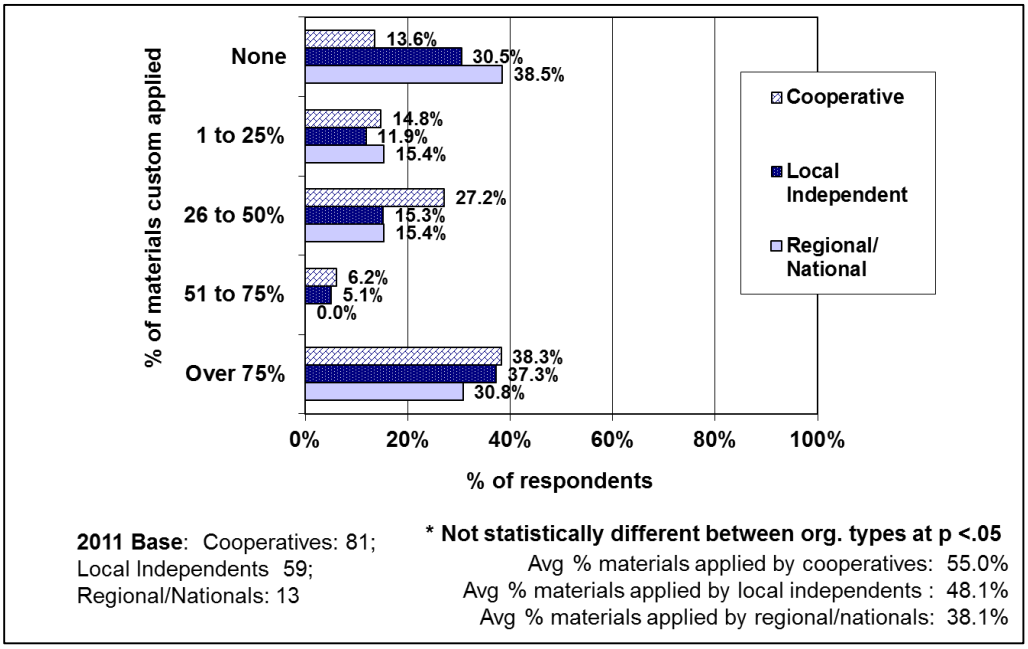


Figure 17. Use of GPS Guidance Systems for Custom Application by Organizational Type in the Midwest: *Auto Control*



Those using autocontrol GPS guidance systems were asked what type of correction they were using (see Table 1 for a guide to terminology). The most common correction was Wide Area Augmentation System (WAAS), with almost two-thirds of the autocontrol guidance system users indicating they used this free service available through the FAA (Figure 18). A quarter of the respondents (25 percent) were purchasing a correction service from an RTK array/cluster such as Deere and Trimble while 21 percent were purchasing satellite correction such as OmniSTAR XP and StarFire2.

For those who are far from stationary bases or who have areas in their fields with poor signal strength, purchasing an individual base station is often the best choice. As of the spring of 2011, 14 percent of those using auto-guidance had purchased their own RTK base station, either a stationary one they could place for the best signal in their market area or a portable base station that was moved with them to different farms/areas.

Two areas at the initial phase of adoption were RTN (Real Time Networks) which use a mesh layout of base stations to provide better service coverage and CORS (Continually Operating Reference Stations) which work on cell phone data plans to provide wireless service not dependent on line-of-sight radio waves. Both methods of RTK correction were being used by fewer than 5 percent of the respondents.

There were no differences between the types of correction being used across the Midwest and non-Midwestern states or between organizational types within the Midwest.

Figure 18. Types of GPS Correction Used

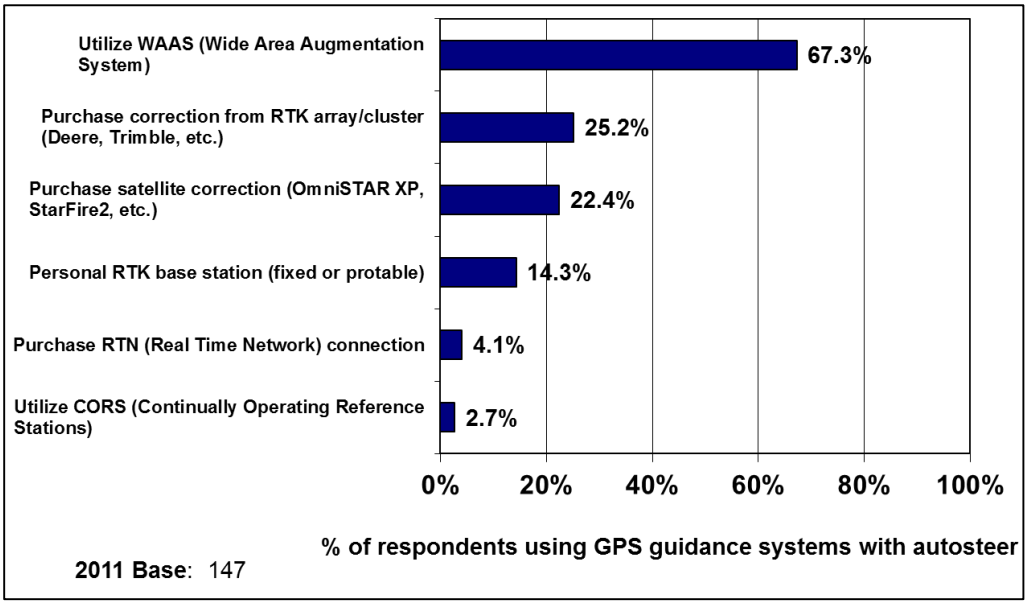


Table 1. GPS Guidance Terminology

GPS: (Global Positioning System) – This is the name of 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.

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
- Internet-capable cell phone or cell modem (available from various cell phone data providers) is used to transmit correction signals from a server to the tractor so no line-of-sight requirements
- Requires cellular phone service and a data plan
- No personal base station is required so some cost is lower

Use of Precision Technologies and Offerings of Site-Specific Services

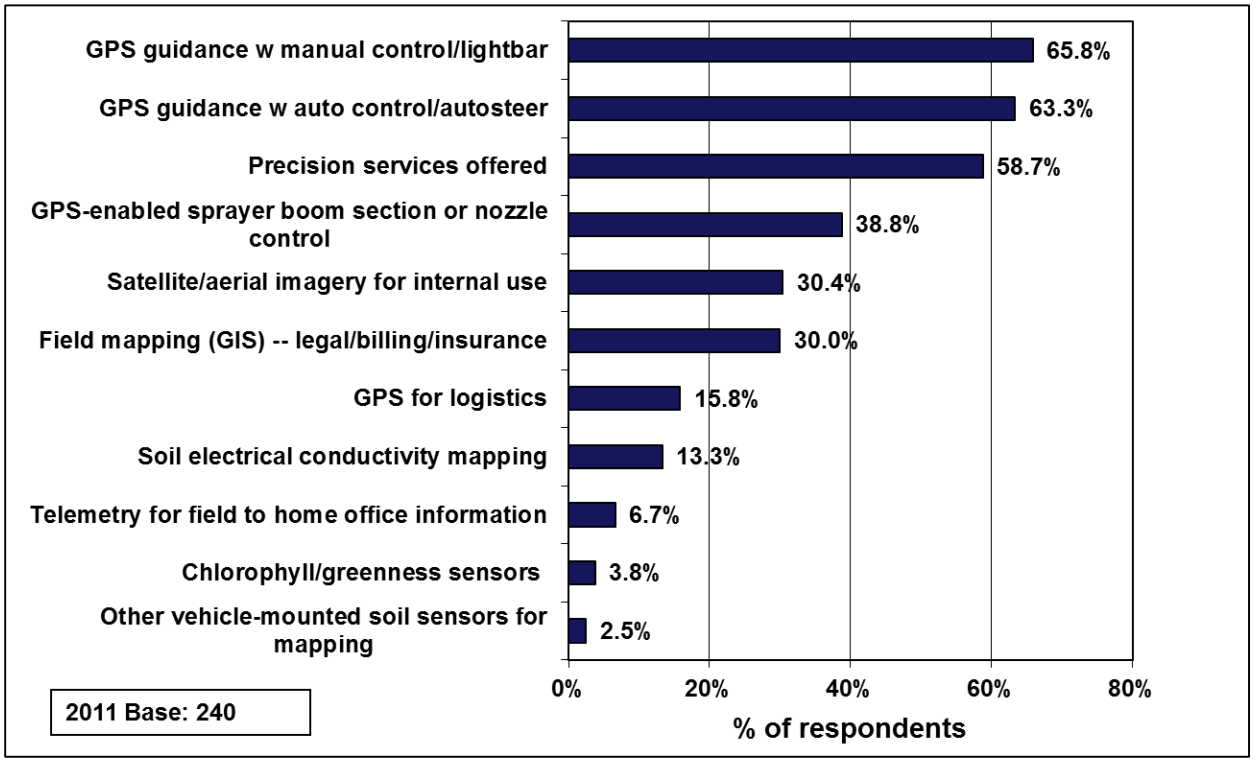
Respondents were asked several questions about their use of precision technologies and which site-specific services they were currently offering (or would be offering by the fall of 2011).

Use of Precision Technologies

Dealerships were asked how they were using precision technology in their dealerships – from offering their customers precision services to using precision technologies internally for guidance systems, satellite/aerial imagery, billing/insurance/legal activities, logistics, or field-to-home office communications.

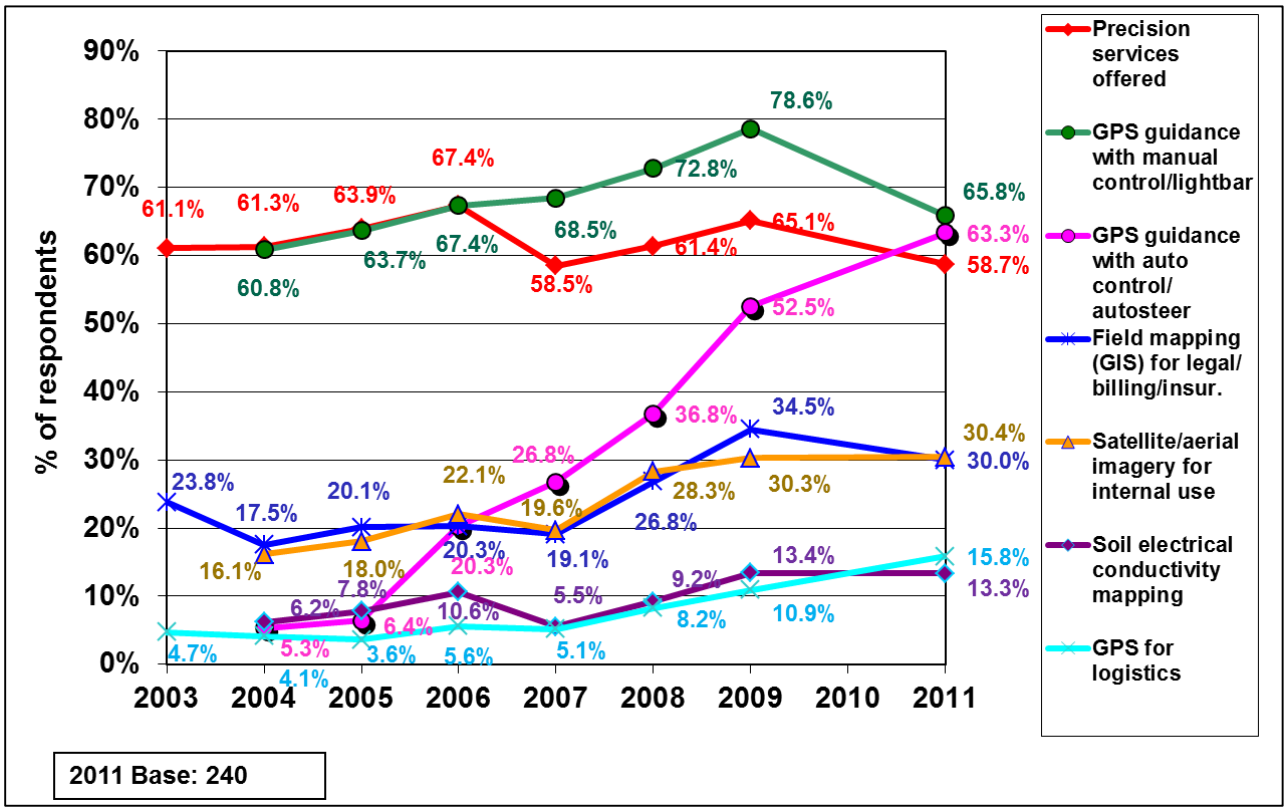
The two most common uses of precision technology in the dealership were using GPS guidance with manual control/light bar (66 percent of all respondents) and autocontrol/auto steer GPS guidance systems (63 percent of all respondents). Only 59 of the respondents indicated that they offered precision services (Figure 19). The next three most common uses of the technology were GPS-enabled sprayer boom section (39 percent of respondents), satellite/aerial photography for internal uses (30 percent of respondents) and field mapping with GIS for billing purposes (also 30 percent of respondents). 16 percent of respondents used GPS for to manage vehicle logistics and 13 percent of the respondents said they used soil electrical conductivity mapping (Veris) (similar to 2009).

Figure 19. Use of Precision Technology



Over time, some uses of precision technology have grown while others have remained fairly stable (Figure 20). The biggest growth seen from 2009 to 2011 was in the use of GPS guidance systems with autocontrol/autosteer, growing from 53 percent of the dealerships in 2009 to 63 percent in 2011. For the first time, this reflected a change for dealers using manual control/light bar as they switched to autocontrol technologies while the use of manual control/light bar actually dropped from 2009 to 2011 (79 percent to 66 percent). The other uses of precision technology remained stable or dropped slightly from 2009 to 2011.

Figure 20. Use of Precision Technology over Time

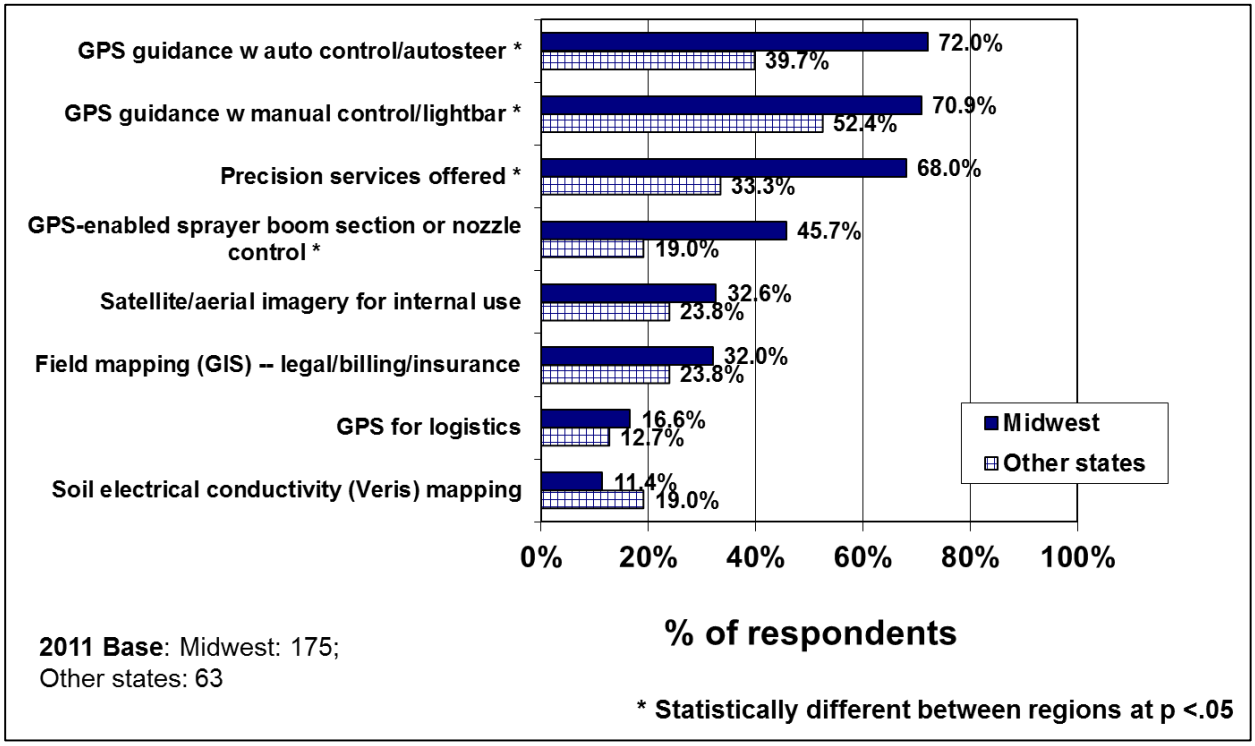


As in other years, precision technologies were being used by significantly more dealerships in the Midwest than in non-Midwestern states (Figure 21). For both regions, the most common use of precision technology was for guidance systems. In the Midwest, autocontrol/autosteer was the most common use with 72 percent of the dealerships using the technology (compared to 40 percent of the respondents from non-Midwestern states). This was an increase in the Midwest over 2009's 58 percent but remained stable in non-Midwestern states. The most common use of precision technology in non-Midwestern states was GPS guidance systems manual control/lightbar instead of autocontrol (52 percent of the respondents from non-Midwestern states). Manual control guidance systems were used by fewer dealerships in both areas in 2011 compared to 2009.

A new question this year was GPS-enabled sprayer boom section control/nozzle control. The technology was in use by almost half of the respondents from the Midwest (48 percent) and 19 percent of the respondents from non-Midwestern states.

Of the technologies asked about, only soil conductivity (Veris) mapping was used by more respondents in non-Midwestern states than by Midwestern states (19 percent in non-Midwestern states compared to 11 percent in Midwestern states).

Figure 21. Use of Precision Technology by Region

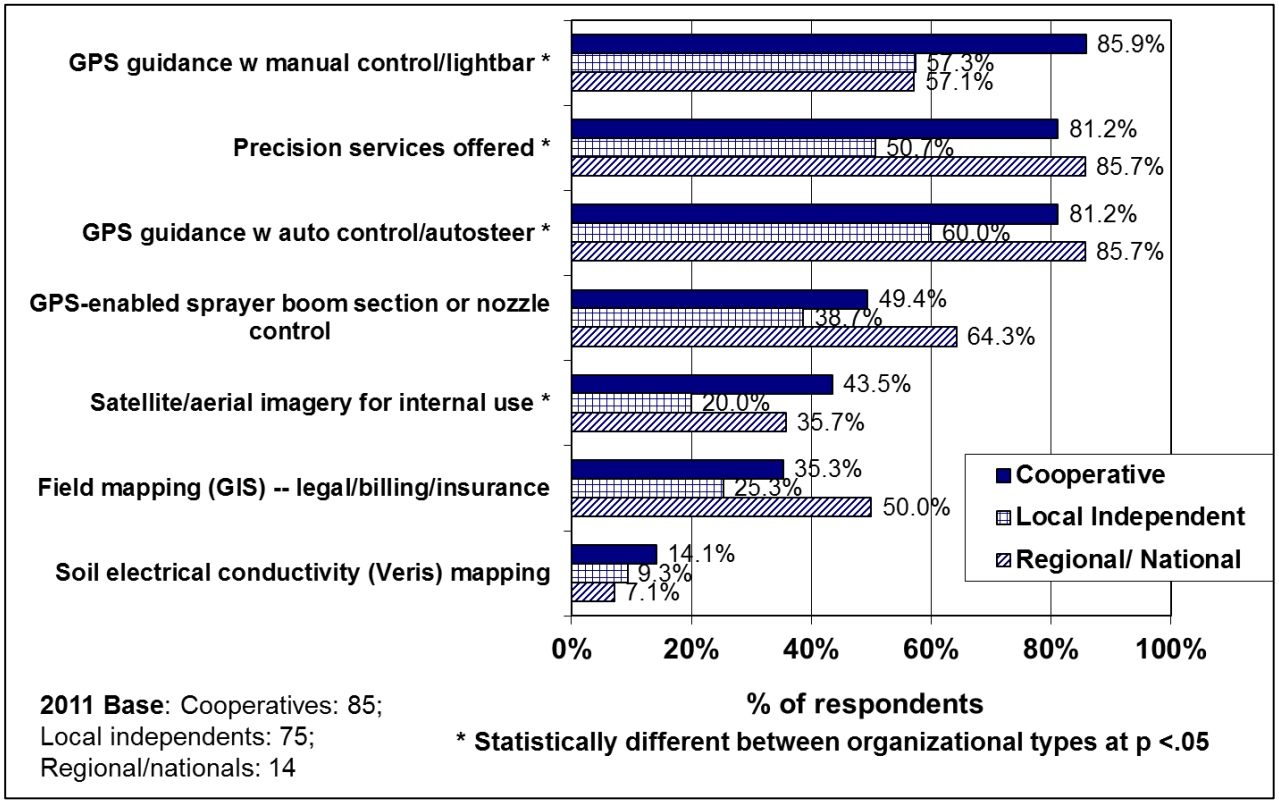


In the Midwest, adoption of precision technology varied by organizational type (Figure 22). Similar to previous years, local independents were the least technology-heavy users across the board, with cooperatives and regional/national organizations being heavier users.

GPS guidance systems with manual control was used statistically more often by cooperatives in the Midwest than by either local independents or regional/national organizations (86 percent of cooperatives compared to 57 percent of the other respondents). Regional/national organizations made up for this difference with the use of auto control/autosteer guidance systems, with 86 percent using the "higher tech" alternative. However, only 60 percent of the local independents used auto control/auto steer guidance systems.

Eight out of ten of the cooperatives and regional/national outlets offered precision services to their customers (81 and 86 percent) (Figure 22), while only 51 percent of the local independents offered precision services. GPS-enabled sprayer boom section/nozzle control, satellite imagery and field mapping with GIS were all used most heavily by cooperatives and regional/national dealerships. Soil electrical conductivity (Veris) mapping did not show a huge difference between the organizational types.

Figure 22. Use of Precision Technology by Organizational Type in the Midwest



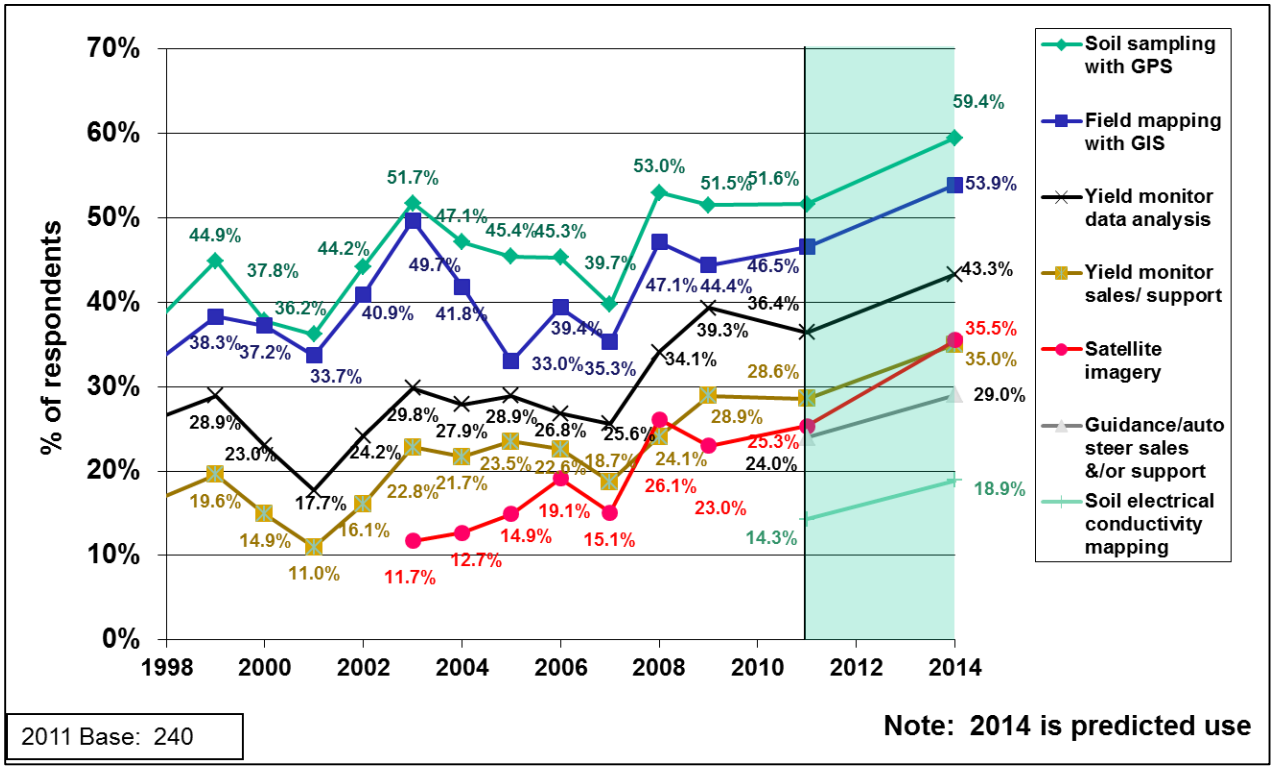
Precision Service Offerings

Respondents were asked which specific precision services they would be offering their customers by the fall of 2011. In most cases, use was stable from 2009 to 2011. As in previous years, the most common precision service offered by these dealerships was soil sampling with GPS – offered by 52 percent of the respondents (Figure 23). By 2014, 59 percent of the respondents expected their dealerships to be offering soil sampling with GPS.

Consistent with most previous years, field mapping with GIS was the second most common precision technology service to be offered, with 47 percent of the respondents offering the service by the fall of 2011. By 2014, 54 percent of respondents expected to be offering this service.

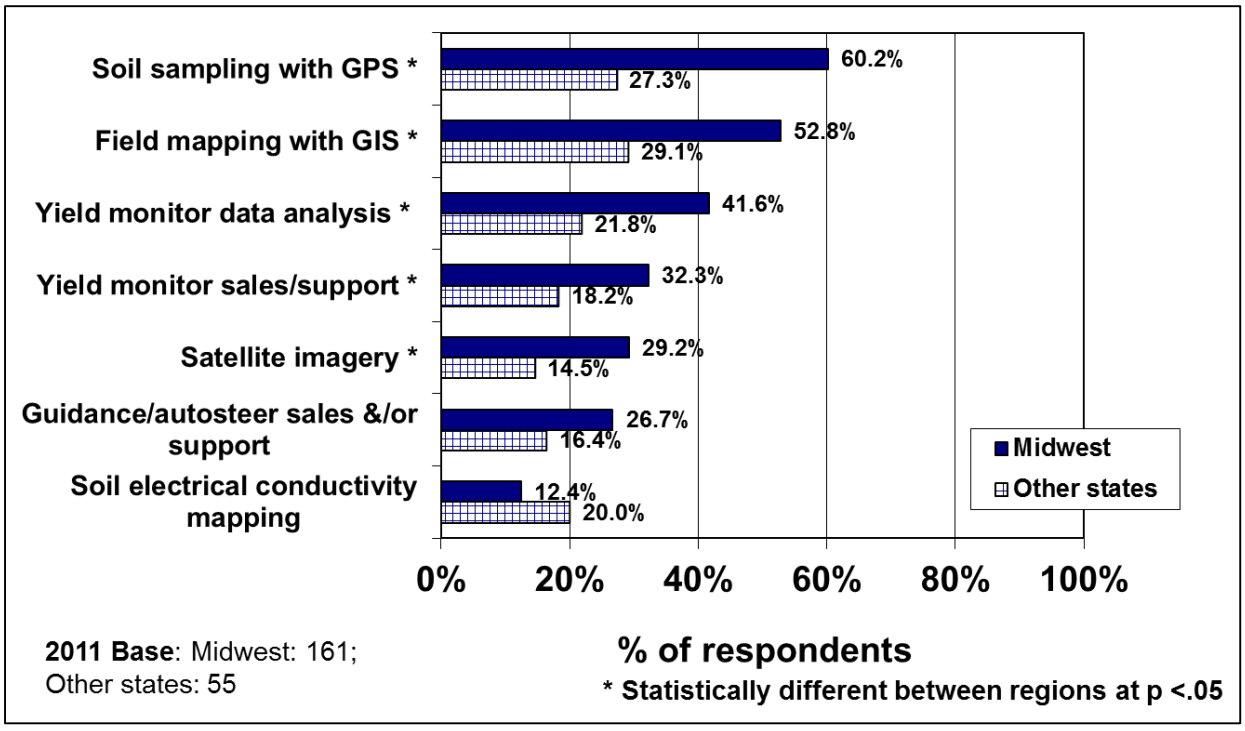
Yield monitor data analysis dropped a bit in 2011, though not significantly, from 39 percent in 2009 to 36 percent in 2011. Growth was still expected by 2014. The other precision ag service offerings have remained fairly stable over the past 3 years.

Figure 23. Precision Ag Services Offered Over Time



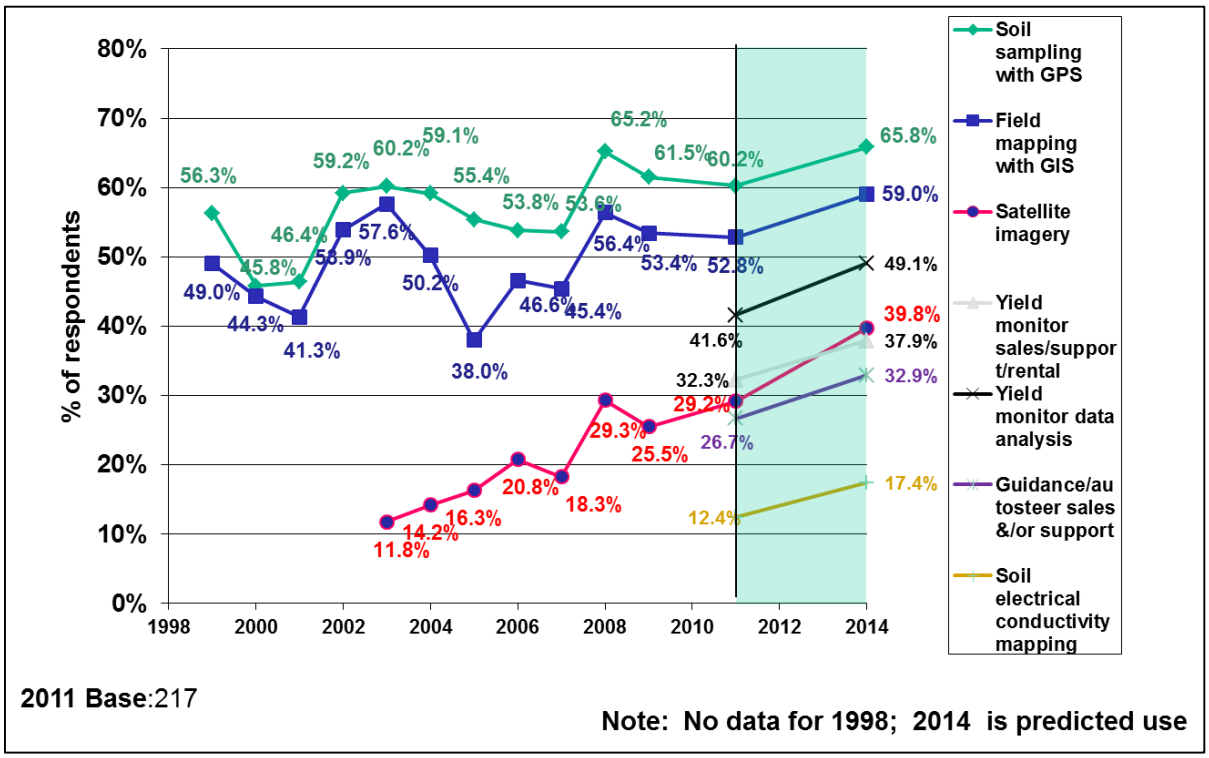
With the exception of soil electrical conductivity mapping and guidance/autosteer sales &/or support, all of these precision service offerings were statistically more common in the Midwest than in other states (Figure 24). For example, 60 percent of the responding dealerships from the Midwest indicated they would be offering soil sampling with GPS by the fall of 2011. In non-Midwestern states, soil sampling with GPS was expected to be offered by only 27 percent of the respondents. Likewise, for field mapping with GIS, over half of the Midwestern respondents (53 percent) expected to be offering the service by the fall 2009 compared to 29 percent of the non-Midwestern respondents. Similar differences were apparent for yield monitor sales/support and data analysis.

Figure 24. Precision Ag Services Offered by Region



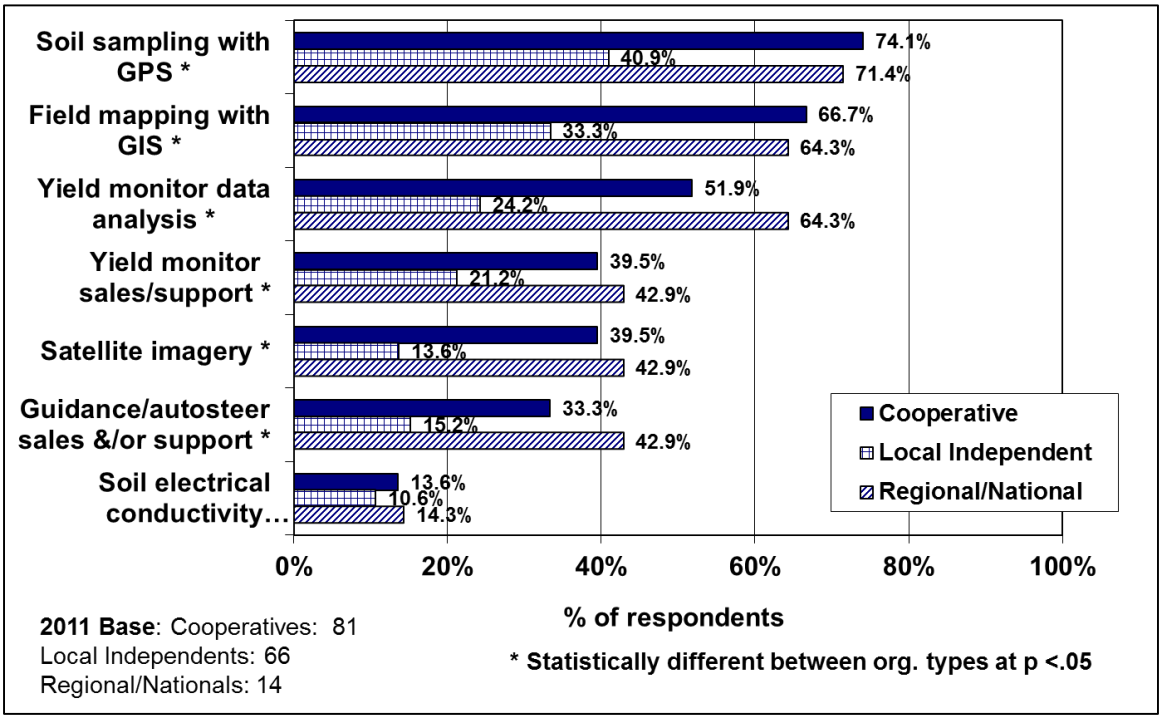
To get a better understanding of precision technology growth in the Midwest, Figure 25 shows the trends in key precision service offerings in the Midwest over the past 13 years. All three of the highlighted services have remained fairly stable from 2008 through to 2011, though growth is still expected in the next 3 years.

Figure 25. Precision Ag Services Offered Over Time in the Midwest



As in previous years, precision service offerings were more extensive in national/regional organizations and cooperatives in the Midwest compared to local independents (Figure 26). In the Midwest, local independents were generally not as likely to offer these services relative to other organizational types. In 2011, only offerings of soil electrical conductivity mapping were not statistically different across organizational types in the Midwest, with approximately a tenth of the dealerships from each type of organizational type offering the service.

Figure 26. Precision Ag Services Offered by Organizational Type in the Midwest

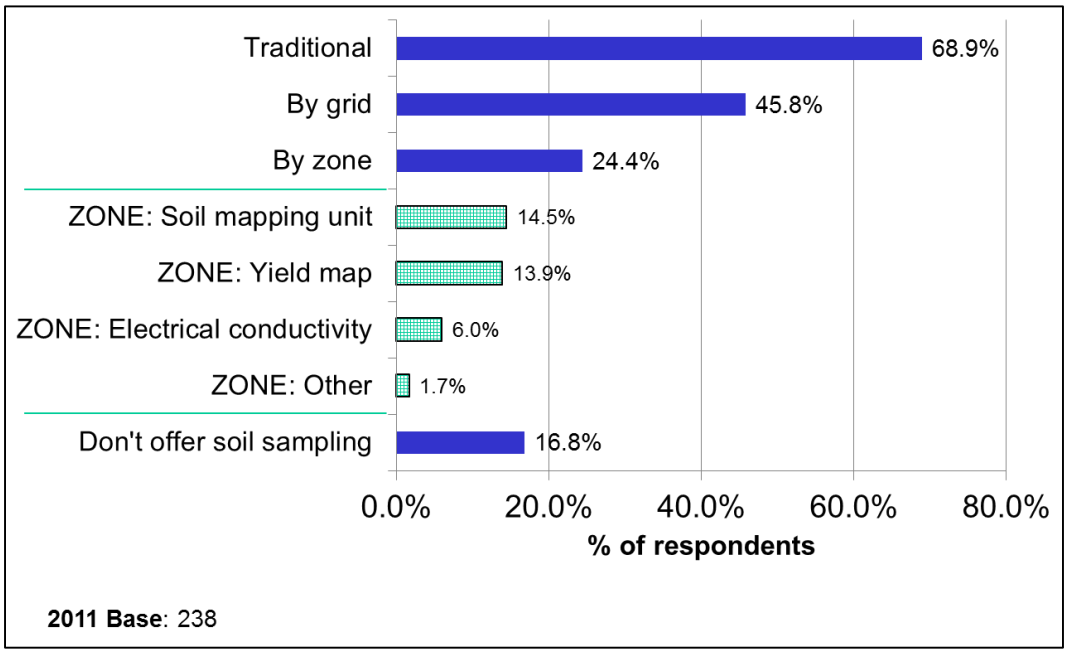


A Focus on Soil Sampling

As in previous years, the types of soil sampling dealerships were offering – by grid or by soil type – were explored in more detail. This year the question was refined a bit to more closely reflect the current technology and service offerings so it is difficult to compare trends from previous years.

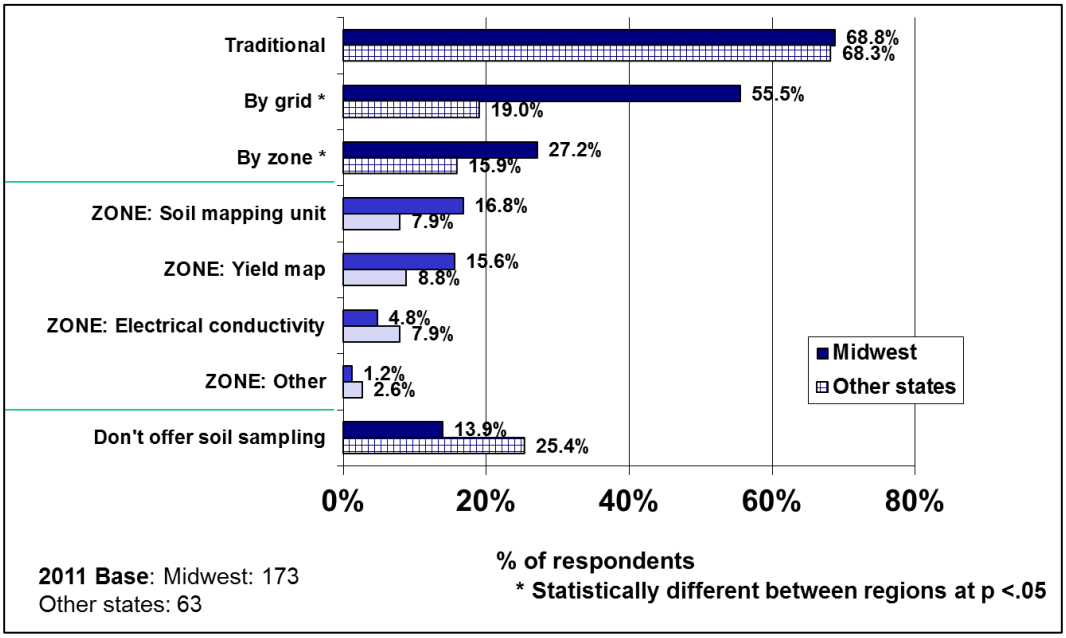
In 2011, 84 percent of the respondents offered some type of soil sampling with two-thirds indicating their dealership offered traditional soil sampling. Just under half of the respondents (45 percent) said they offered soil sampling by grid, while a quarter offered soil sampling by zone (Figure 27). Soil sampling by zone was most commonly offered by soil type zone or by zones based on yield maps.

Figure 27. Types of Soil Sampling Offered



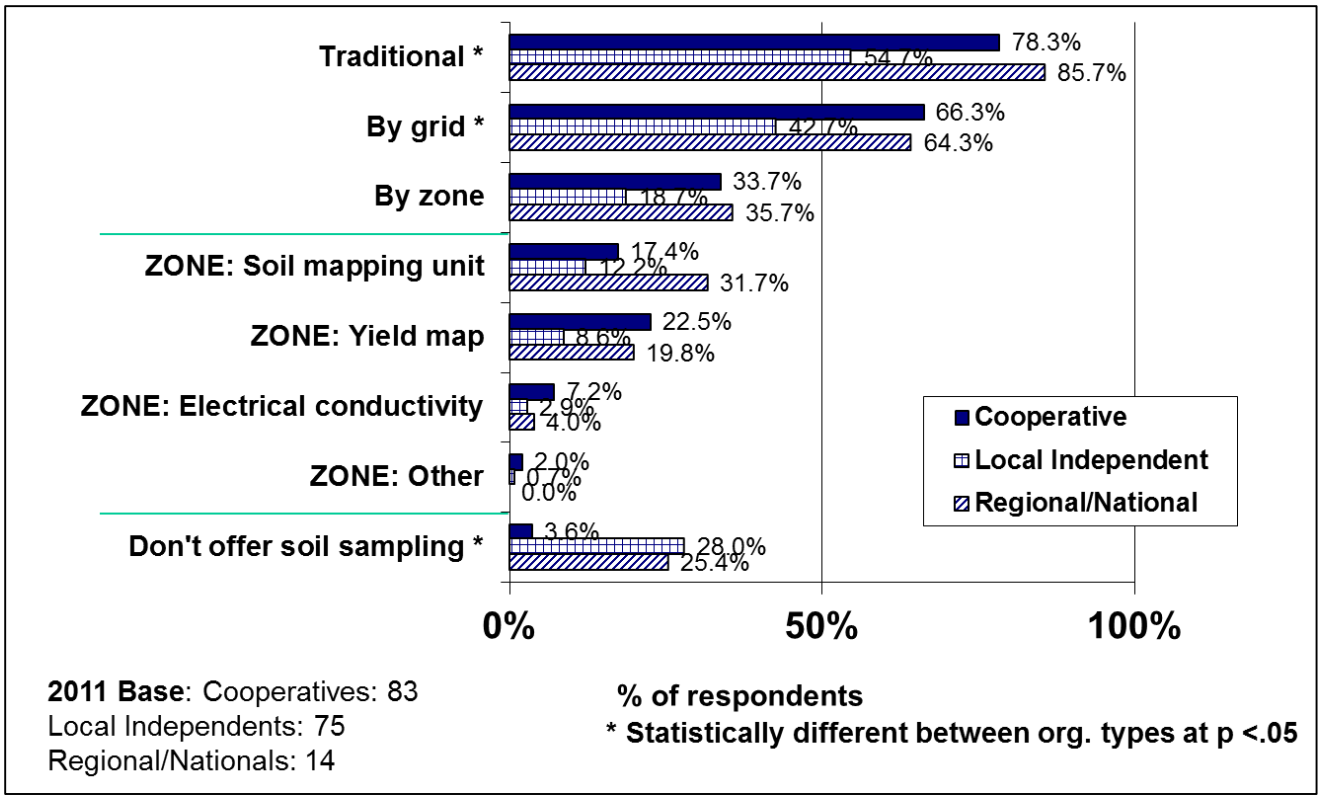
Soil sampling is slightly more common in the Midwest than in other states (Figure 28) with 86 percent of the respondents in the Midwest saying their dealership offered some type of soil sampling, compared to 75 percent of the respondents from non-Midwestern states. Soil sampling by grid was offered by almost three times as many respondents in the Midwest as from non-Midwestern states (56 percent of those in the Midwest compared to 19 percent in non-Midwestern states). Soil sampling by zone was offered by almost twice as many dealerships in the Midwest compared to other states (27 percent compared to 16 percent).

Figure 28. Types of Soil Sampling Offered by Region



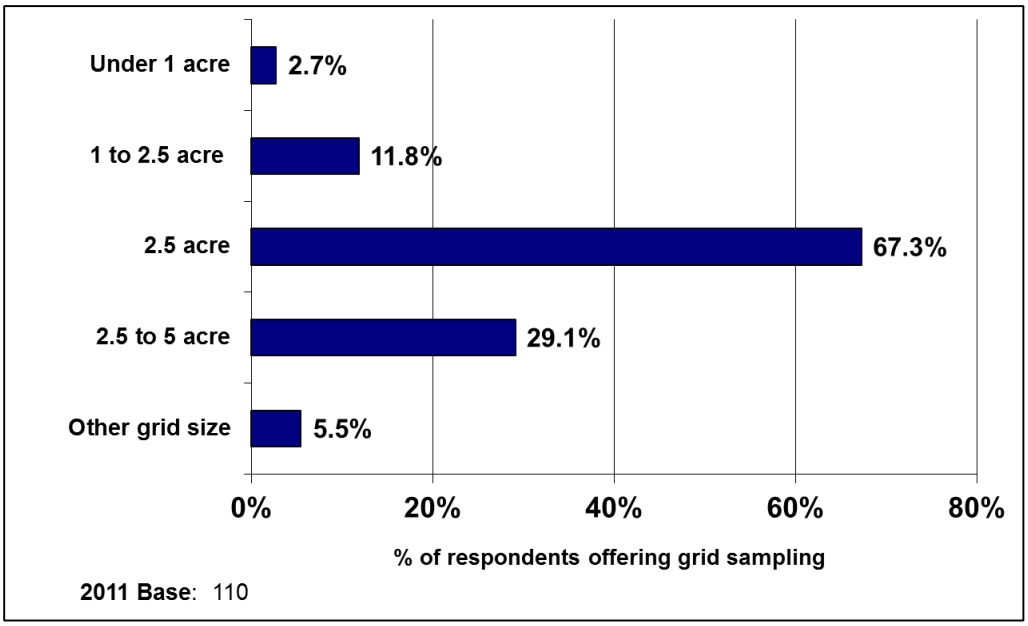
In the Midwest, the type of soil sampling also varied by organizational type (Figure 29). This year, cooperatives were much more likely to indicate that they offered some type of soil sampling (96 percent) compared to three-quarters of the local independents and regional/national respondents. Traditional soil sampling was offered by 86 percent of the regional/national organizations, 78 percent of the cooperatives and only 55 percent of the local independents. Similar patterns existed for both soil sampling by grid and by zone.

Figure 29. Types of Soil Sampling Offered by Organizational Type in the Midwest



The distribution of grid sizes has remained fairly constant over time with the most common grid size continuing to be 2.5 acres, followed by 2.5 to 5.0 acres (Figure 30). There was no variation in grid size by region or by organizational type within the Midwest.

Figure 30. Grid Sizes Used in Grid Sampling

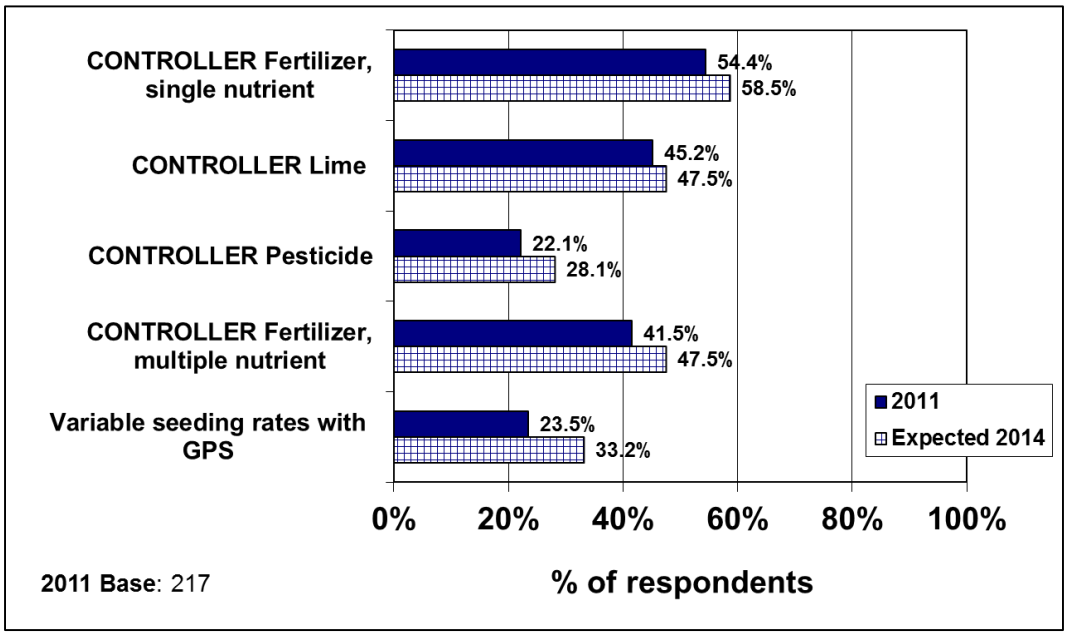


Variable Rate Application

Service offerings of variable rate custom application of fertilizer, lime and pesticides, as well as variable rate seeding with GPS have typically been provided along with traditional custom application services. Figure 31 shows the offerings of variable rate application and seeding services in 2011 and what respondents expected them to be in 2014. Compared to other years and other services, there were not expected to be huge changes in the 3 years ahead. Over half of the respondents (54 percent) offered controller application of fertilizer (single nutrient) and 42 percent offered fertilizer application as a multi-nutrient option. Forty-five percent of the respondents offered controller-driven application of lime and half of that number (22 percent) offered controller-driven application of pesticides. Due to updating the questionnaire, 2011 data could not be compared to previous year data.

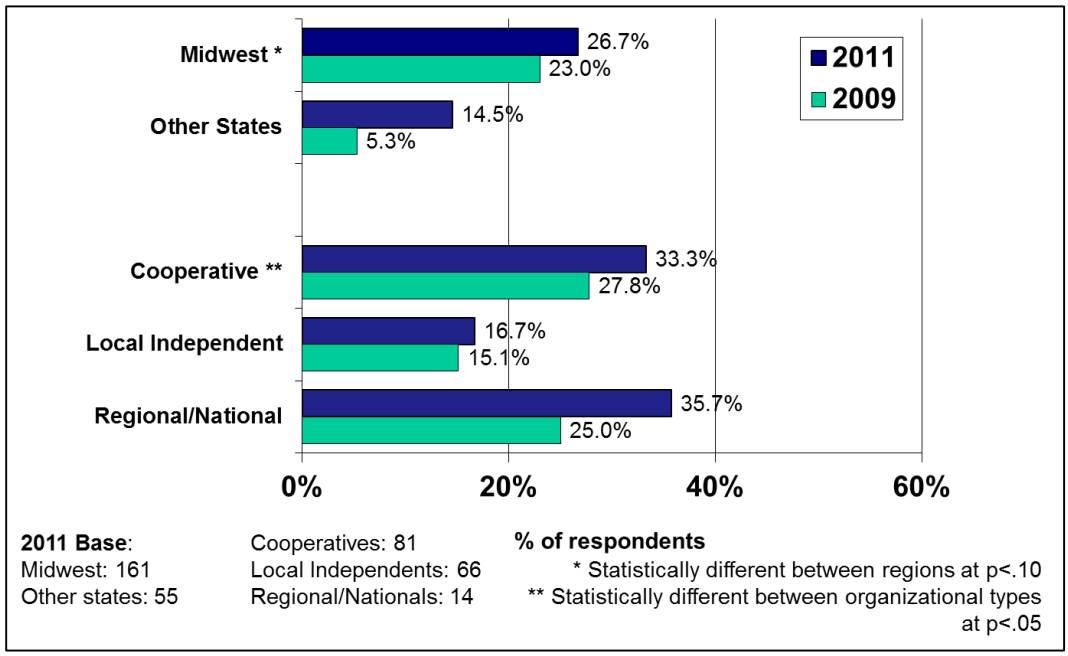
The biggest change in the past few years has been in variable seeding with GPS, with the service being offered by almost a quarter of the respondents in 2011 (24 percent) up from 18 percent in 2009. A third of the respondents expected to be offering variable seeding with GPS by 2014.

Figure 31. Variable Rate Application Offered



Focusing on variable rate seeding services, Figure 32 shows the 2009 to 2011 comparison between the Midwest and non-Midwestern states and between organizational types within the Midwest. In all cases, the percentage of respondents offering variable rate seeding had grown from 2009 to 2011, with the most growth seen in non-Midwestern states (5.3 percent of dealerships offered the service in 2009 compared to 14.5 percent in 2011). Among organizational types, the highest growth in service offerings was seen for regional/national dealerships, rising from 25 percent in 2009 to 36 percent in 2011.

Figure 32. Variable Rate Seeding by Regions and by Organizational Types within the Midwest



Consistent with other years and other precision service offerings, precision application services for fertilizer were more common in the Midwest than in non-Midwestern states and more common for cooperatives and regional/nationals in the Midwest than local independents (

Figure **33** and Figure 34). Controller-driven application of fertilizer was offered by almost twice as many dealerships in the Midwest over non-Midwestern states for both single nutrient application and multi-nutrient application. Multi-nutrient controller-driven application of fertilizer was offered by almost three times as many cooperative dealerships in the Midwest than by local independents.

Figure 33. Precision Application of *Fertilizer* Offered by Region

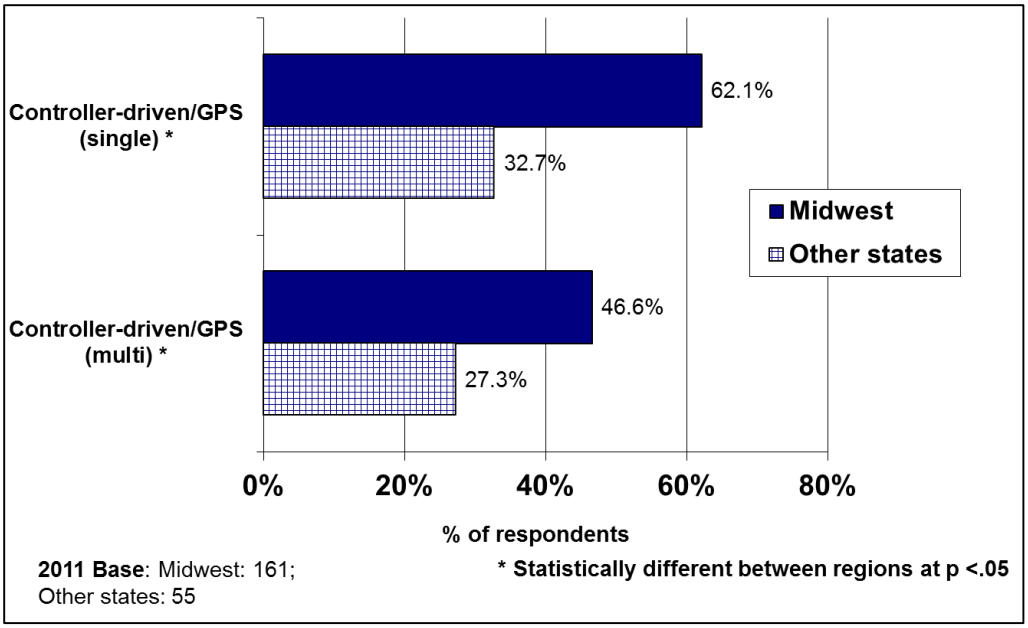
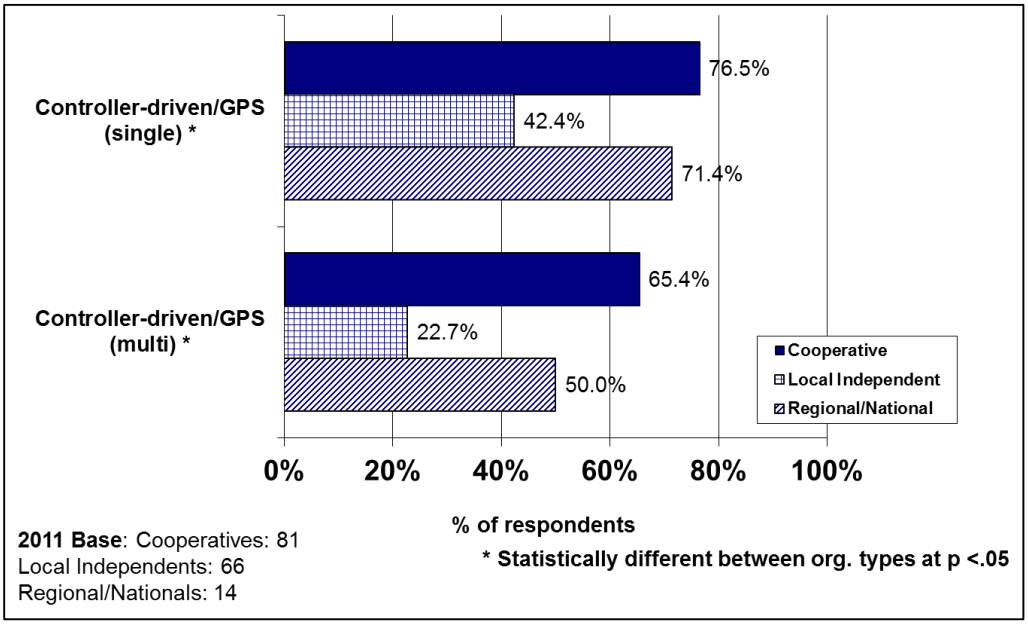


Figure 34. Precision Application of *Fertilizer* Offered by Organizational Type in the Midwest



Similar patterns were seen for both lime and chemical precision applications, though there were no statistically significant differences between the regions for controller-driven application of pesticides or for controller-driven application of lime or pesticides by organizational type in the Midwest (Figure 35 and Figure 36).

Figure 35. Precision Application of Lime and Pesticides Offered by Region

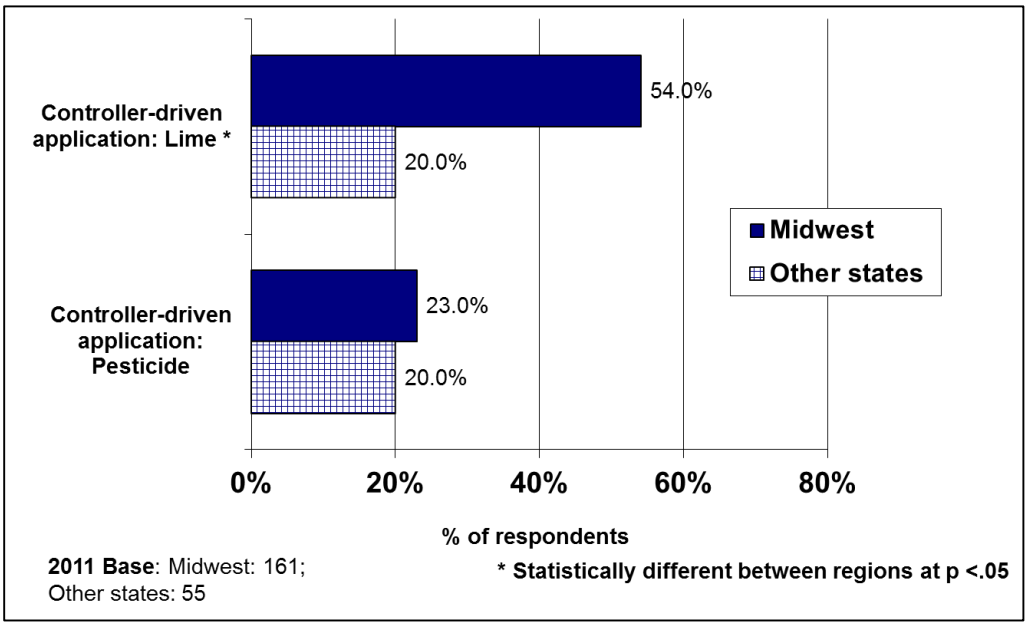
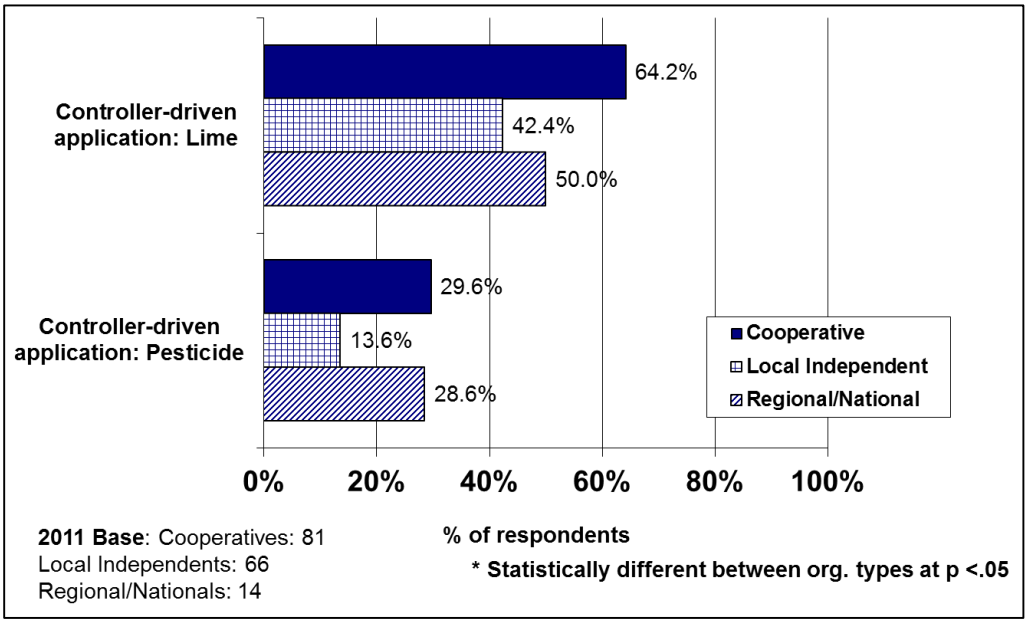


Figure 36. Precision Application of Lime and Pesticides Offered by Organizational Type in the Midwest

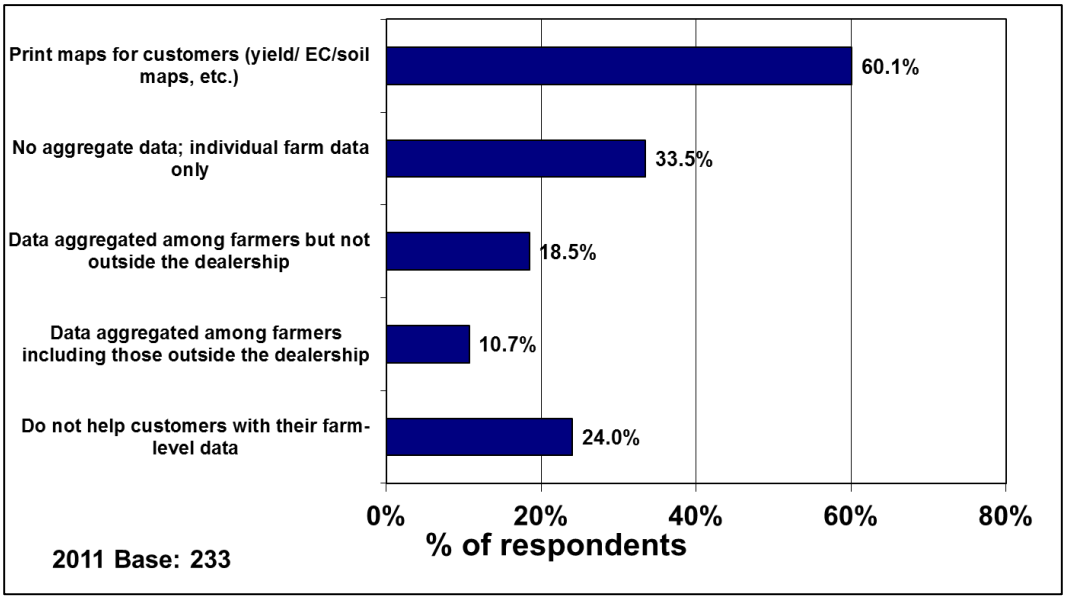


Analysis of Farm Data in More Detail

A new area explored in 2011 was how dealers were helping customers analyze farm data. Were they helping growers map the data, were they aggregating the results, or were they letting the grower work with the data themselves? Almost two-thirds of the dealerships were printing some type of yield map/EC/soil map for their customers (Figure 37). A third of the dealerships

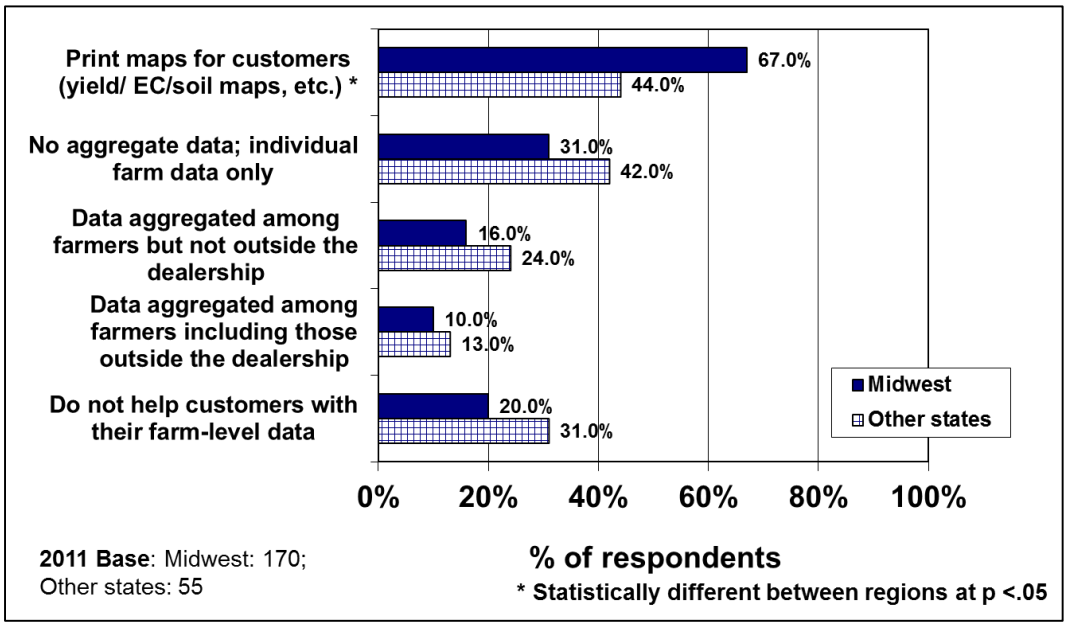
said they mapped non-aggregate data. Almost 20 percent aggregated the data among the growers within their dealership but not across growers outside their dealership. Only 11 percent were aggregating data outside of the dealership.

Figure 37. Managing farm-level data to assist customers in their decision making



The results were not statistically different between the Midwest and non-Midwestern states with the exception of printing maps – where two-thirds (67 percent) of the Midwestern dealerships but only 44 percent of the non-Midwestern dealerships were printing maps for their customers (Figure 38). There were no statistical differences between organizational types within the Midwest.

Figure 38. Managing farm-level data to assist customers in their decision making by Region



Profitability of Precision Service Offerings

Dealerships were asked how profitable they felt their precision offerings were. Overall, results were similar to those seen in 2009.

Each bar in Figure 39 and Figure 40 shows the proportion of respondents who indicated that a particular service was:

- Not covering fixed or variable costs;
- Covering variable costs;
- Covering both variable and fixed costs; or
- Generating a profit.

Using soil sampling with GPS in Figure 39 as an example, more than four out of ten of the respondents said the service generated a profit for their dealership (44.8 percent). Over a quarter (26.9 percent) said that it just covered fixed and variable costs. One in ten respondents (12.7 percent) felt that they were covering variable costs but not fixed costs for soil sampling with GPS and 9.0 percent said they were covering neither variable nor fixed costs. Only 6.7 percent of the respondents did not know how profitable soil sampling with GPS was for their dealership.

In looking at the precision services across both charts, the most profitable precision service offerings appeared to be application services of all sorts. Over half of the respondents indicating they were generating a profit with their traditional, non-precision custom application services (58

percent), but almost as many respondents said they were generating a profit with controller-driven multi-nutrient applications (57 percent) and controller-driven single nutrient applications (51 percent). The most profitable non-application precision service offering was soil sampling with GPS, with 45 percent of the respondents generating a profit with the service.

Similar to previous years, the least profitable of the precision services were yield monitor sales/support, variable seeding with GPS, satellite/aerial imagery and mapping, and yield monitor data analysis, with less than a quarter of the respondents reporting they made a profit on those services.

Overall, respondents were confident about the profitability of their total precision service offerings. Four out of ten of the respondents (42 percent) indicated their precision package generated a profit while another 29 percent said they were covering both the fixed and variable costs of providing the services. Both numbers were almost identical to 2008 and 2009 results (though most of the individual service offerings were reported to be more profitable in 2011).

There were no significant differences in reported profitability between regions.

Figure 39. Profitability of Precision Service Offerings

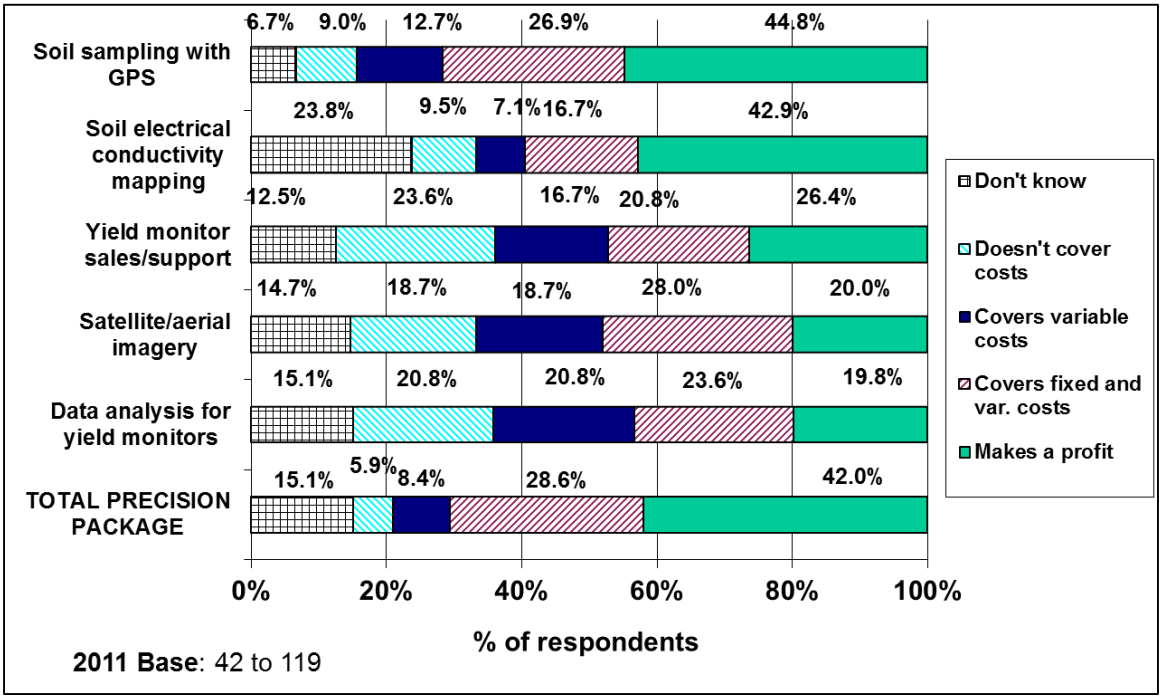


Figure 40. Profitability of Precision Application Offerings

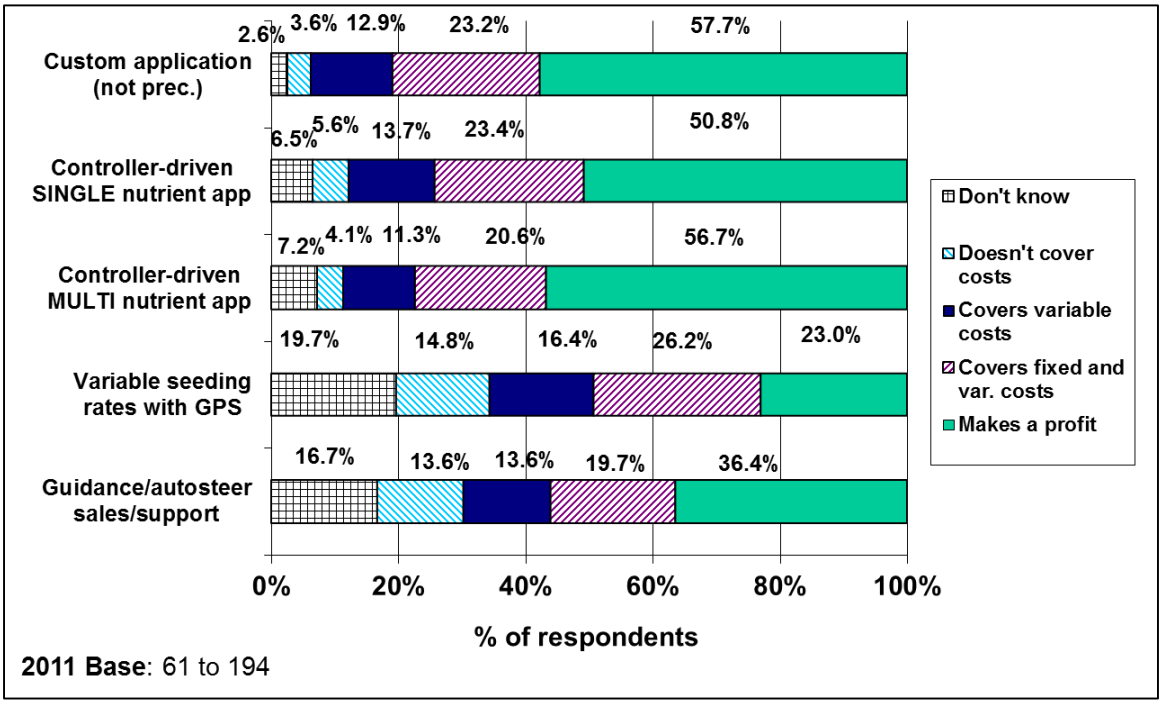


Figure 41 shows the profitability of several services across time, indicating the percentage of respondents generating a profit on the service. This year showed very few changes in profitability for any of the precision services 2008 through 2011 with the exception of yield monitor data analysis which increased from 15 percent of respondents saying they were generating a profit in 2008 to 26 percent in 2011 and multi-nutrient controller-driven application which rose from 51 percent generating a profit in 2009 to 58 percent in 2011.

Figure 41. Respondents Generating a Profit from Precision Services

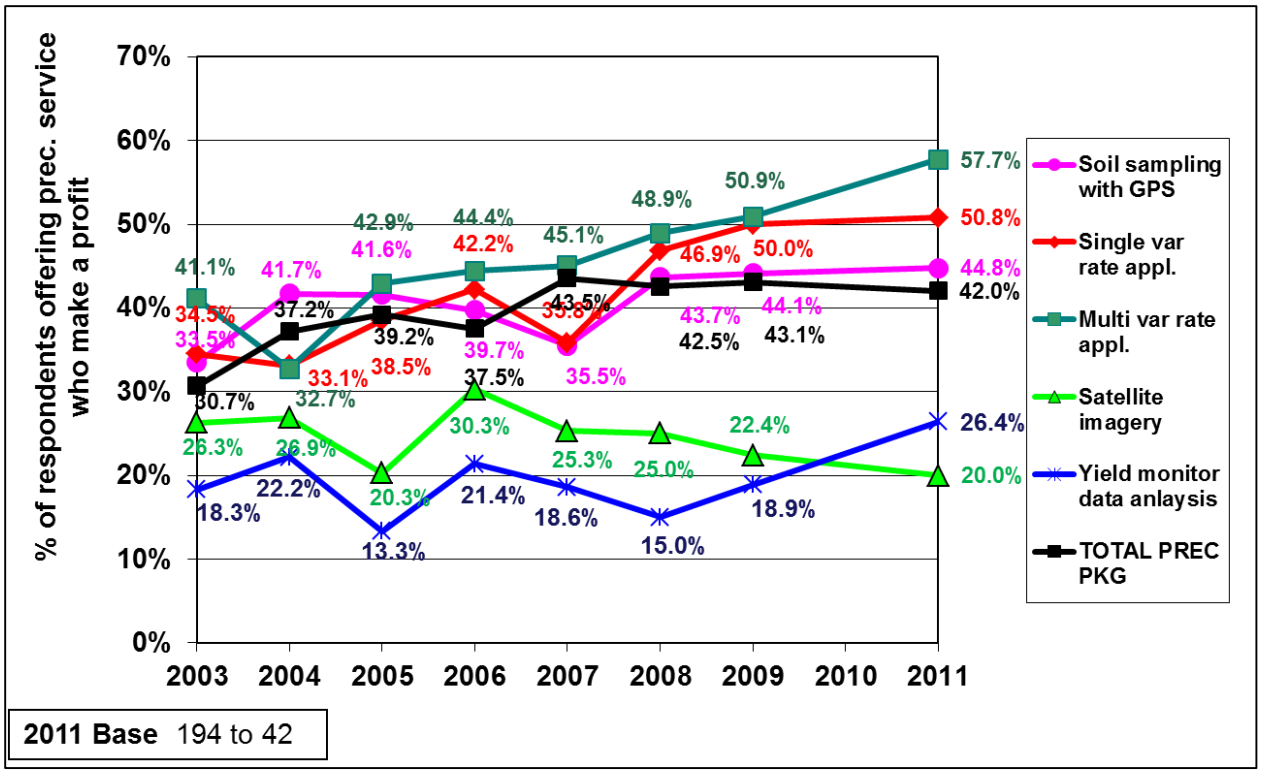
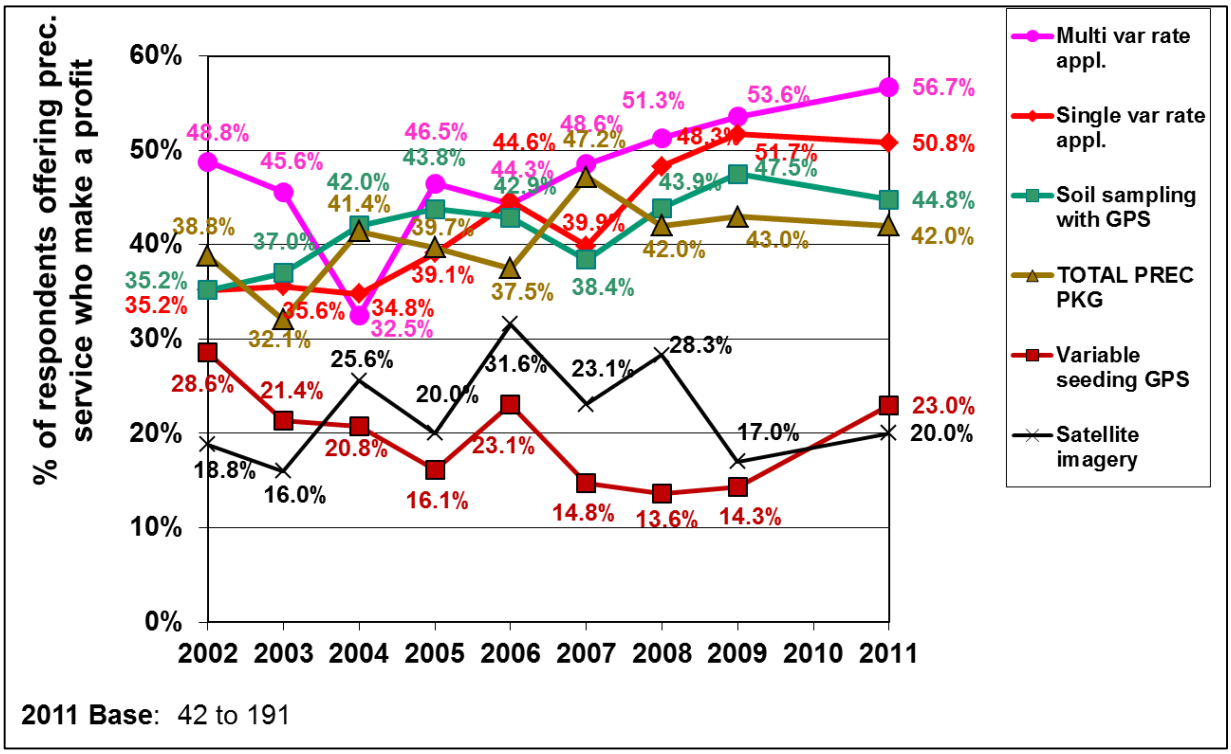


Figure 42 shows the same trends broken out just for the respondents from the Midwest. Like the overall sample, there were very few changes from 2009 to 2011. One exception was variable rate seeding which increased from 14 percent of respondents saying it was generating a profit in 2009 to 23 percent in 2011. Profitability of the total precision package was stable from 2008 to 2011, with just over 40 percent of Midwestern respondents generating a profit.

Figure 42. Respondents Generating a Profit from Precision Services in the Midwest



Customer Use of Precision Services

To get a better understanding of how quickly growers are adopting precision services, survey participants were asked what percentage of the total acreage in their market area (all growers, not just current customers) were currently using various site-specific management services; and, in their opinion, what proportion of the local market acres would be using these services in 3 years. Figure 43 to Figure 46 show the estimated market use in 2011 and the average market use that respondents expect by 2014.

Figure 43. Estimated Market Area Using Application Services

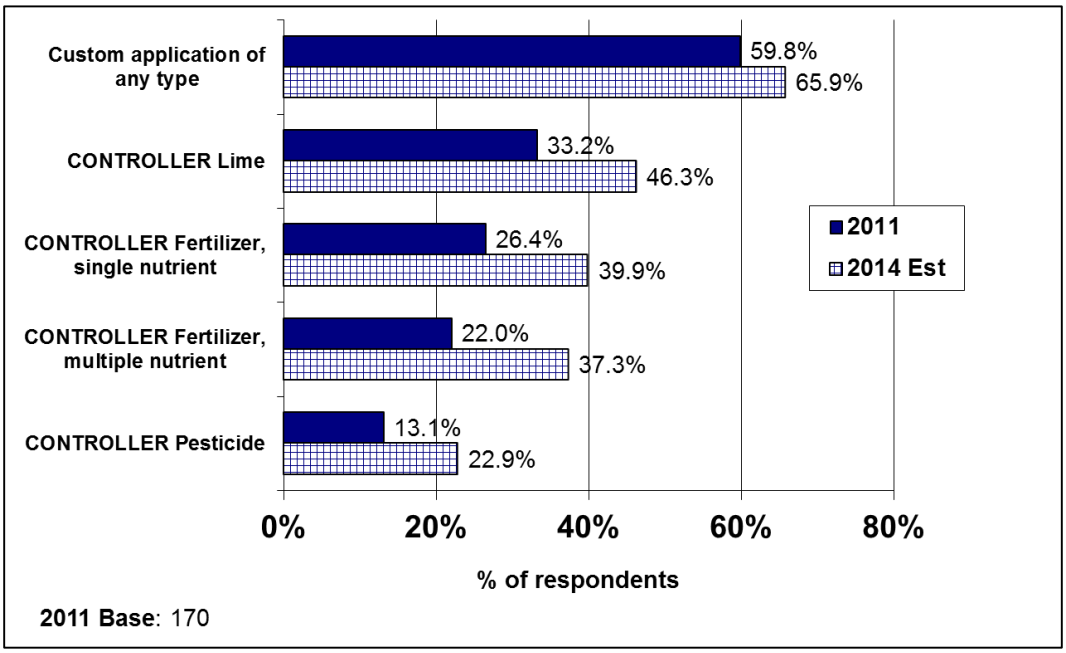


Figure 44. Estimated Market Area Using Precision Guidance and Control

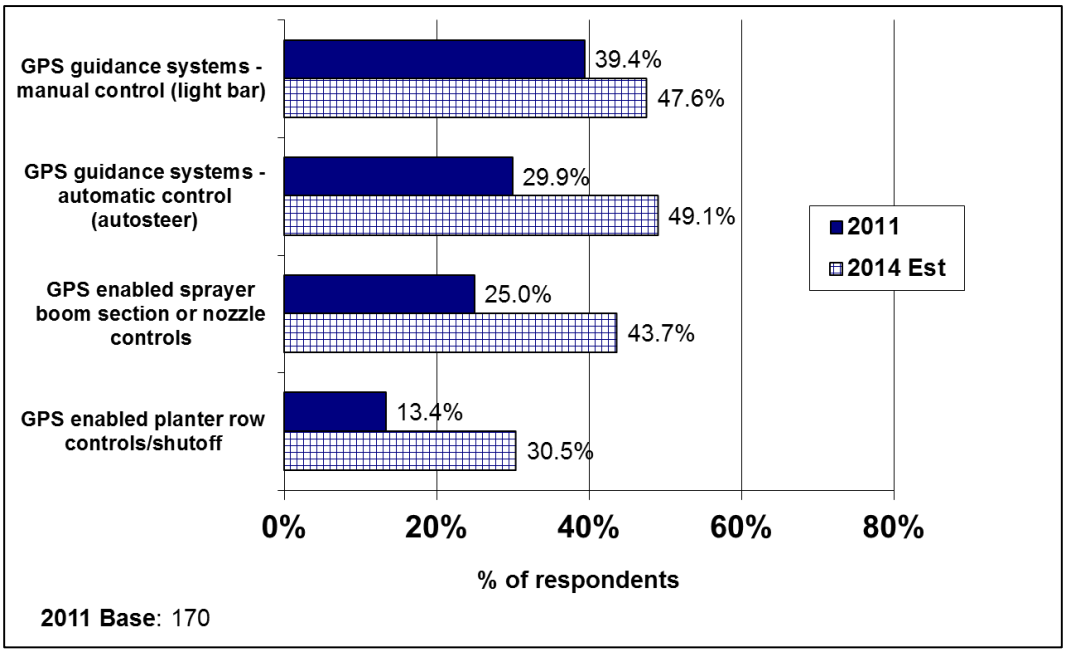


Figure 45. Estimated Market Area Using Precision Sensors and Variable Seeding

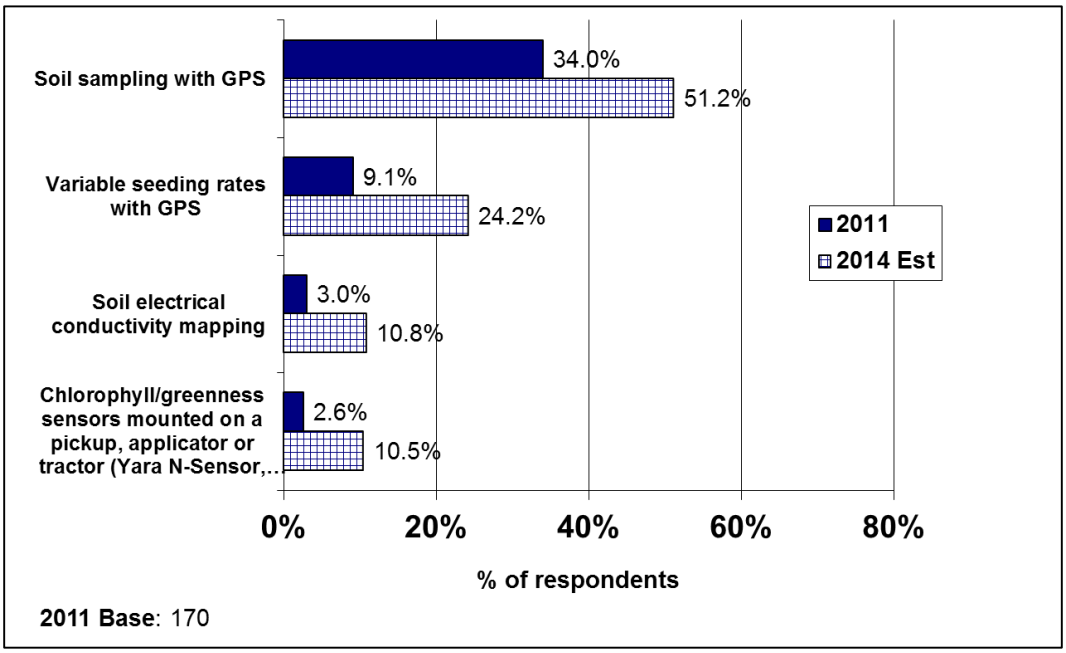


Figure 46. Estimated Market Area Using Field Mapping, Yield Monitors and Satellite Imagery

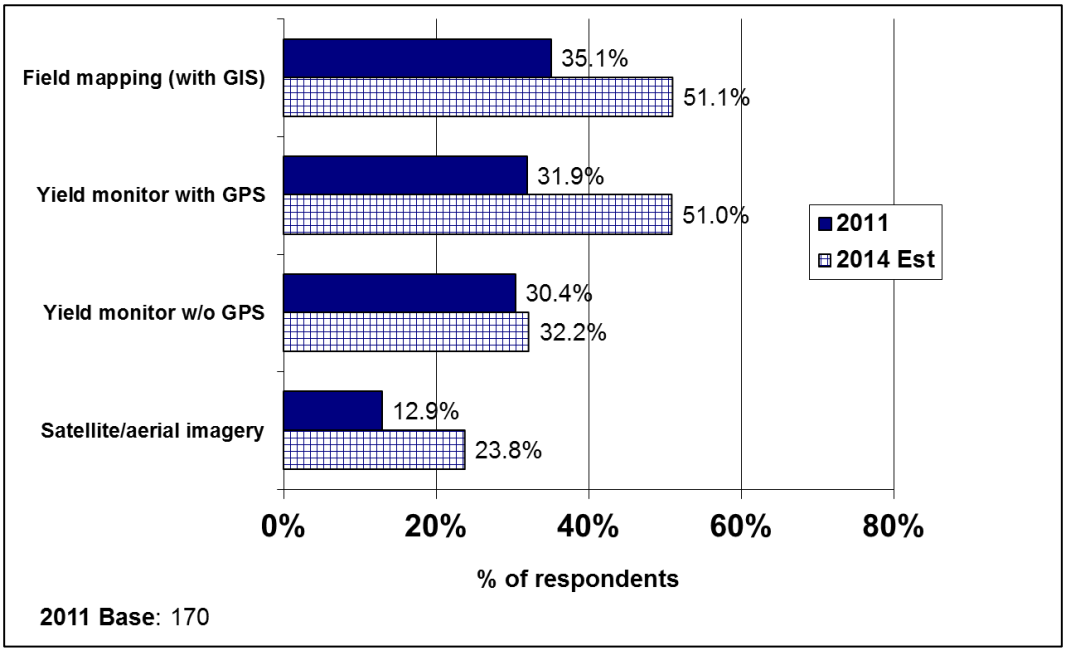


Figure 47 and Figure 48 show the average market acreage using various specific precision technologies over time. All services continued to increase from 2009 with the largest percentage increase once again being in GPS guidance systems with auto control/auto steer. The use of auto-control guidance grew from an average of 21.3 percent of the market to 29.9 percent of the market

as shown in Figure 47. Expectations continue to be optimistic for market growth over the next 3 years.

Figure 47. Estimated Market Area Using Precision Services over Time

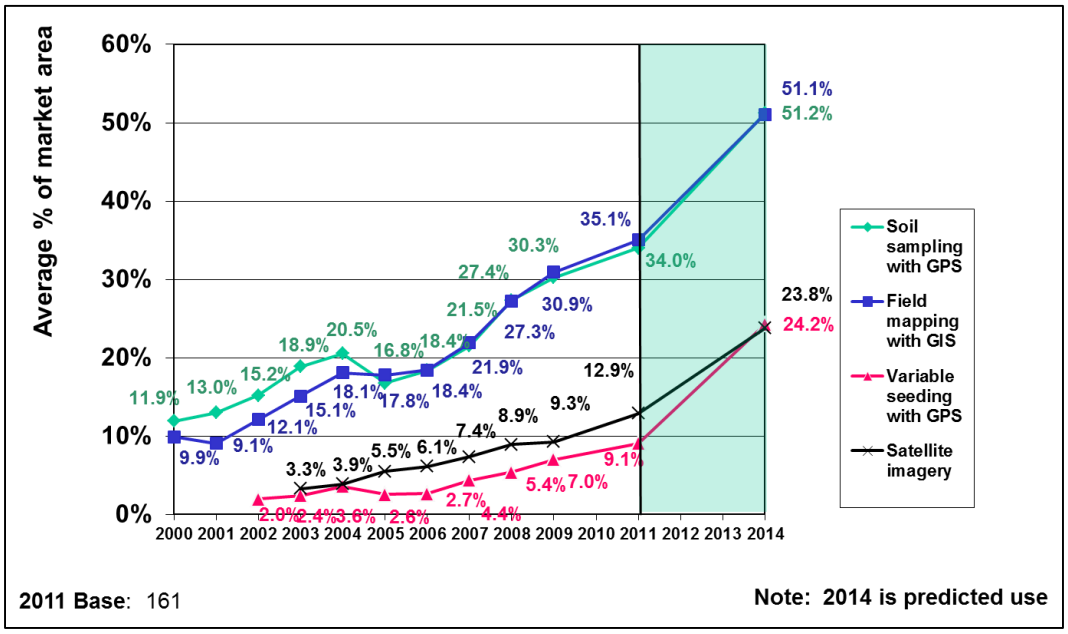


Figure 48. Estimated Market Area Using Yield Monitors and Guidance Systems Over Time

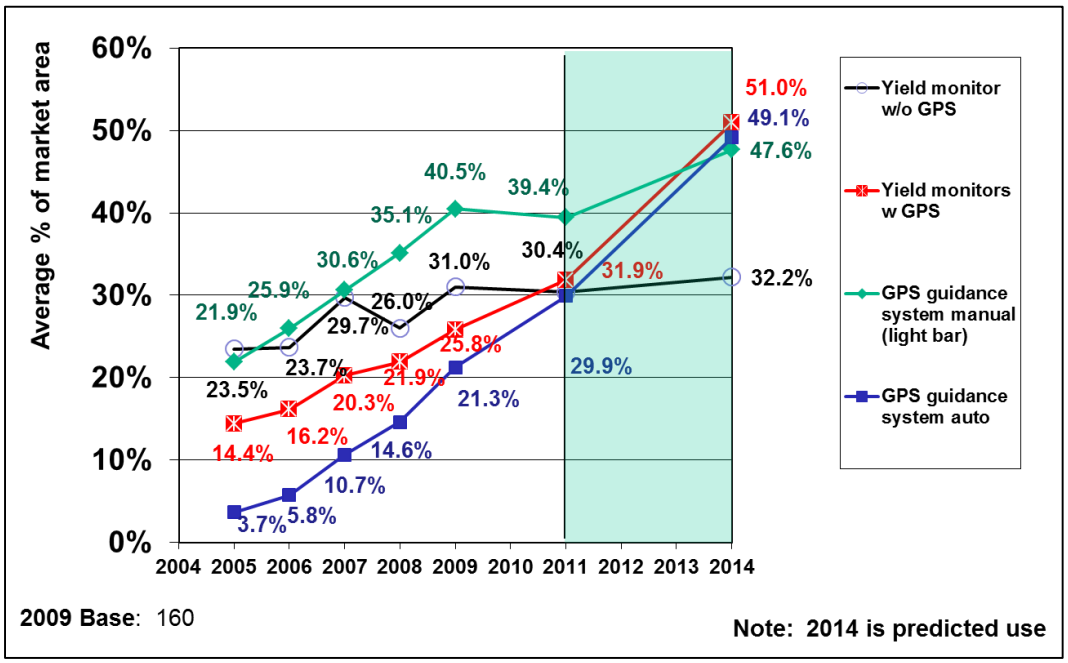


Figure 49 to **Error! Reference source not found.** break out estimated market usage of precision services by region. Some estimates of market usage were significantly higher in the Midwest than in the other states. Market penetration was estimated to be significantly higher in the Midwest for soil sampling with GPS, field mapping with GIS, yield monitors with GPS, and GPS guidance systems with manual control. The most growth in precision service use from 2009 to 2011 in both in the Midwest and non-Midwestern states was for GPS guidance systems with auto control/autosteer.

Figure 49. Estimated Market Area Using Precision Services in the Midwest LANDSCAPE

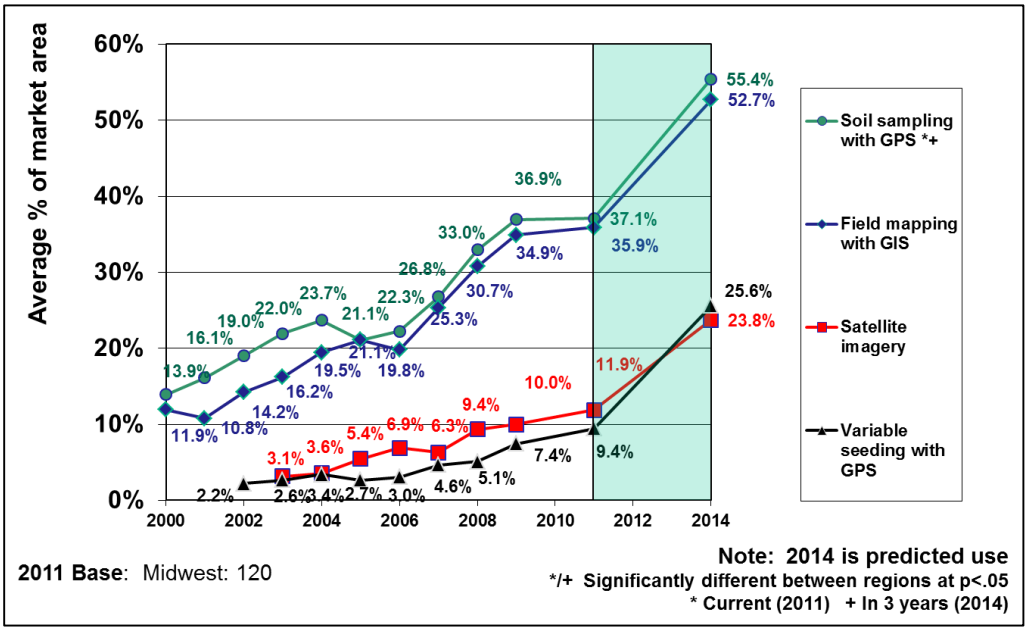


Figure 50. Estimated Market Area Using Precision Services in the Other States LANDSCAPE

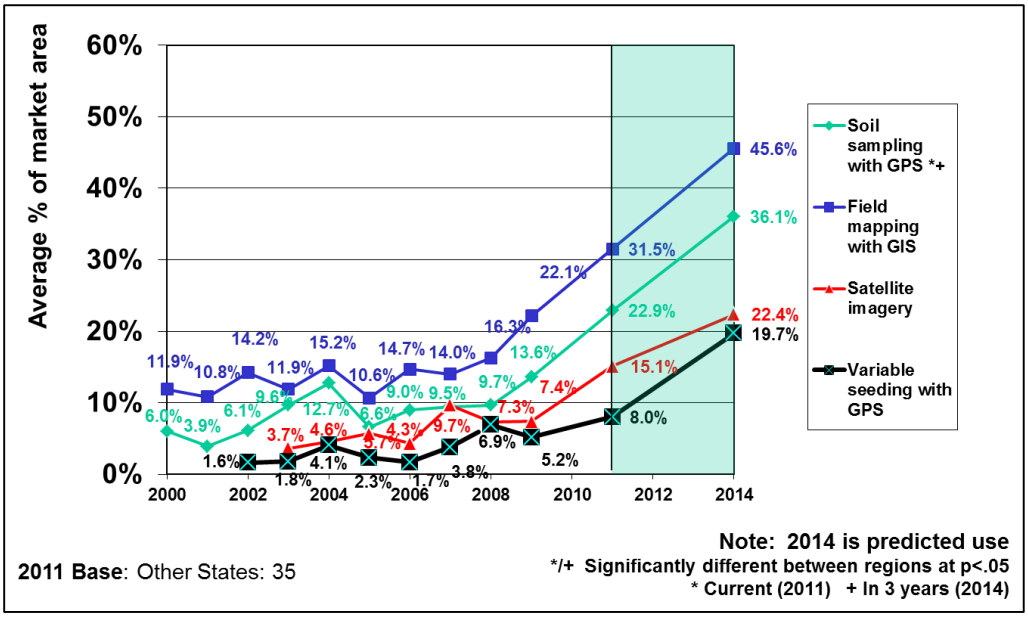


Figure 51. Estimated Market Area Using Yield Monitors and Guidance Systems in the Midwest

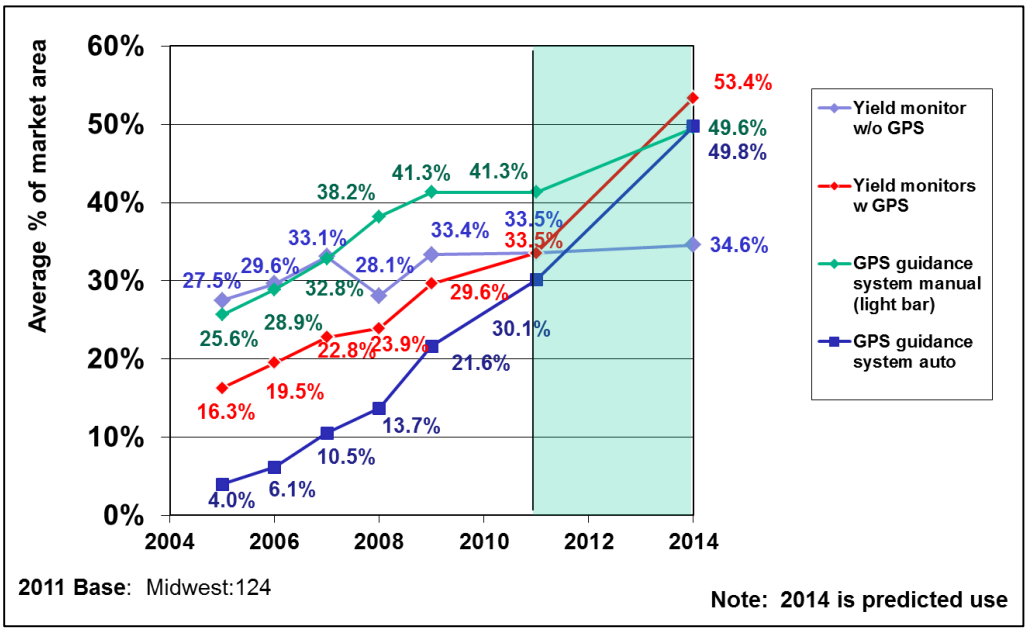
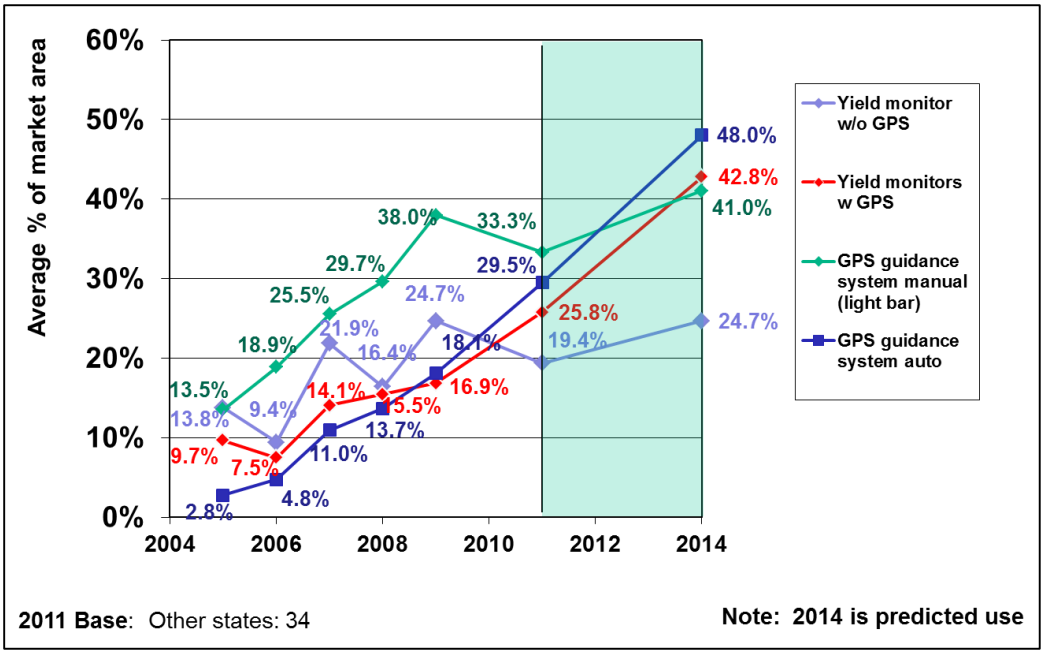


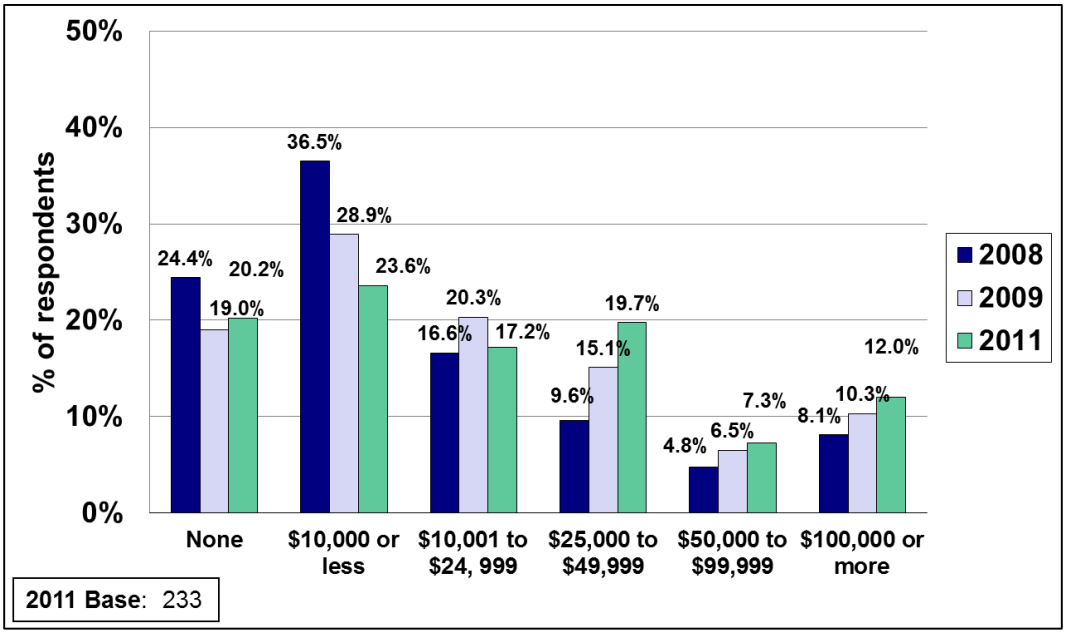
Figure 52. Estimated Market Area Using Yield Monitors and Guidance Systems in Other States



What's Expected of Precision Technology in the Future?

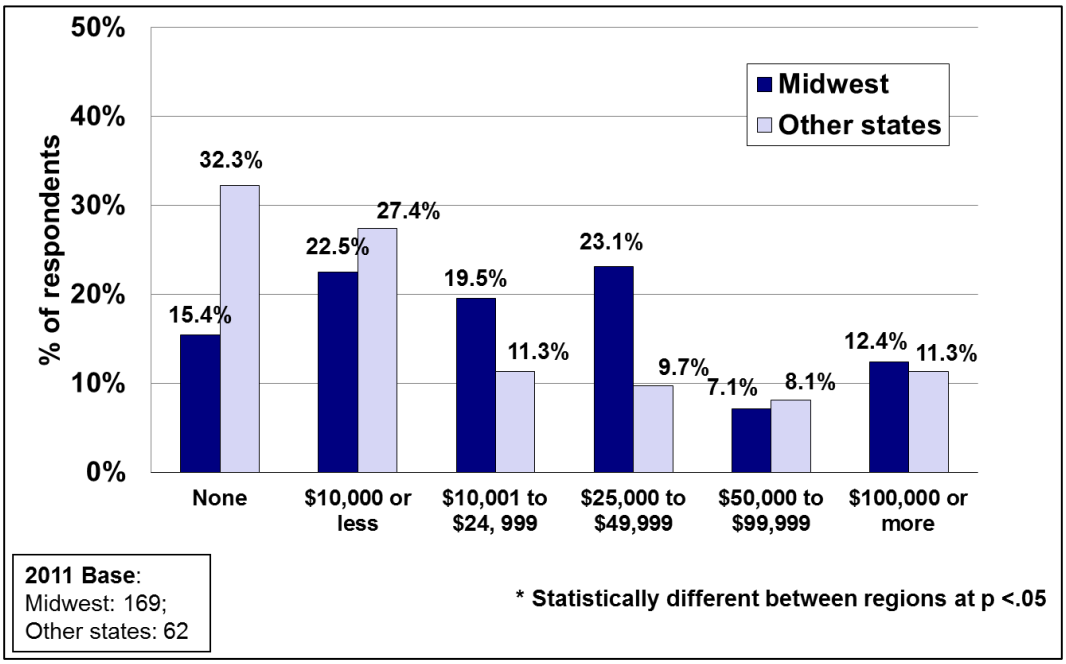
Plans for investing in precision technology continued to grow in 2011 over both 2009 and 2008 (Figure 53). When asked how much they expected to invest in precision technology in 2011, 80 percent of the responding dealerships expected to invest some money in precision technology, similar to 2009 and up from 76 percent in 2008. However, in 2011, over one in ten responding dealerships expected to invest $100,000 or more, with another 27 percent expecting to invest $25,000 up to $100,000. Overall, with continued improvements in technology and an easing economy, this investment may continue to grow for 2012 similar to the consumer market.

Figure 53. Expected Investment in Precision Technology in 2011



As expected, the investment in precision technology was much different by region. Though 85 percent of the agricultural dealers in the Midwest expected to invest in precision technology in 2011, only 68 percent of those in other states expected to invest anything in precision technology this year (Figure 54). In the Midwest, the most common budget for investment technology for 2011 was between $25,000 and $50,000 (23 percent of the respondents) where the most common budget among non-Midwestern respondents was $10,000 or less (27 percent of respondents).

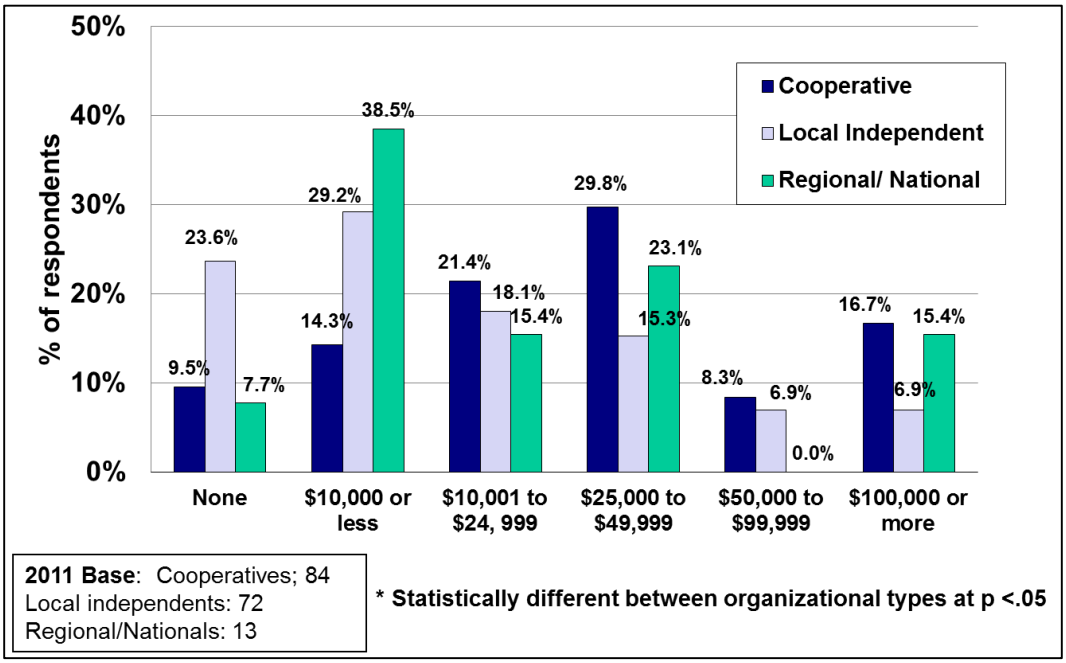
Figure 54. Expected Investment in Precision Technology by Region



Within the Midwest, approximately 85 percent of respondents from both cooperatives and regional/national dealerships expected to spend more than $100,000 on precision technologies in 2011, compared to only 7 percent of the local independents (

Figure **55**). Almost a quarter of the local independents in the Midwest were not expecting to spend anything on precision technologies in 2011.

Figure 55. Expected Investment in Precision Technology in 2011 by Organizational Type in the Midwest *



Barriers to Growth and Expansion in Precision Agriculture

Survey respondents were also asked to rate a series of potential barriers (customer focused and dealer/technology focused) as to how much of a limitation they were to the growth and expansion of precision agriculture.

Figure 56 and Figure 59 show the percentage of respondents who agreed (rated 4 or 5 out of 5, where 5 is strongly agree and 1 is strongly disagree) or disagreed (rated 1 or 2 out of 5) with each customer, dealer/technology barrier listed. A similar list of potential barriers was explored in the 2004, 2008 and 2009 *CropLife*/Purdue Precision Surveys.

In addition, Figure 57 and Figure 60 compare results from 2011 to those of 2009, 2008 and 2004, focusing on the percentage of respondents who agreed or strongly agreed with each statement. In many cases there were statistical differences between the ratings in the Midwest and other states. Those differences are shown in the remaining charts in this section.

Customer Barriers

In 2009, the biggest customer barrier to precision technology adoption was farm income, with half of the dealers agreeing or strongly agreeing that it was a barrier. As the economy strengthened in 2011, that barrier was a big concern for only 35 percent of the respondents (Figure 56 and Figure 57). By region, though, it was significantly more of a barrier for non-Midwestern respondents, with 57 percent of the respondents agreeing or strongly agreeing that farm income was a customer barrier to precision adoption.

In 2011, more respondents disagreed than agreed that each of the other potential customer barriers were limiting grower expansion/growth of precision agriculture. These ratings were similar to the past few years.

Figure 56. Customer Issues that Create a Barrier to Expansion/Growth in Precision Agriculture

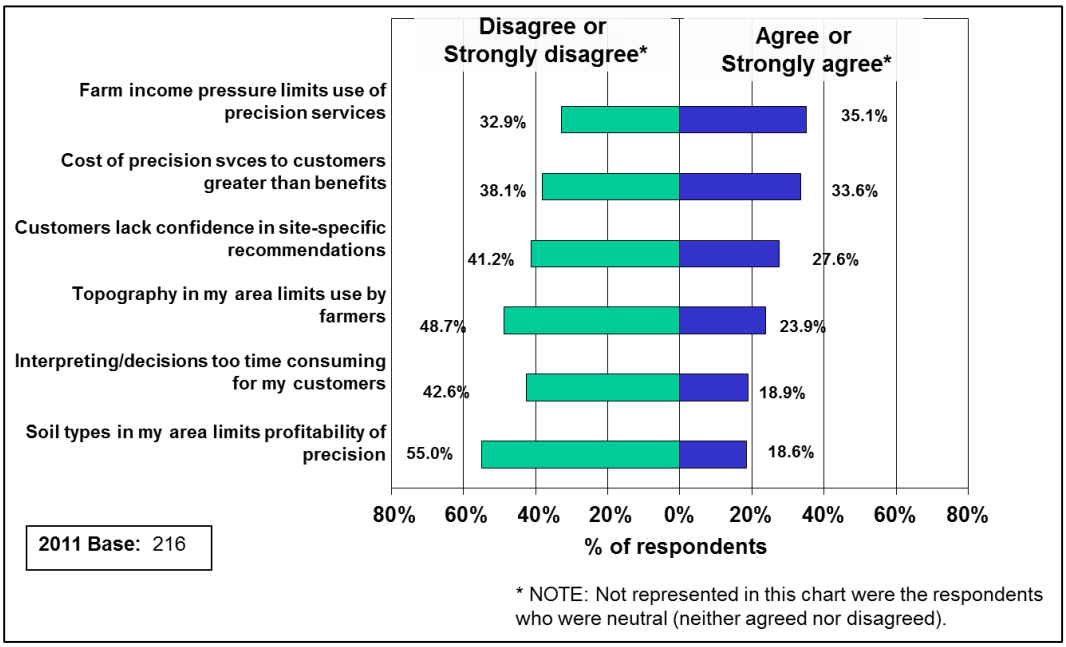
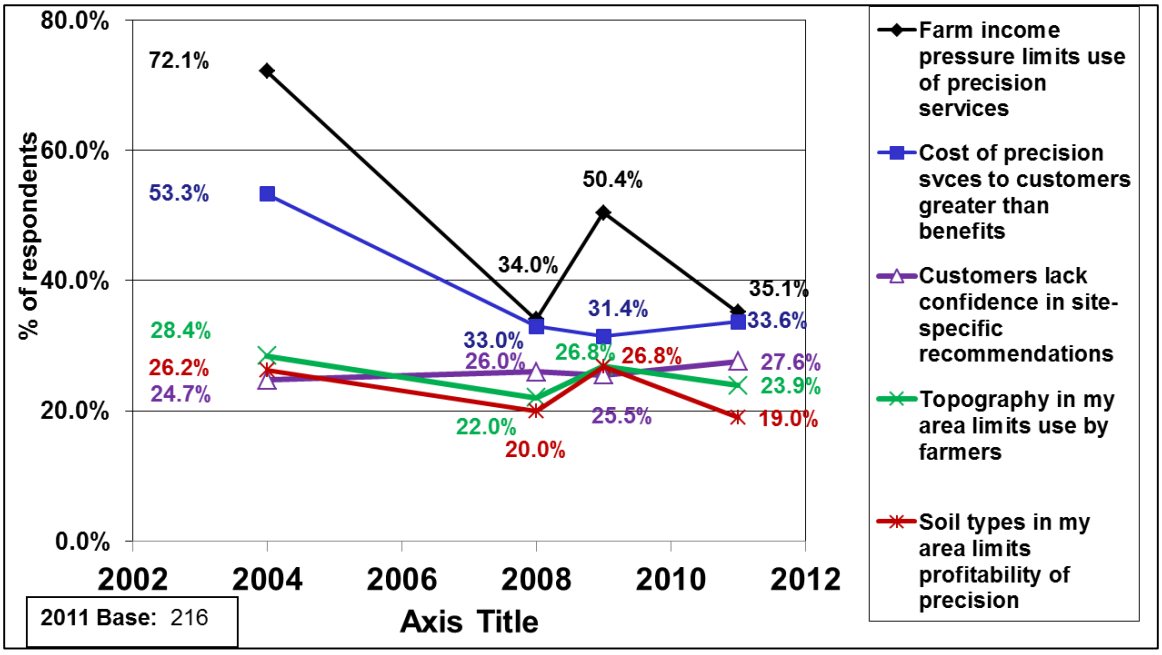
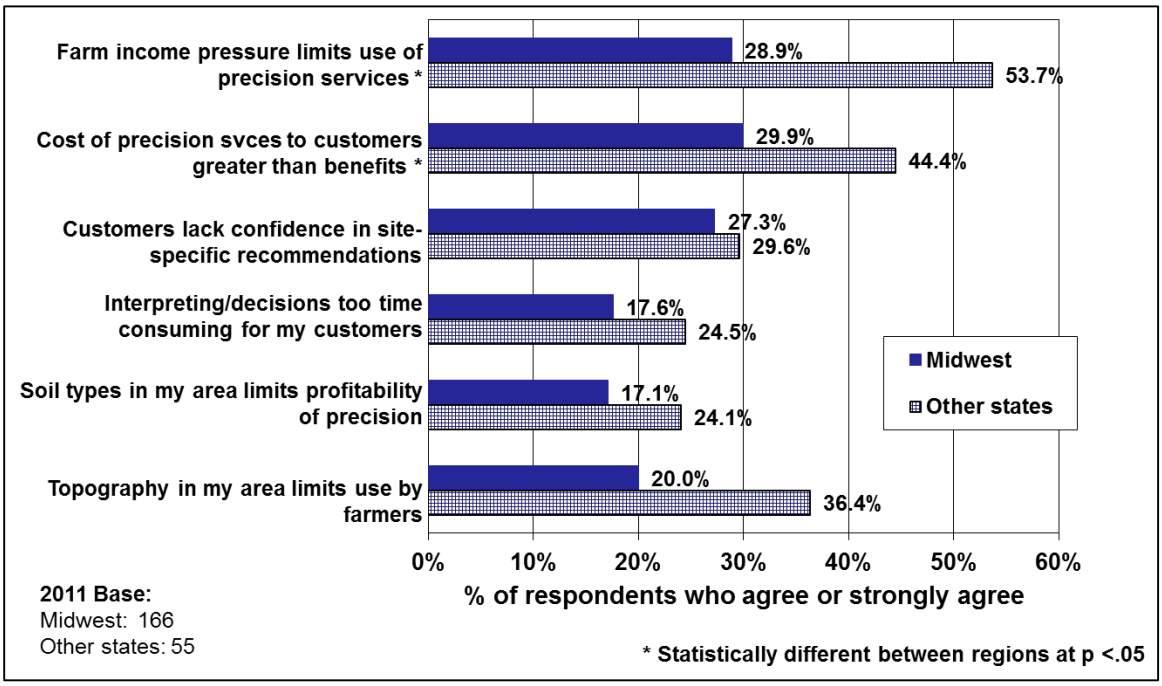


Figure 57. Percent of Respondents who Agree/Strongly Agree that Customer Issues Create a Barrier to Expansion/Growth in Precision Agriculture Over Time



The three biggest customer barriers to the growth/expansion of precision agriculture in non-Midwestern states were farm income, the cost of the services, and the topography (Figure 58). This reflects the higher use of precision technologies in general in the Midwest. Within the Midwest, there were no significant differences in responses from different organizational types.

Figure 58. Customer Issues Creating a Barrier to Growth in Precision Agriculture by Region

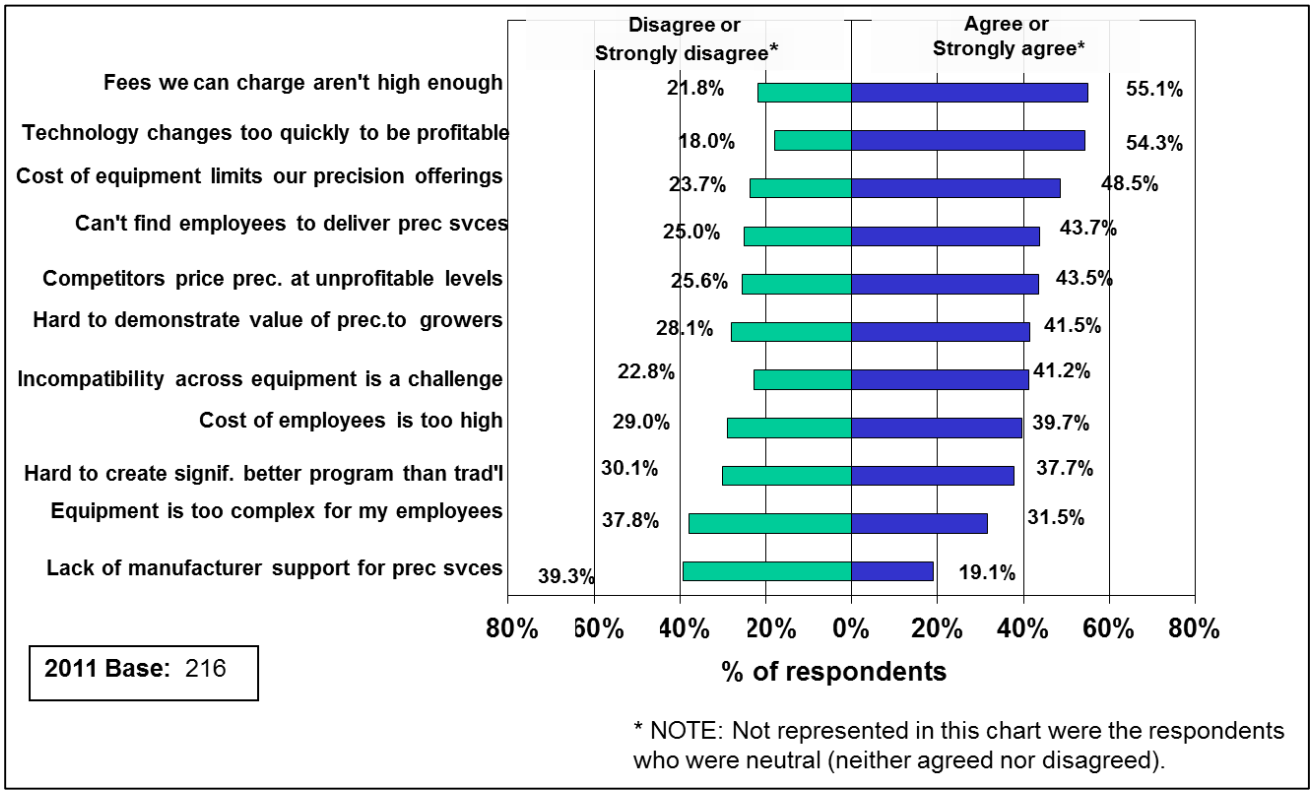


Dealer and Technology Barriers

When looking at dealer and technology-focused issues that could create barriers for the expansion of precision agriculture, the most important ones impacted profitability at the dealer level. Over half of the respondents (55 percent) (Figure 59) said that they just weren't able to charge high enough fees to make precision services profitable, up from 51 percent in 2009 (Figure 60). Rapid technology changes that impacted the bottom line were seen to be a barrier by 54 percent of the respondents. The cost of equipment also limited precision service offerings for 49 percent of the respondents. Over 4 out of 10 respondents agreed that low competitive prices, demonstrating value of precision to growers, incompatibilities across equipment were all barriers.

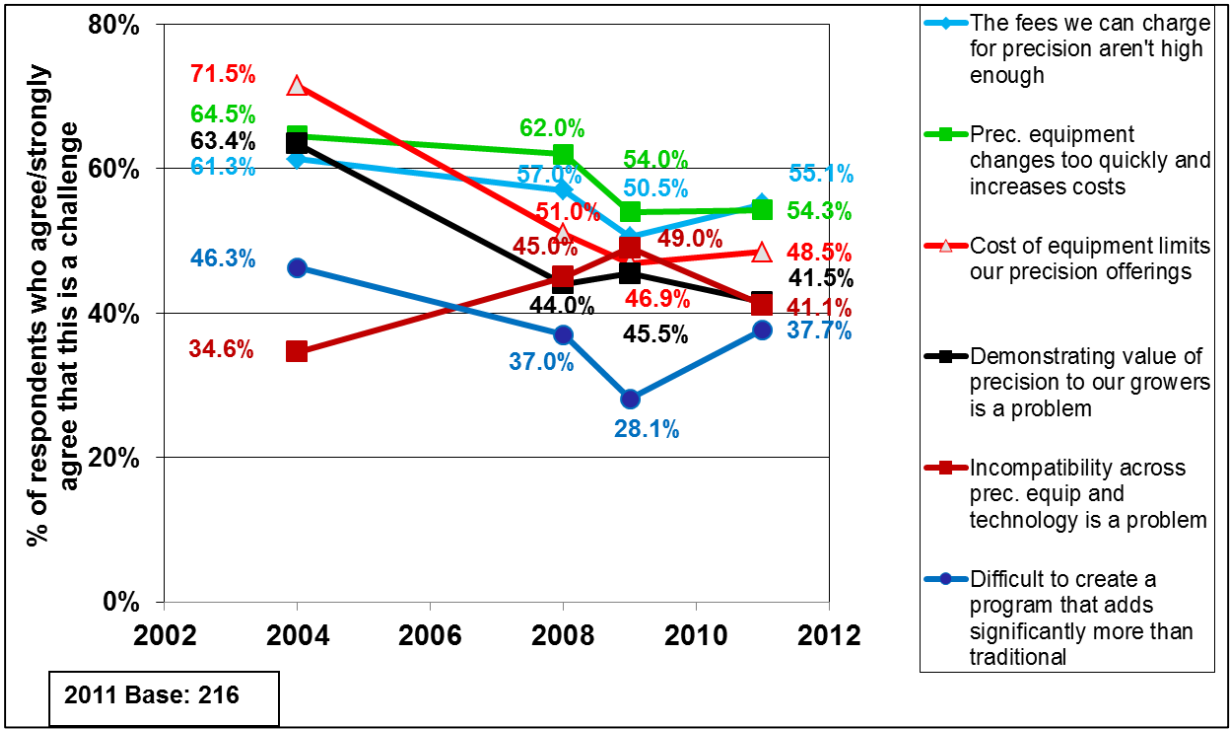
The most disagreement occurred with the issue that a lack of manufacturer support for precision services limits their ability to provide such services (disagreed with by 39 percent while only 19 percent agreed).

Figure 59. Dealer/Technology Issues that Create a Barrier to Expansion/Growth in Precision Agriculture



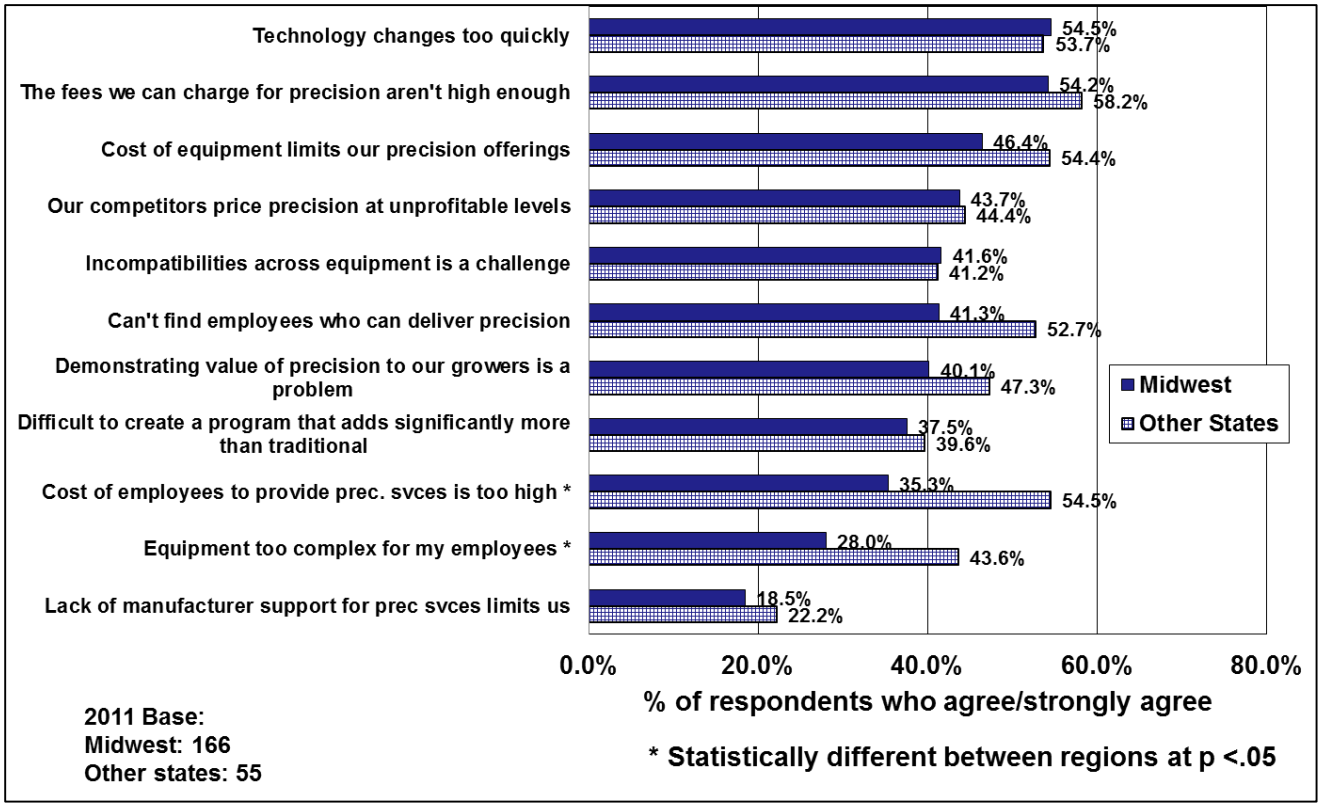
When looking at trends over time, from 2004 to 2011 most of the dealer and technology issues have slowly been decreasing in how much of a barrier they provide (Figure 60). The biggest decrease has been in the cost of equipment, followed by the challenge of demonstrating the value of precision technology to the growers.

Figure 60. Dealer/Technology Issues that Create a Barrier to Expansion/Growth in Precision Agriculture Over Time



Almost all of the dealer issues explored were perceived to be more significant barriers in non-Midwestern states than in Midwestern states (Figure 61), though the differences have become less statistically significantly different between states. In 2011, the biggest differences between regions were seen to be employee related – both in terms of the cost of employees to provide precision services, and in terms of how complex the equipment is for the employees available.

Figure 61. Dealer/Technology Issues that Create a Barrier to Expansion/Growth in Precision Agriculture by Region



Summary

With the economy stabilizing from the 2009 levels, 2011 showed few surprises in trends of precision technology adoption. Demand for precision services continues to be expected to show slow growth with the most growth continuing to be in the GPS guidance with auto control/auto steer. As the technology improves, dealerships appear willing to invest more into technologies to improve accuracy and data collection/use in their businesses, and to use the technology to enhance the service they provide growers.

15th PRECISION AG SURVEY

CropLife • PURDUE CENTER FOR FOOD AND AGRICULTURAL BUSINESS • 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 11, 2011.***

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 2010?

- ☐ Under $1,000,000
- ☐ $1,000,000 - under $2,000,000
- ☐ $2,000,000 - under $3,000,000
- ☐ $3,000,000 - under $5,000,000
- ☐ $5,000,000 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
- ☐ 10,001 to 25,000 acres
- ☐ 25,001 to 50,000 acres
- ☐ over 50,000 acres

6. In 2010, approximately what proportion of your total fertilizer sales were custom applied? _____%

7. In 2010, approximately what proportion of your total herbicide/pesticide sales were custom applied? _____%

8. In 2010, 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

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
- ☐ Soil electrical conductivity mapping
- ☐ Other soil sensors for mapping, mounted on a pickup, applicator or tractor (example: pH sensor)

Question 10 continued on next page

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 (Crop Circle, GreenSeeker, Yara N-Sensor, etc.)
- ☐ Field mapping with GIS to document work for billing/insurance/legal purposes
- ☐ Telemetry to send field information to home office from field
- ☐ GPS to manage vehicle logistics, tracking location of vehicles, and guiding vehicles to next site
- ☐ GPS enabled sprayer boom section or nozzle control
- ☐ **Don't 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 2011	Offer by 2014	Never/ Don't Know	Don't offer now but did
Field mapping (with GIS)	☐	☐	☐	☐
Controller-driven (GPS), variable rate technology (VRT)				
Fertilizer, single nutrient	☐	☐	☐	☐
Fertilizer, multiple nutrient	☐	☐	☐	☐
Lime	☐	☐	☐	☐
Pesticide	☐	☐	☐	☐
Yield monitor sales/support/rental	☐	☐	☐	☐
Yield monitor data analysis	☐	☐	☐	☐
Variable seeding rates with GPS	☐	☐	☐	☐
Satellite/aerial imagery	☐	☐	☐	☐
Guidance/autosteer sales & support	☐	☐	☐	☐
Soil sampling with GPS	☐	☐	☐	☐
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 decisionmaking? (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 close to breaking even	I am just covering variable costs (See NOTE)	I am covering both variable and fixed costs	I am generating a profit	Don't know	Don't offer
Custom application (Not-precision)	1	2	3	4	5	6
Data analysis for yield monitors	1	2	3	4	5	6
Variable seeding rates with GPS	1	2	3	4	5	6
Satellite/aerial imagery	1	2	3	4	5	6
Soil sampling with GPS	1	2	3	4	5	6
Yield monitor sales/support	1	2	3	4	5	6
Guidance/autosteer sales/support	1	2	3	4	5	6

	I am not close to breaking even	I am just covering variable costs (See NOTE)	I am covering both variable and fixed costs	I am generating a profit	Don't know	Don't offer
Controller-driven (GPS) **single** nutrient variable rate application	1	2	3	4	5	6
Controller-driven (GPS), **multiple** nutrient variable rate application	1	2	3	4	5	6
Soil electrical conductivity mapping	1	2	3	4	5	6
Total precision program, all components	1	2	3	4	5	6

NOTE: **Variable Costs** are the costs of actually performing the service — costs increase or decrease with how much business you do (fuel, supplies, etc.) **Fixed Costs** are the costs of making the service available (depreciation on equipment, computers, labor, training, etc.)

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 2014)?

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

Practice	Currently	3 years from now (2014)
Custom application of any type	_____%	_____%
Field mapping (with GIS)	_____%	_____%
Controller-driven (GPS), variable rate technology (VRT)		
Fertilizer, single nutrient	_____%	_____%
Fertilizer, multiple nutrient	_____%	_____%
Lime	_____%	_____%
Pesticide	_____%	_____%
GPS guidance systems with manual control (light bar) for field operations (tillage, planting, etc.)	_____%	_____%
GPS guidance systems with automatic control (autosteer) for field operations (tillage, planting, etc.)	_____%	_____%
GPS enabled sprayer boom section or nozzle controls	_____%	_____%
GPS enabled planter row controls/shutoff	_____%	_____%
Chlorophyll/greenness sensors mounted on a pickup, applicator or tractor (Crop Circle, Greenseeker, Yara N-Sensor, etc.)	_____%	_____%
Yield monitor without GPS	_____%	_____%
Yield monitor with GPS	_____%	_____%
Variable seeding rates with GPS	_____%	_____%
Satellite/aerial imagery	_____%	_____%
Soil electrical conductivity mapping	_____%	_____%
Soil sampling with GPS	_____%	_____%

16. Of your farmer-customers who use a yield monitor with GPS, how do they use their yield monitor information/ yield maps?

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

17. 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

• Customer Issues, continued

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
Demostrating 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

18. How much will your location be investing in precision/site-specific technology during 2011?

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

19. 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?

_____

_____

_____

_____

_____

_____

20. What is the two-letter abbreviation for the state your location is situated in? _____

21. What is your ZIP code? _____

Thank you for your cooperation! PLEASE SEND YOUR COMPLETED SURVEY TO:
CropLife, 37733 Euclid Ave., Willoughby, OH 44094, Fax: 440-942-0662.