2006 PRECISION

AGRICULTURAL SERVICES

DEALERSHIP SURVEY RESULTS

SPONSORED BY *CROPLIFE* MAGAZINE

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AGRICULTURAL BUSINESS

by

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Staff Paper # 06-10

August 2006

Dept. of Agricultural Economics

Purdue University

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Abstract

Precision technologies are now well-integrated into the agricultural industry – both at the farm level and at the crop input dealer level. No longer are crop input dealers only using the technologies to bring new services to their customers, they are also utilizing the technology in their own businesses to improve the efficiency and effectiveness of their business operations. In early 2006, *Crop Life* magazine and Purdue University's Center for Food and Agricultural Business conducted a survey for the 11th consecutive year to assess the adoption of precision agriculture practices in the U.S. from the perspective of the retail crop input dealer. The questionnaire was sent to 2500 retail crop input dealerships across the U.S. A total of 368 questionnaires were returned, with 343 being usable providing an effective response rate of 14 percent.

Consistent with previous surveys, dealers were asked questions about the types of precision services they offer and/or use in their businesses, the fees they are charging for precision services, how fast their customers are adopting precision agriculture practices, how profitable they are finding precision services to be in their businesses and how their precision customers compare with their 'traditional' customers.

Keywords: precision agriculture, crop input dealers, variable rate application, site-specific agriculture, technology adoption

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Introduction

Precision technologies are now well-integrated into the agricultural industry – both at the farm level and at the dealership level. No longer are dealers only using the technologies to bring new services to their customers, they are also utilizing the technology in their own businesses to improve the efficiency and quality of their business operations. In addition, dealerships are seeing an impact of the technology on their businesses in terms of differences in what their precision customers demand of them compared to their traditional customers.

In early 2006, *Crop Life* magazine and Purdue University's Center for Food and Agricultural Business conducted a survey of crop input dealers for the 11th consecutive year to determine which precision technologies were being used by dealers, what type of precision services they were expecting to offer in the future, and how precision customers were impacting their businesses. As in previous years, a survey was sent to 2500 *Crop Life* readers involved in dealership/retail operations to 'take the pulse of the industry' with respect to precision technologies.

The survey was conducted in late January to early March 2006. The questionnaire was sent to 2500 retail agronomy dealerships across the U.S. A second questionnaire was mailed to participants approximately two weeks after the first one as a reminder to complete and return it. (See Appendix I to this report for a copy of the questionnaire.) A total of 368 questionnaires were returned, with 343 being usable providing an effective response rate of 14 percent. This response rate was a bit lower than last year's rate of 16 percent. (Response rates have ranged from a high of 38 percent in 1996 to a low of 11 percent in 2001.)

Consistent with previous surveys, dealerships were asked questions about the types of precision services they offer and/or use in their businesses, the fees they are charging for precision services, how fast their customers are adopting precision agriculture practices, how profitable they are finding precision services to be in their businesses and how their precision customers compare with their "traditional" customers.

Questionnaire and Data Analysis Notes

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 25 unusable questionnaires among the 368 returned.

In 2000 and 2001, the data were statistically weighted to have the same demographics as the 1999 data 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 those two years made this necessary (timing of the survey, survey length, etc.). As in the 2002 to 2005 surveys, this year's data were not statistically different from the 1999 data in terms of these demographic variables and therefore the data used in this report have not been weighted.

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.

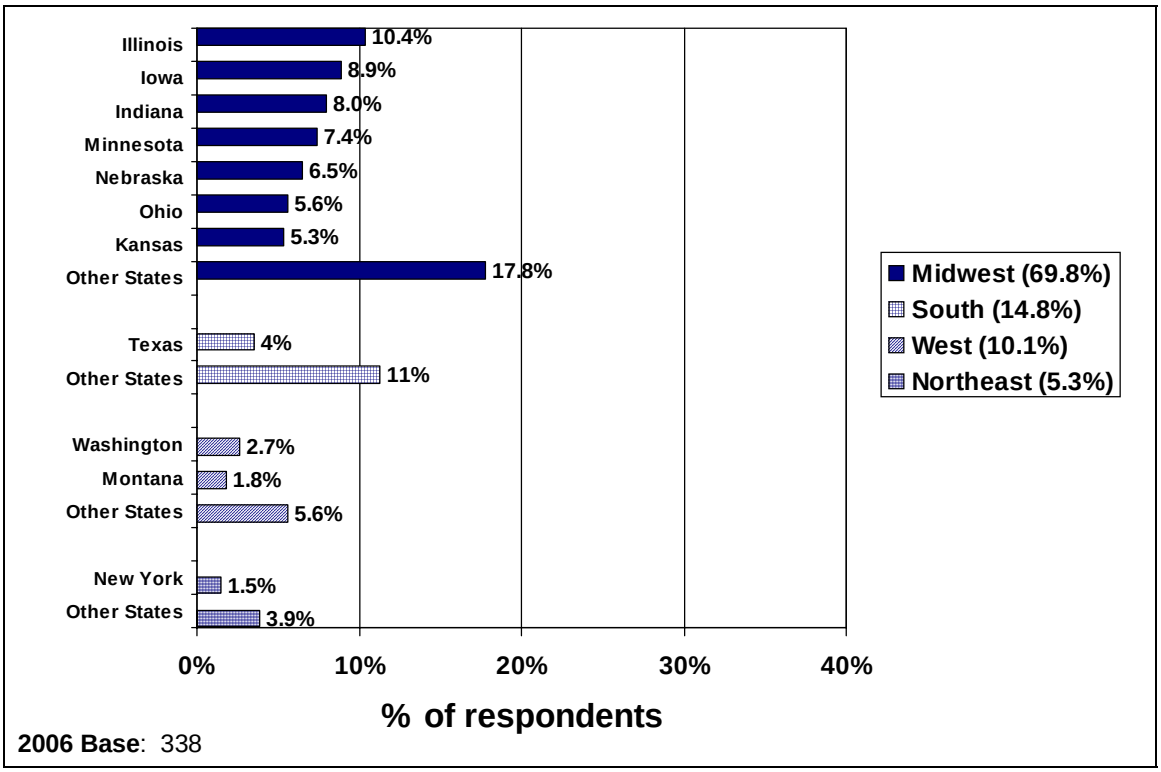
The Respondents

The 343 survey respondents came from 40 states, with the highest state representation from Illinois, accounting for 10.4 percent of the respondents, and Iowa with 8.9 percent (Figure 1). By region, the Midwest was heavily represented in the distribution of respondents, with 70 percent of the respondents being from the Midwest states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North and South Dakota, Ohio and Wisconsin. Fifteen percent of the respondents were from the South, 10 percent were from the West and 5 percent were from the Northeast.

Responding dealerships represented a variety of organizational types with just over four out of 10 being cooperatives (43 percent), while 44 percent represented local independents and 13 percent were part of a national or regional chain of dealerships. This is similar to the sample from 2005.

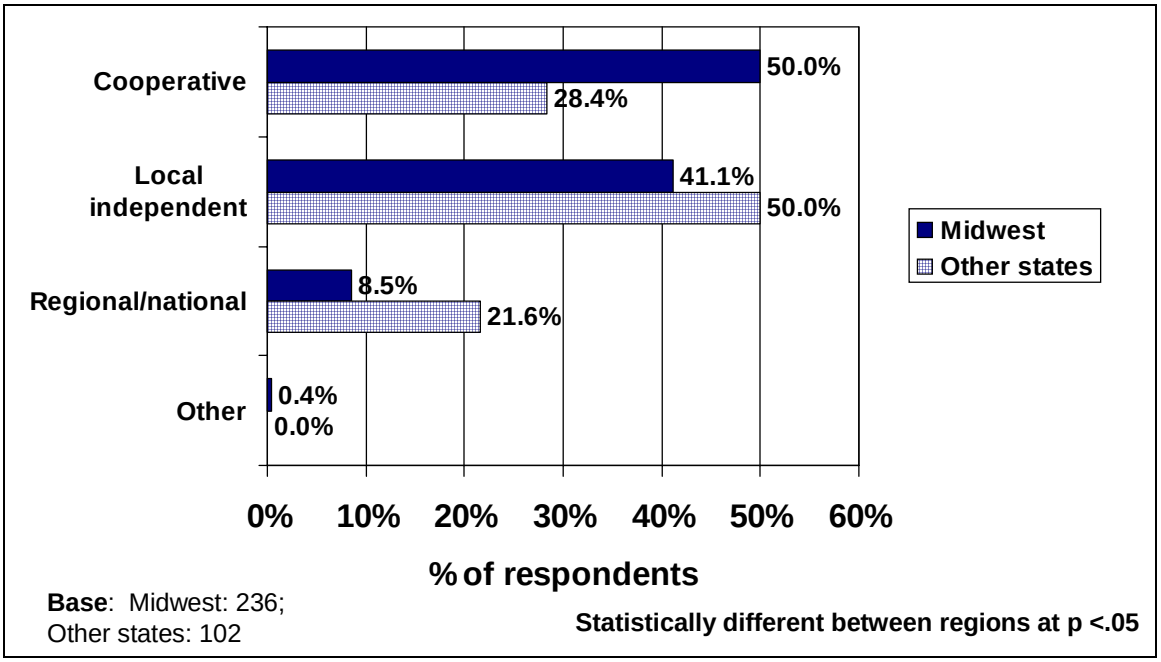
As in other years, cooperatives were a larger part of the sample in the Midwest (50 percent of respondents) compared to other states (28 percent of respondents) (Figure 2). Local independents were more heavily represented in non-Midwestern states, accounting for half of those respondents (50 percent) compared to 40 percent of those from the Midwest. Regional/ national organizations were also more heavily represented in non-Midwestern states (22 percent of respondents) compared to Midwestern states (9 percent of respondents).

Figure 1. States Represented



2006 Base: 338

Figure 2. Organization Types by Region



Base: Midwest: 236;
Other states: 102

Statistically different between regions at p <.05

The size of the responding dealerships ranged from one outlet (36 percent of the respondents) to more than 25 outlets (14 percent of the respondents) (Figure 3). When the number of retail outlets was broken out by region, respondents with only one retail outlet were the most common in both regions. In the Midwest respondents from firms with 2 to 15 outlets were next most common, while the second most common group of respondents in other states were from large firms with over 25 outlets (Figure 4). In the Midwest, local independents were significantly more likely to have only one retail outlet (66 percent) while cooperatives typically had 2 to 15 outlets (76 percent) and regional/national organizations had over 25 outlets (74 percent of these respondents).

Figure 3. Number of Retail Outlets Owned or Managed

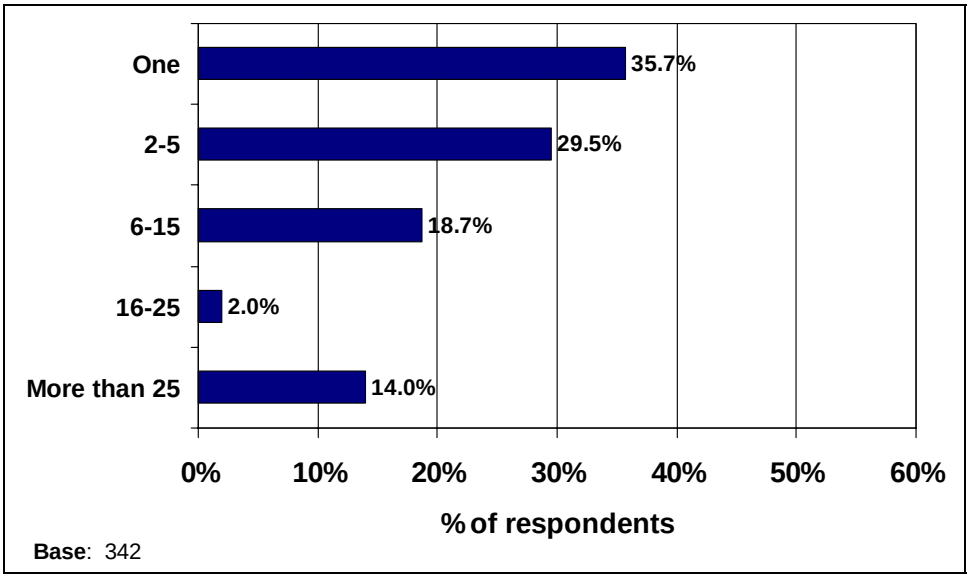
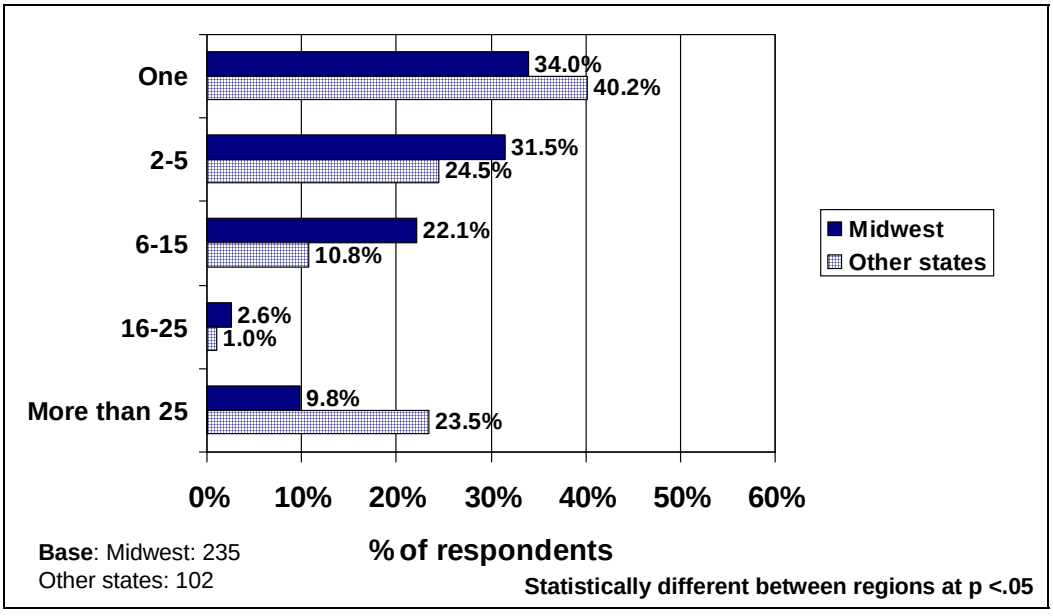


Figure 4. Number of Retail Outlets Owned or Managed by Region



Respondents also represented a range of outlet sizes. Twelve percent of this year's respondents had annual agronomy sales of less than $1 million at their location, similar to last year, while 31 percent had $5 million or more in annual agronomy sales (Figure 5). When broken out by region, there were no significant differences in outlet size between respondents in the Midwest and other states. However, within the Midwest, there were significant differences in annual agronomy 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 agronomy sales dollars per outlet (Figure 6).

Figure 5. Total 2005 Annual Agronomy Sales at Location

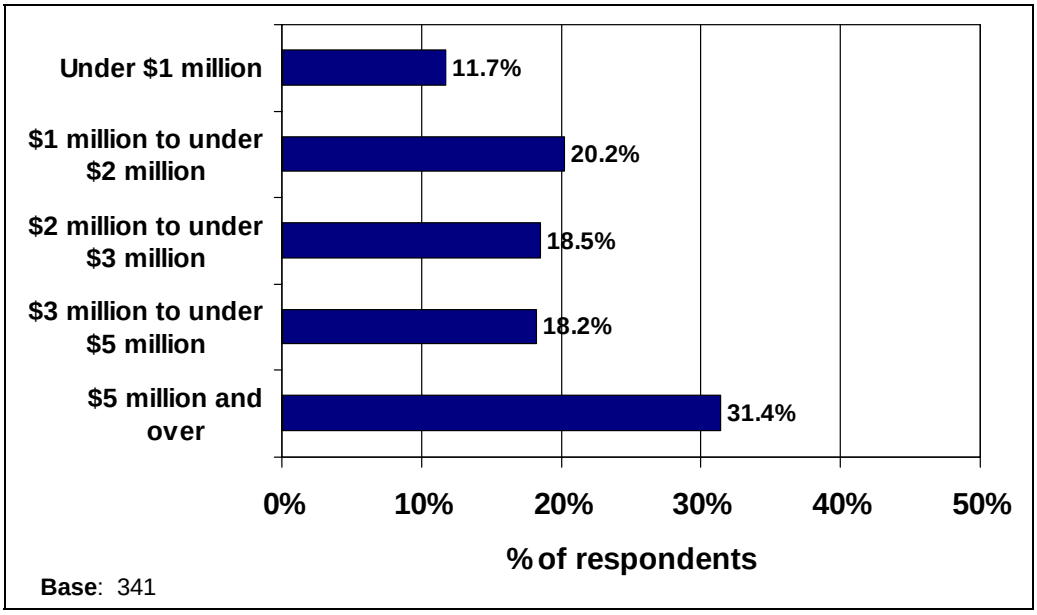
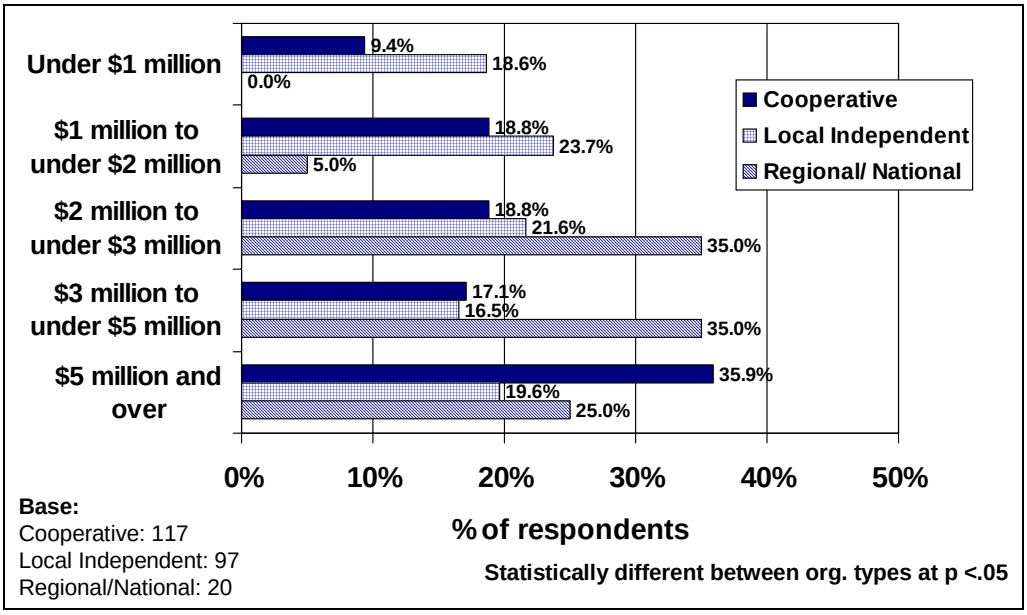
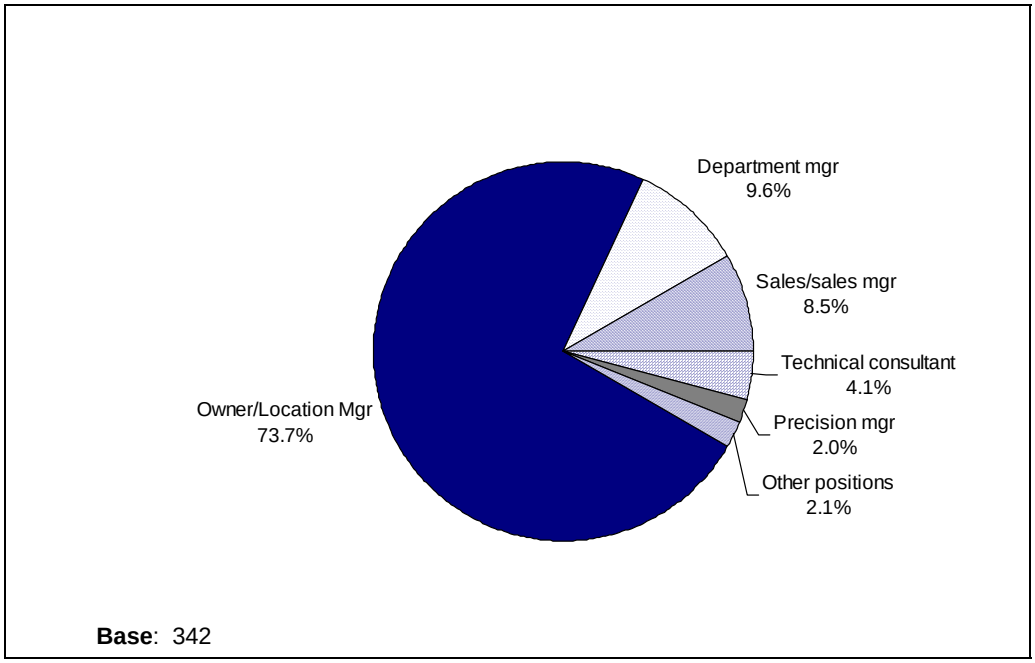


Figure 6. Total 2005 Annual Agronomy Sales at Location by Organizational Type in the Midwest



Three-quarters of the questionnaires were completed by the owner or manager of the outlet (74 percent), while 10 percent of the respondents were departmental managers (Figure 7). Technical consultants and precision managers accounted for 6 percent of the respondents. By region, respondents in non-Midwest states were more likely to be the owner/manager of the dealership (81 percent compared to 70 percent in the Midwest). In the Midwest, the owner/manager was again the most common position for respondents from all three types of organizations. Eight out of 10 (85 percent) of the respondents representing local independents owned or managed the location, while 61 percent of the respondents representing cooperatives were the owners or managers and 55 percent of those representing regional/national organizations were owners/managers.

Figure 7. Responsibility of Survey Respondent



To better understand the size of growers in the dealerships' markets, respondents were asked for the average size (in acres) of their customers. Almost three-quarters of the respondents (72 percent) said their average customer farmed more than 500 acres with 28 percent of the respondents indicating their average customer farmed more than 1000 acres (Figure 8). As expected, the average customer size varied greatly across geographic regions. Over half of the respondents in the Midwest said their average customer farmed between 501 and 1000 acres (52 percent) and another 27 percent of the Midwestern respondents said their average customer farmed over 1000 acres. The average customer size for dealerships in other (non-Midwestern) states was almost evenly divided among the four size categories (Figure 9) with almost a third of them (30 percent) indicating their average customer size was over 1000 acres. There were no statistical differences in average customer size across organizational types in the Midwest.

Figure 8. Average Customer Size

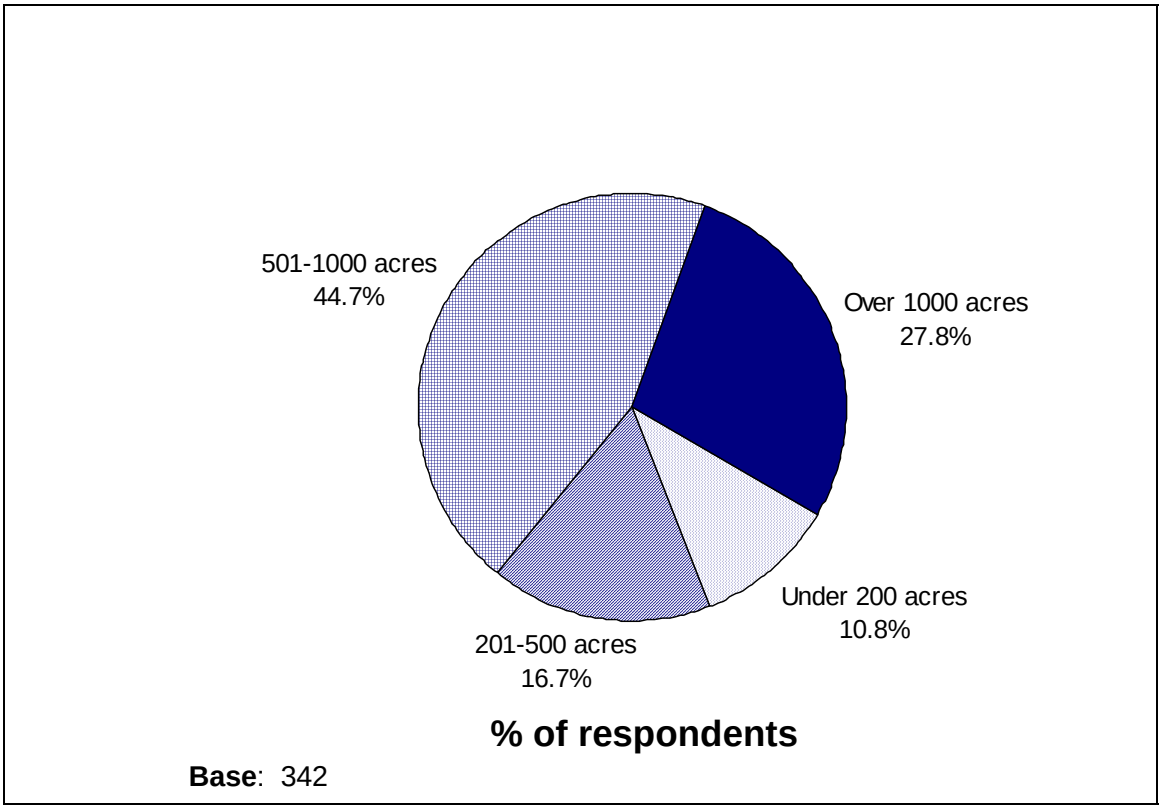
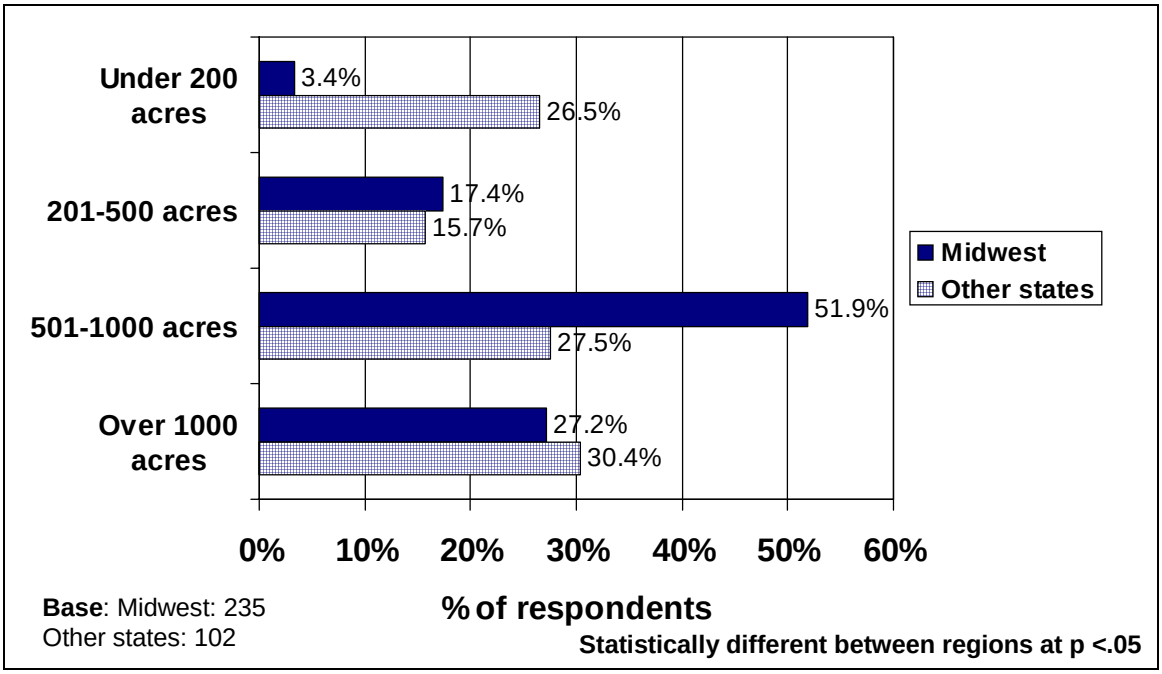


Figure 9. Average Customer Size by Region



Custom Application

Custom application was offered by 84 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 (58 percent) (Figure 10). Across the U.S., however, custom application was most common in the Midwest where 92 percent of the respondents offered custom application services compared to 78 percent of the respondents from other states (Figure 11).

Figure 10. Acres Custom Applied

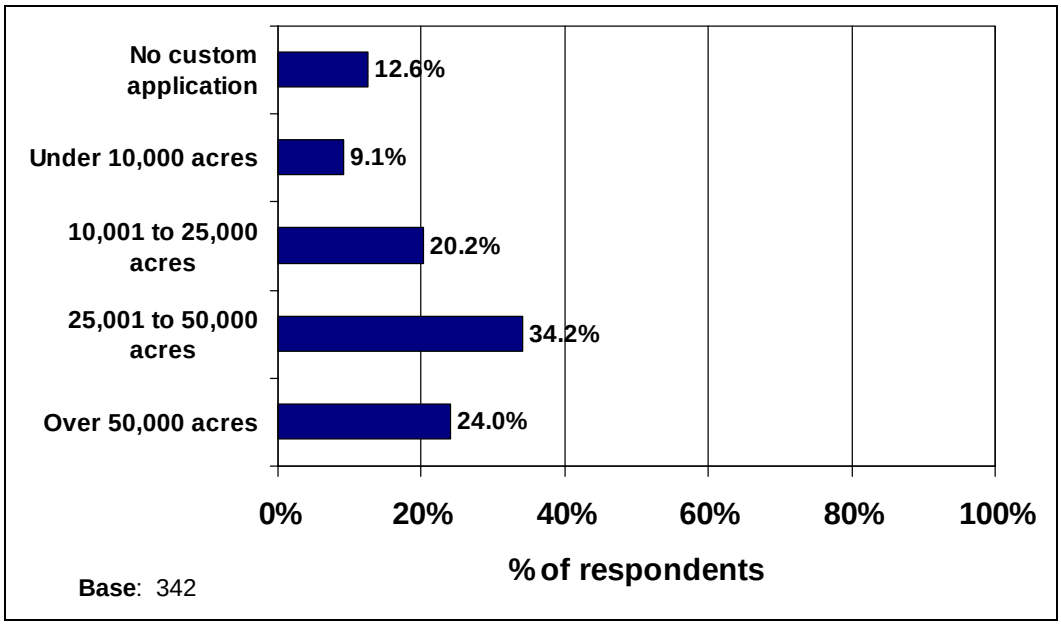
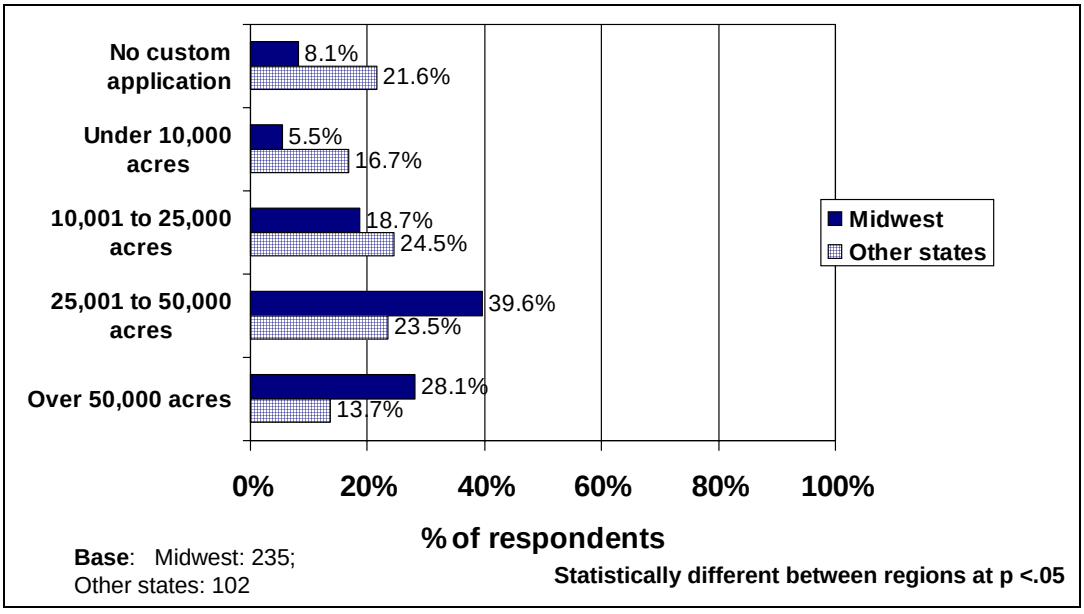
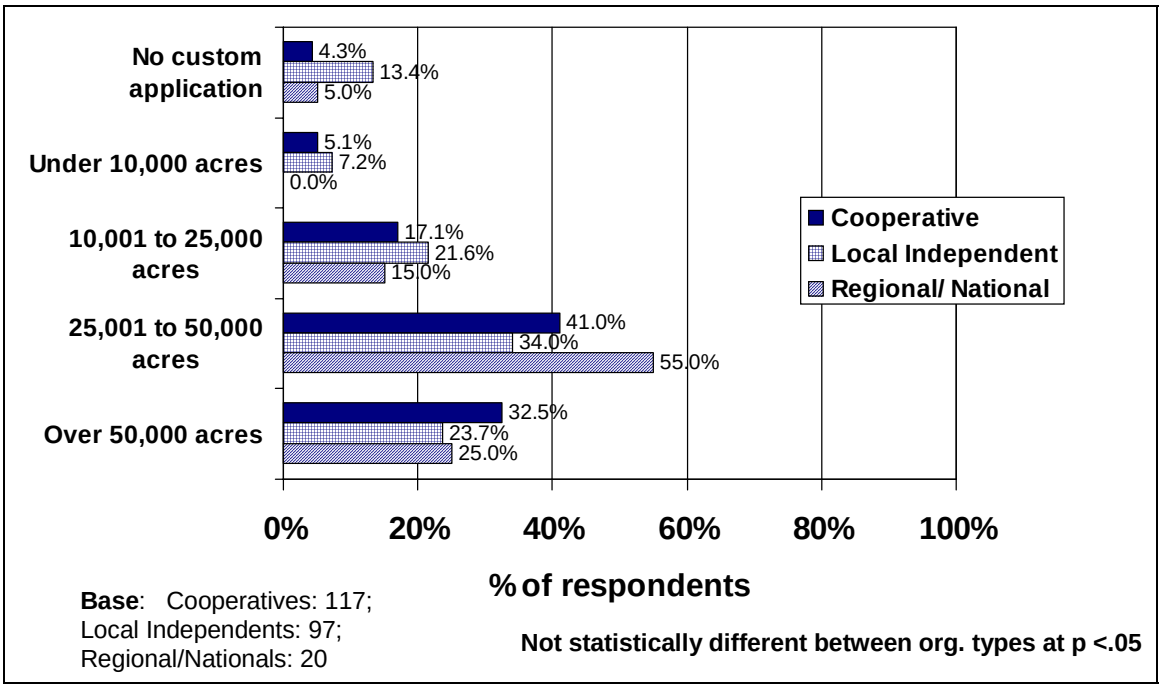


Figure 11. Acres Custom Applied by Region



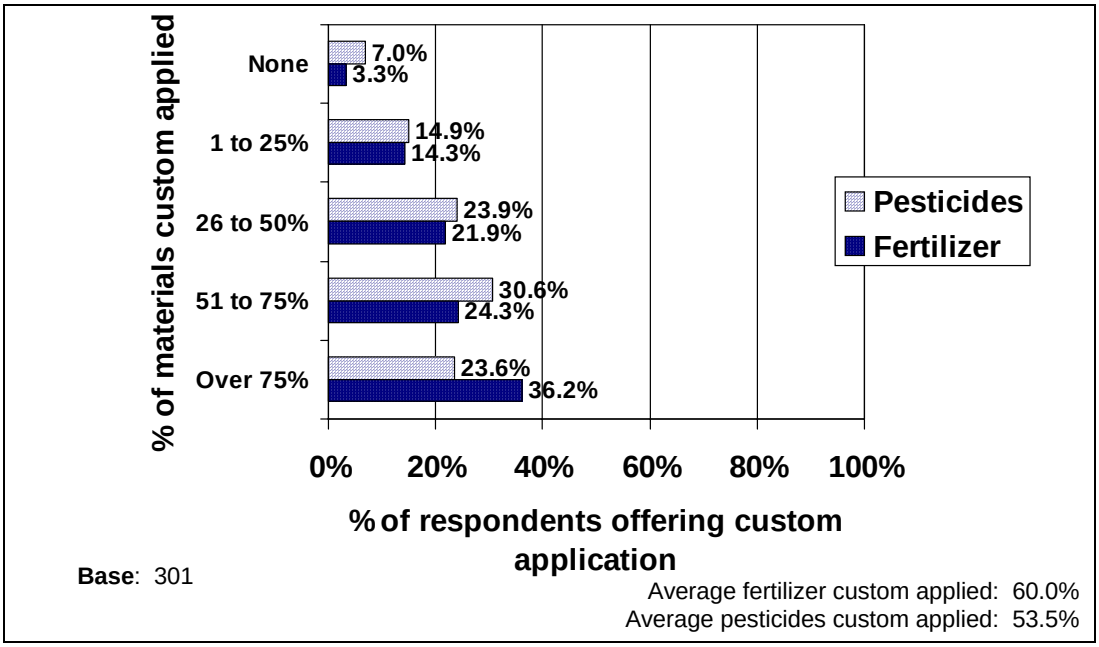
Unlike last year, there were no statistical differences in the amount of custom application offered by organizational types in the Midwest (Figure 12).

Figure 12. Acres Custom Applied by Organizational Type in the Midwest



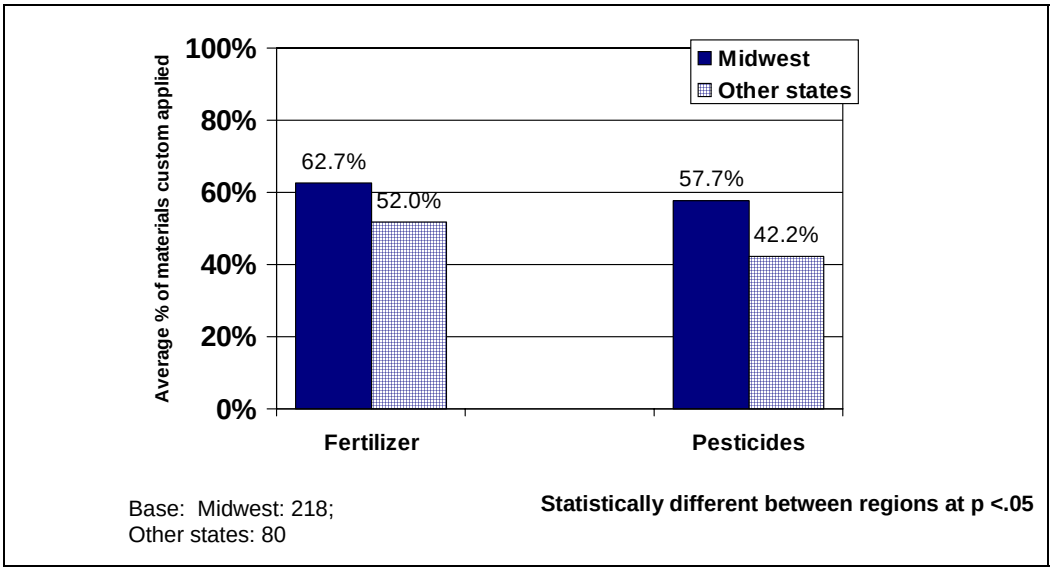
When asked specifically about custom application of fertilizer versus pesticides, respondents custom applied a slightly greater proportion of the fertilizer they sold relative to pesticides. On average, respondents *who indicated their outlet offered custom application* applied 60 percent of the fertilizer they sold and 54 percent of the pesticides they sold (Figure 13). Almost a quarter of the respondents offering custom application said their dealership custom applied over 75 percent of the pesticides sold. Over a third of the respondents offering custom application said they custom applied over 75 percent of the fertilizer they sold.

Figure 13. Custom Application of Fertilizer and Pesticides



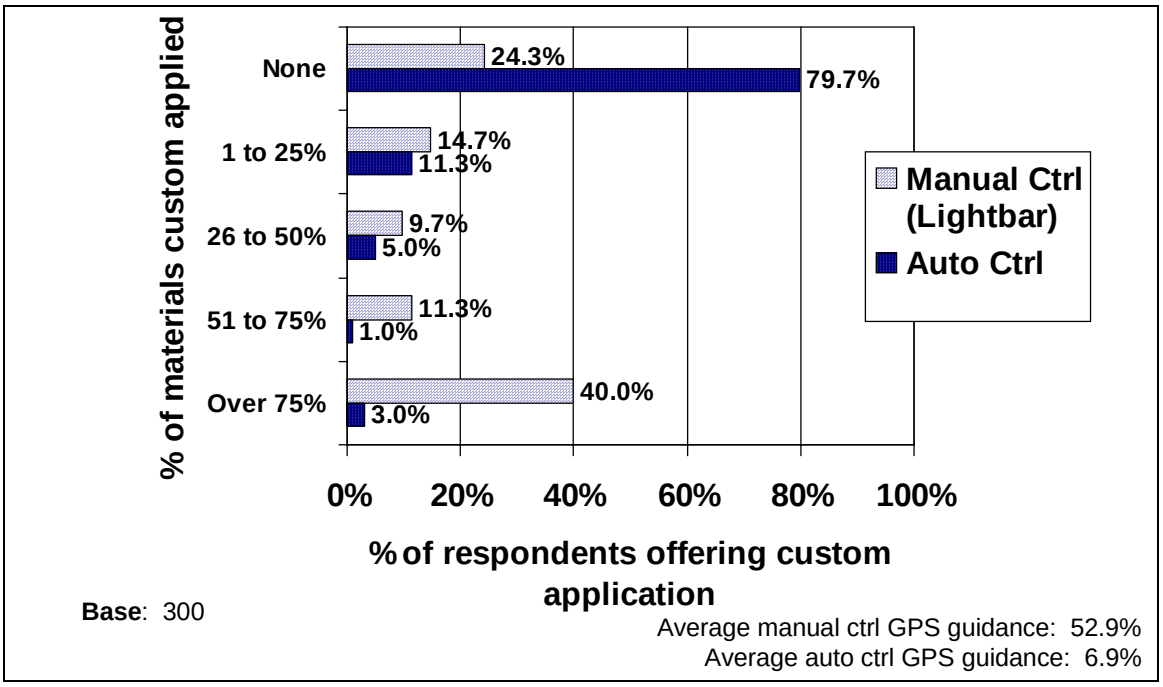
Those dealerships from the Midwest who offered custom application typically applied a greater proportion of what they sold. Midwestern respondents said they custom applied an average of 63 percent of the fertilizer they sold and 58 percent of the pesticides they sold while those from non-Midwestern states applied an average of 52 percent of the fertilizer sold and 42 percent of the pesticides sold (Figure 14). In the Midwest, there were no differences in the average amount of fertilizer or pesticides custom applied by organizational type.

Figure 14. Custom Application of Fertilizer and Pesticides by Region



For the second year, we asked respondents what percentage of their custom application was done using GPS guidance systems. Of those who offered custom application, 76 percent said they were custom applying at least some of the fertilizer/chemicals using a GPS guidance system with manual control/light bar (Figure 15). Twenty percent said they used a GPS guidance system with auto control/auto steer for at least some of their custom application, up from only 6 percent last year. Overall, an average of 53 percent of the materials custom applied were applied with GPS with manual control/light bar and 7 percent of the materials custom applied were applied with auto control GPS.

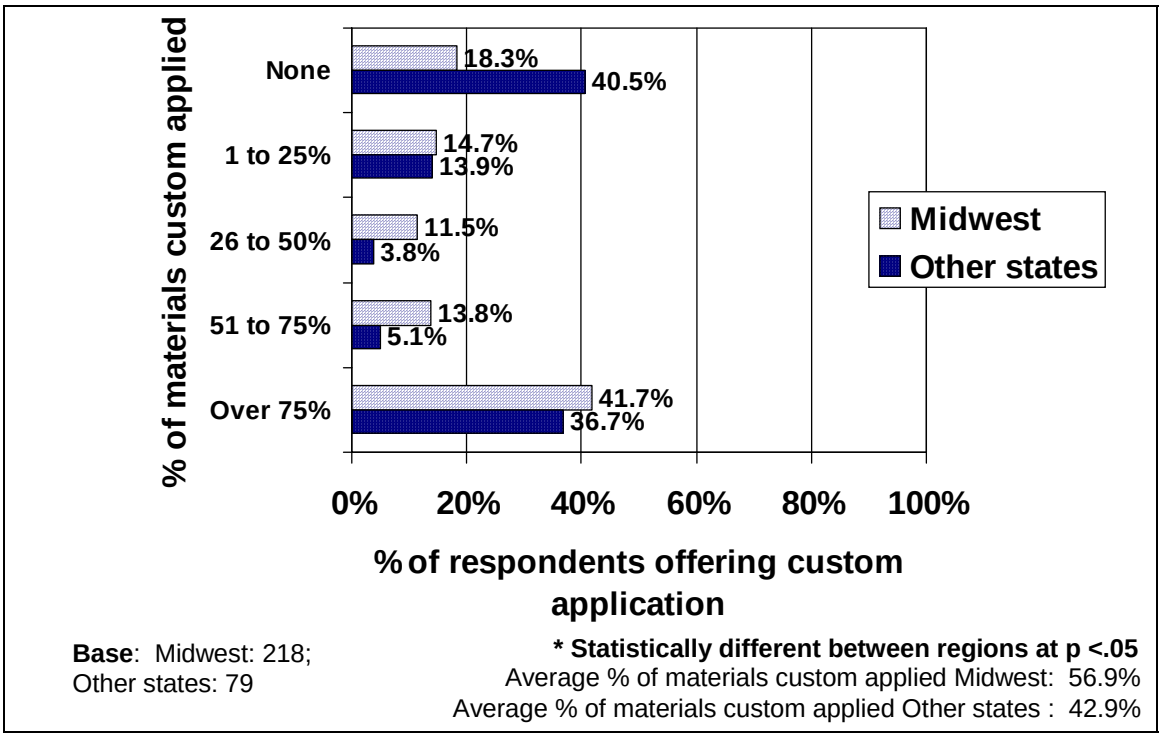
Figure 15. Use of GPS Guidance Systems for Custom Application



The use of GPS guidance systems with manual control/lightbars varied by region (Figure 16), with much heavier use in the Midwest than in non-Midwestern states. Over 80 percent of the respondents from the Midwest used some form of GPS guidance system with manual control, compared to only 60 percent of the respondents from non-Midwestern states. On average, 57 percent of the materials being custom applied in the Midwest were applied with manual control GPS guidance systems, compared to 43 of the material in non-Midwestern states. Both were up significantly over last year's averages of 51 and 34 percent, respectively.

Breaking regional differences out further, respondents in the Midwest and South both applied an average of over 50 percent of materials they applied for their customers using manual controlled GPS guidance systems (lightbar), compared to an average of 35 percent in the West and 25 percent in the Northeast. While these regional differences were not statistically different for GPS guidance systems with auto control/autosteer (Figure 17), there was some indication that dealerships in the West may be ahead of those in the other regions in adopting autosteer guidance systems.

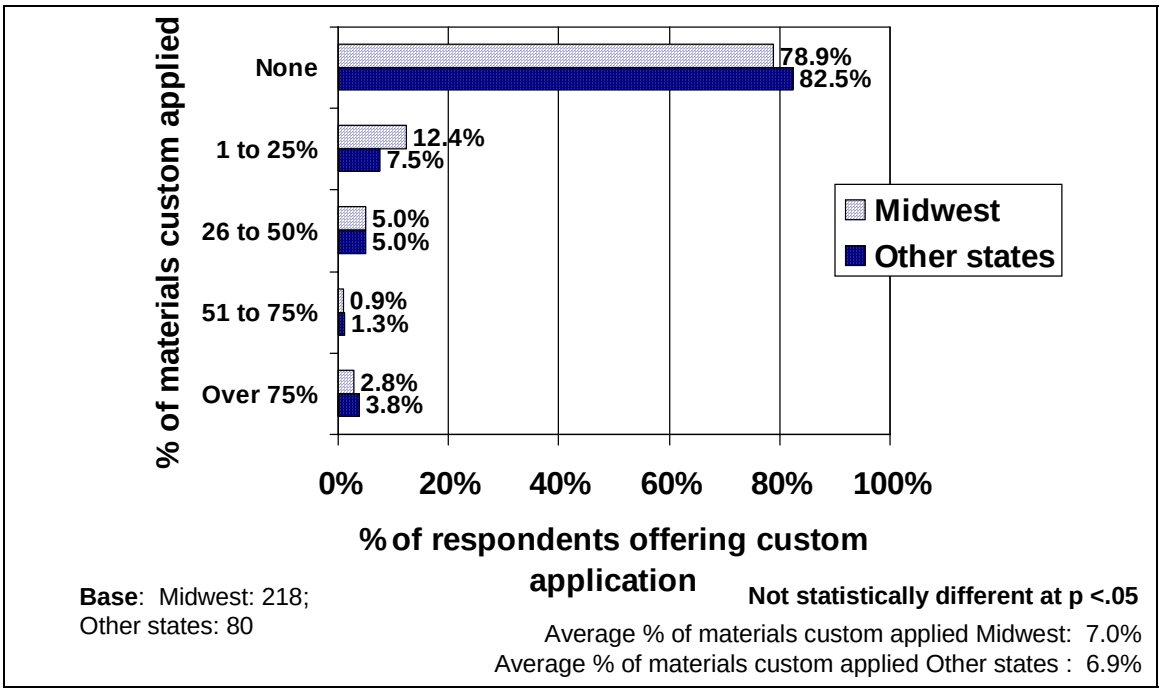
Figure 16. Use of GPS Guidance Systems for Custom Application by Region: Manual Control



Base: Midwest: 218;
Other states: 79

*** Statistically different between regions at p <.05**
Average % of materials custom applied Midwest: 56.9%
Average % of materials custom applied Other states : 42.9%

Figure 17. Use of GPS Guidance Systems for Custom Application by Region: Auto Control



Base: Midwest: 218;
Other states: 80

Not statistically different at p <.05
Average % of materials custom applied Midwest: 7.0%
Average % of materials custom applied Other states : 6.9%

In the Midwest, use of GPS guidance systems with manual control did not vary significantly by organizational type (Figure 18). There were also no significant differences in use of auto-control GPS guidance systems between organizational types in the Midwest (Figure 19).

Figure 18. Use of GPS Guidance Systems for Custom Application by Organizational Type in the Midwest: Manual Control

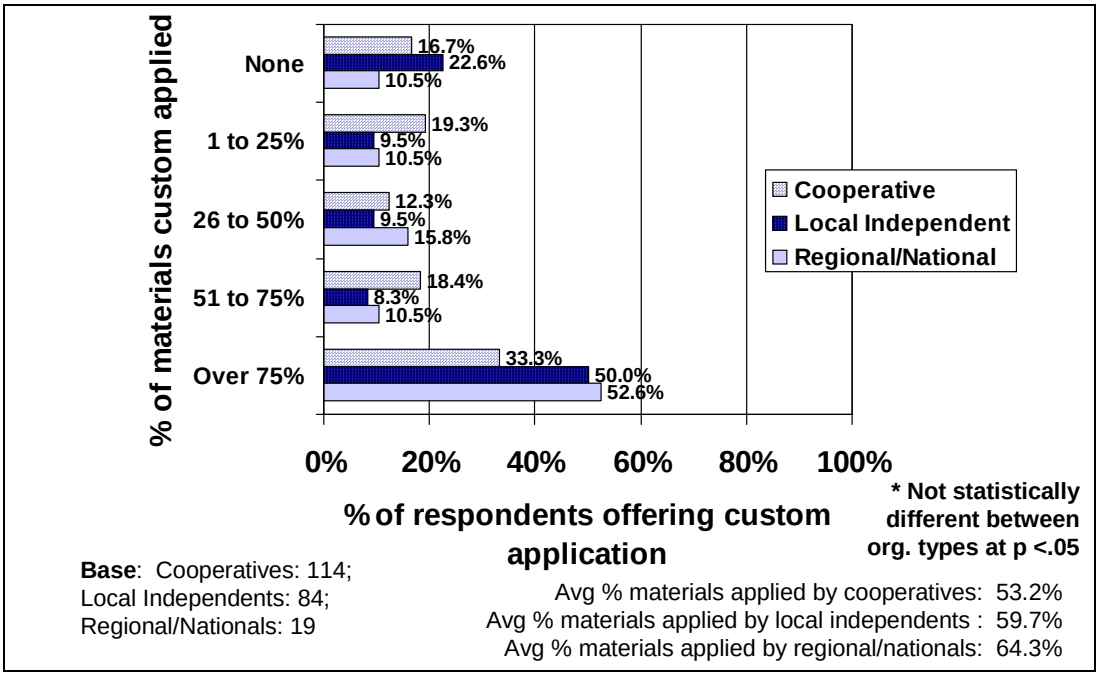
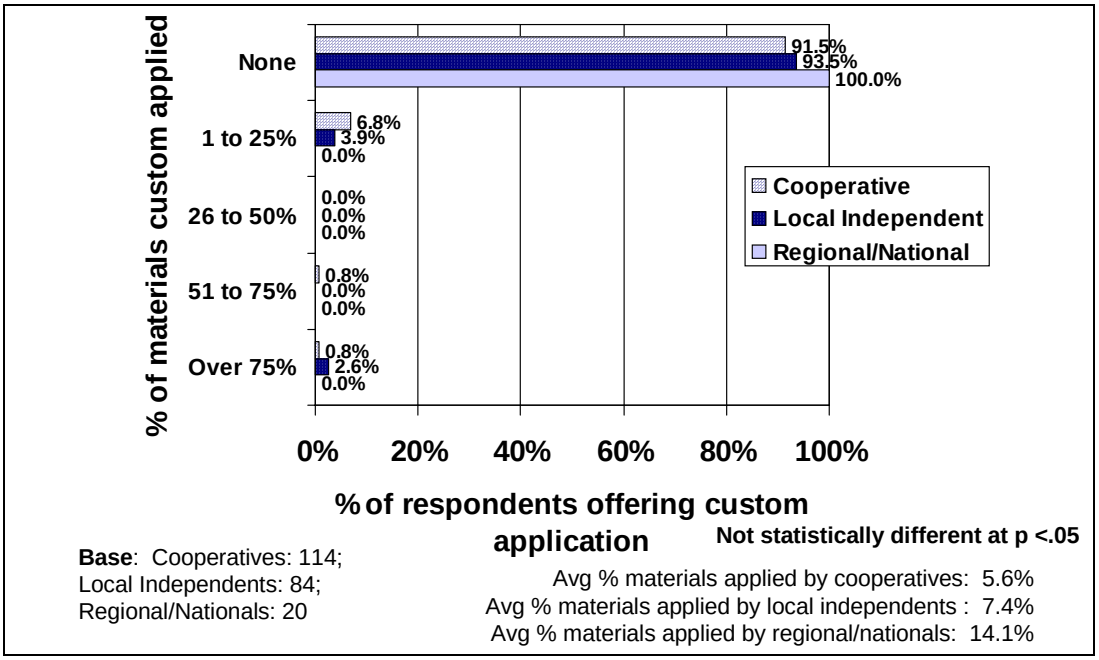


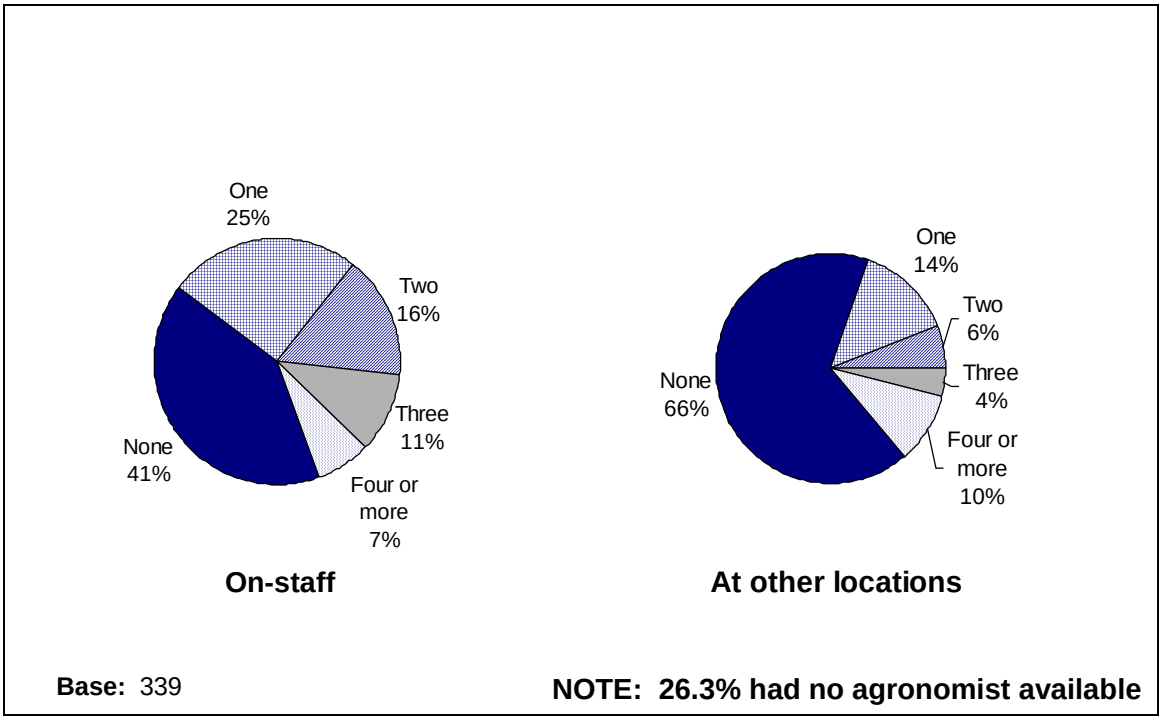
Figure 19. Use of GPS Guidance Systems for Custom Application by Organizational Type in the Midwest: Auto Control



Full-Time Agronomists

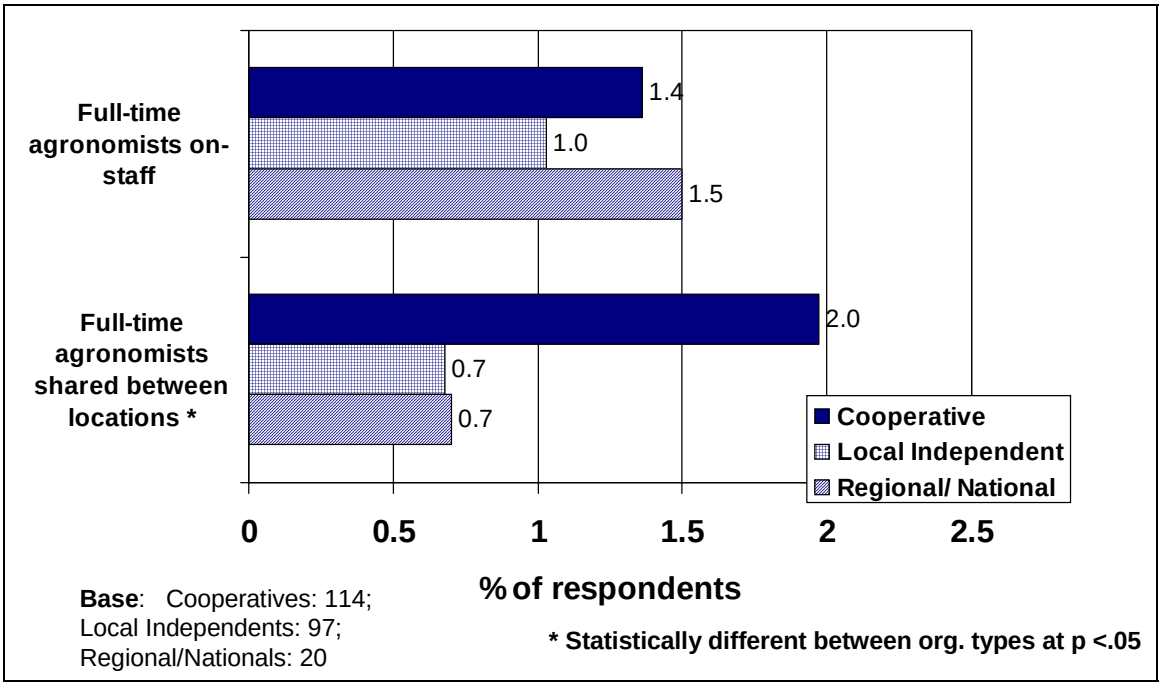
To support these services, many dealerships had agronomists available, either full-time on staff or shared with other locations. On average, the respondents had 1.4 full-time agronomists available on staff and shared an average of 1.4 agronomists with other locations. Two-thirds of the responding dealerships had at least one full-time agronomist on staff at their location (59 percent) (Figure 20), however several of those with no full-time agronomist at their location did have one available for their use at another location. A quarter of the respondents (26 percent) had no full-time agronomist available to them at all.

Figure 20. Full-time Agronomists Available



Though there were no differences in the number of agronomists available between regions, in the Midwest the type of organization did have an impact. Though all three organizational types had a similar number of agronomists available on staff, cooperatives were most likely to have a larger number of shared agronomists (Figure 21). Cooperatives shared an average of 2.0 agronomists between locations, compared to an average of 0.7 for regional/nationals and local independents.

Figure 21. Average Number of Agronomists Available by Organizational Type in the Midwest



Use of Precision Technologies and Offerings of Site-Specific Services

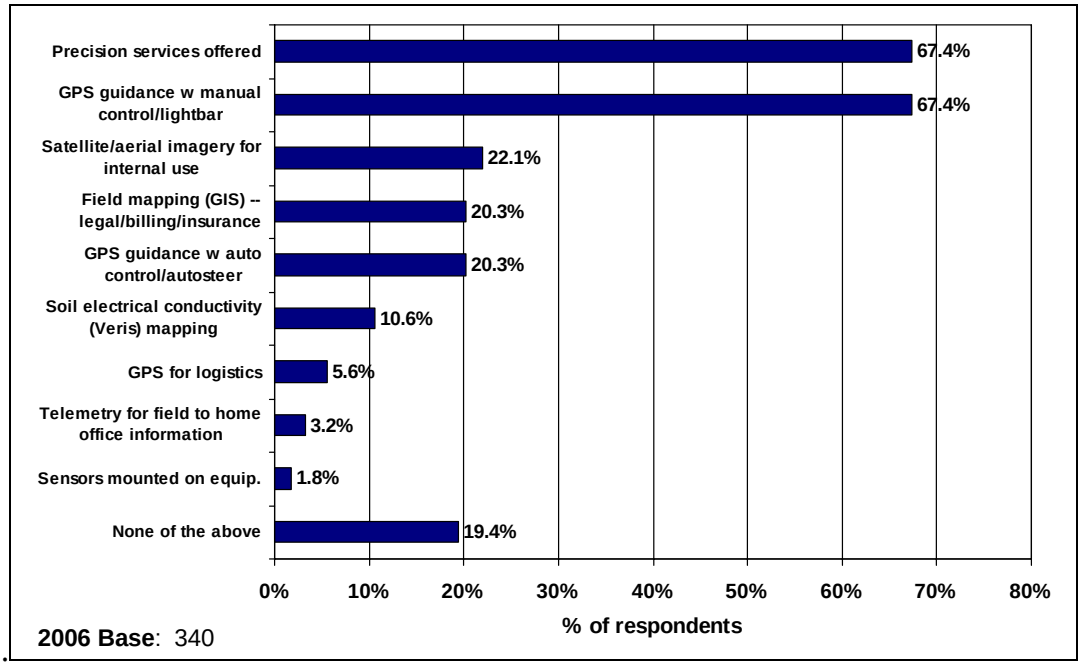
Respondents were asked several questions about their use of precision technologies and which site-specific services they were currently offering (or would be offering by the fall of 2006).

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.

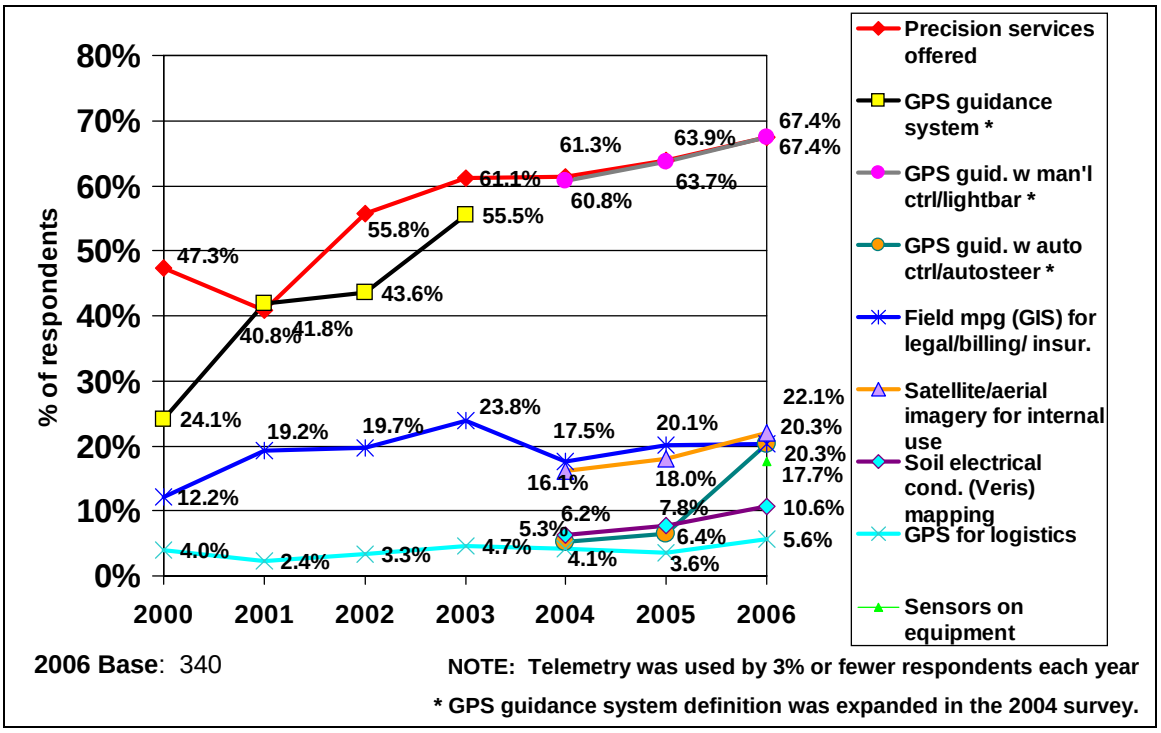
Showing some growth over last year, 81 percent of the respondents used precision technologies in some way in their dealership (up from 76 percent last year) (Figure 22). The two most common uses were precision service offerings for their customers (67 percent of respondents) and using GPS guidance with manual control/light bar (also 67 percent of respondents). The next three most common uses were satellite/aerial photography for internal uses, field mapping with GIS (Geographical Information Systems) for legal/billing/insurance purposes and GPS guidance with auto control/autosteer (22, 20 and 20 percent of respondents, respectively). Only 10 percent of the respondents said they used soil electrical conductivity mapping (Veris) while 6 percent used GPS for logistics, 3 percent used telemetry for field to home office information, and 2 percent had sensors such as pH soil sensors or chlorophyll/ greenness sensors mounted on their pick-up, applicator, or tractor

Figure 22. Use of Precision Technology



Over time, some uses of precision technology have increased while others have remained fairly stable (Figure 23). The biggest growth has been in precision service offerings, with fairly consistent growth from 2000 to 2006. Field mapping (GIS) for legal/billing/insurance purposes has moved in the 12 to 24 percent range while GPS used for logistics has been fairly constant, hovering around the 5 percent level. The biggest growth seen this year was in the use of GPS guidance systems with autocontrol/auto steer, growing from 6.4 percent of the dealerships in 2005 to 20.3 percent in 2006.

Figure 23. Use of Precision Technology over Time



2006 Base: 340

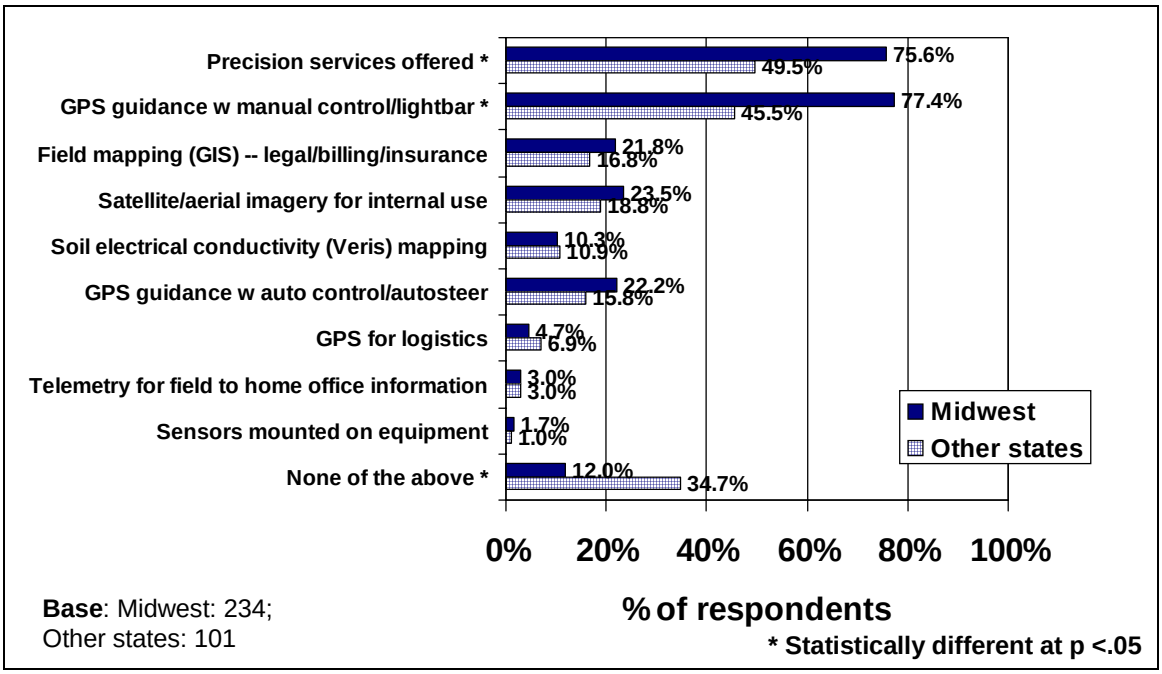
NOTE: Telemetry was used by 3% or fewer respondents each year

*** GPS guidance system definition was expanded in the 2004 survey.**

As in other years, precision technologies were being used by significantly more dealerships in the Midwest than in non-Midwestern states (Figure 24). Almost 9 out of 10 of the respondents in the Midwest (88 percent) said their dealership used precision technologies in some way, compared to just over six out of 10 of the respondents from other states (65 percent). Over two-thirds of the Midwestern respondents said their dealership offered precision services (76 percent) compared to only 50 percent of the non-Midwestern respondents. GPS was used as a guidance system with manual control/lightbar by 77 percent of the Midwestern dealerships compared to 46 percent of the non-Midwestern respondents. There were no statistical differences between regions in the use of GPS for the other items asked about in the questionnaire.

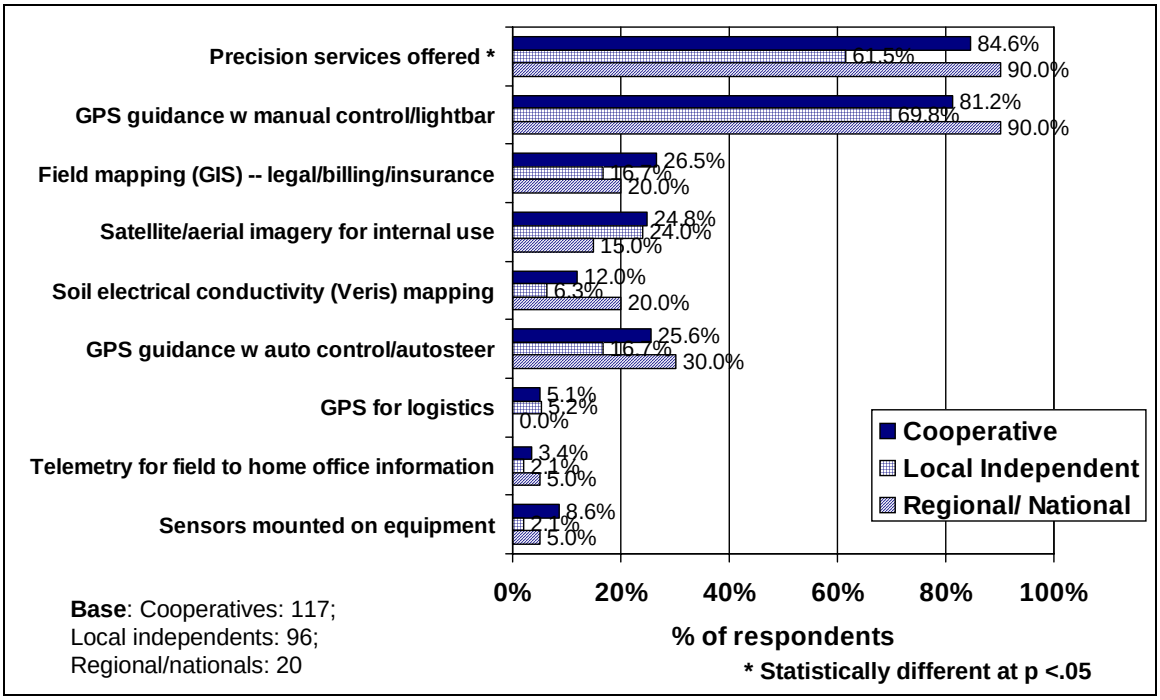
The only two uses of precision technologies that were significantly different across a more detailed breakout of regions were precision service offerings and GPS guidance systems with manual control (light bar). In both cases, use was highest in the Midwest, followed by the South, West, and finally the Northeast.

Figure 24. Use of Precision Technology by Region



In the Midwest, adoption of precision technology varied by organizational type. Over 9 out of 10 respondents representing cooperative organizations said they used at least one precision technology (93 percent) while 90 percent of those representing regional/nationals used at least one precision technology and only 81 percent of the local independents used at least one. Ninety percent of the respondents representing regional/nationals offered precision services to their customers (Figure 25), while almost as many (85 percent) of the cooperatives offered precision services. This can be contrasted to the local independents where only 62 percent of the respondents offered precision services.

Figure 25. Use of Precision Technology by Organizational Type in the Midwest



Precision Service Offerings

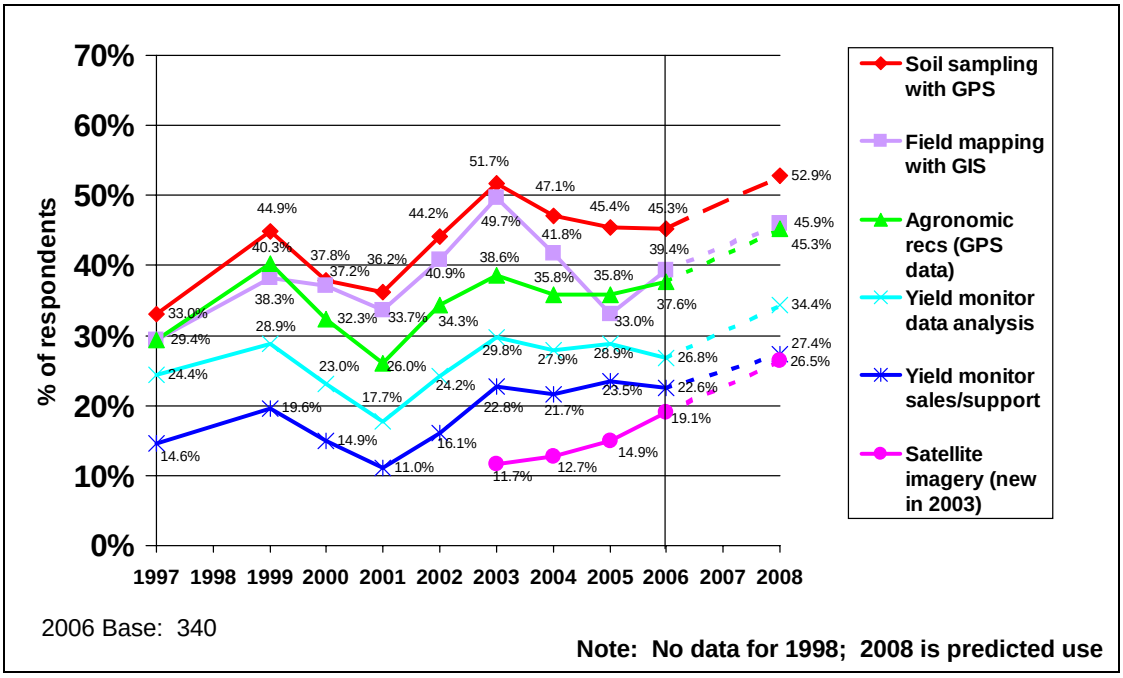
Respondents were asked which specific precision services they would be offering their customers by the fall of 2006. In most cases, 2006 use and projections were similar to those provided last year. The most common precision service offered by these dealerships was soil sampling with GPS – offered by 45 percent of the respondents (Figure 26). This was almost identical to last year's offering. By 2008, 53 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 39 percent of the respondents offering the service by the fall of 2006. By 2008, over 45 percent of respondents expected to be offering this service.

Similar to field mapping with GIS, agronomic recommendations based on GPS data was offered by 38 percent by the fall of 2006, with expectations of it rising to 45 percent by 2008. This service has remained fairly stable since 2003.

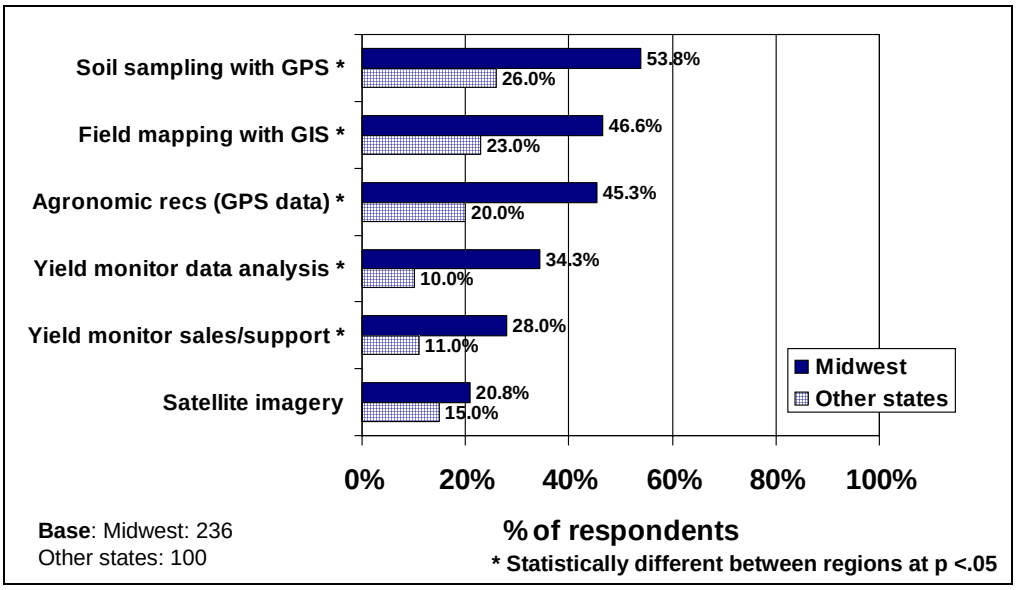
The biggest growth occurred with satellite/aerial imagery, offered by 19 percent of the dealerships in 2006, up from 15 percent in 2005.

Figure 26. Precision Ag Services Offered Over Time



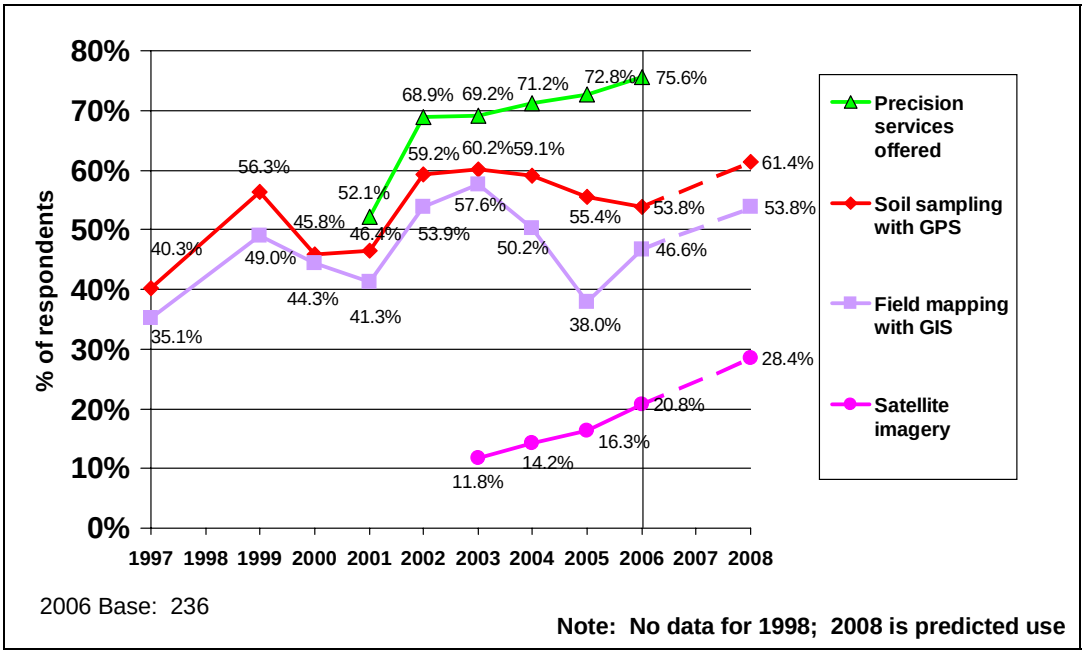
With the exception of satellite/aerial imagery, all of these precision service offerings were significantly more common in the Midwest than in other states (Figure 27). For example, 54 percent of the responding dealerships from the Midwest indicated they would be offering soil sampling with GPS by the fall 2006. In non-Midwestern states, soil sampling with GPS was expected to be offered by 26 percent of the respondents (similar to last year). Similar differences were evident for field mapping with GIS, agronomic recommendations based on GPS data, yield monitor data analysis and yield monitor sales/support.

Figure 27. Precision Ag Services Offered by Region



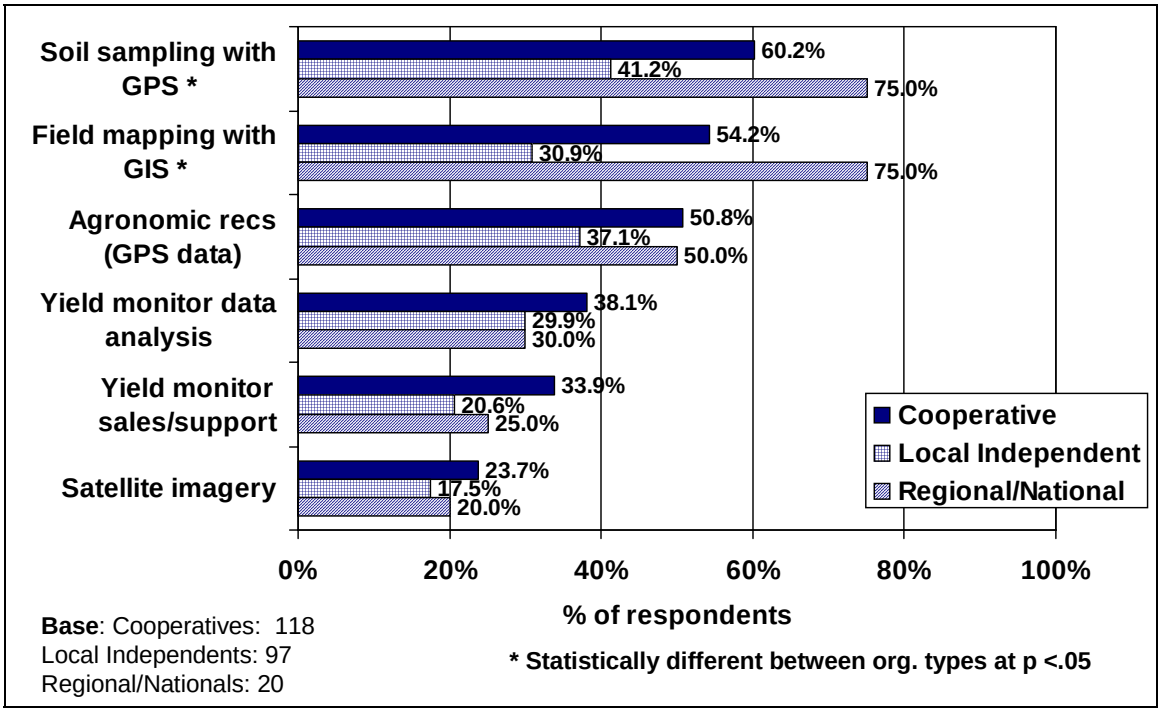
To get a better understanding of precision technology growth in the Midwest, Figure 28 shows the trends in key precision service offerings in the Midwest over the past 10 years. Overall, dealers offering any type of precision service offerings have shown a slow but steady increase since 2002, growing from 69 percent to 76 percent in 2006. However, individual services have not shown as much consistency in growth. The most consistent growth can be seen with satellite/aerial imagery, which has increased each year since we started measuring it in 2003.

Figure 28. 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 29). In the Midwest, local independents were generally not as likely to offer these services relative to the other organizational types. The two specific services where there were statistical differences were soil sampling with GPS and field mapping with GIS.

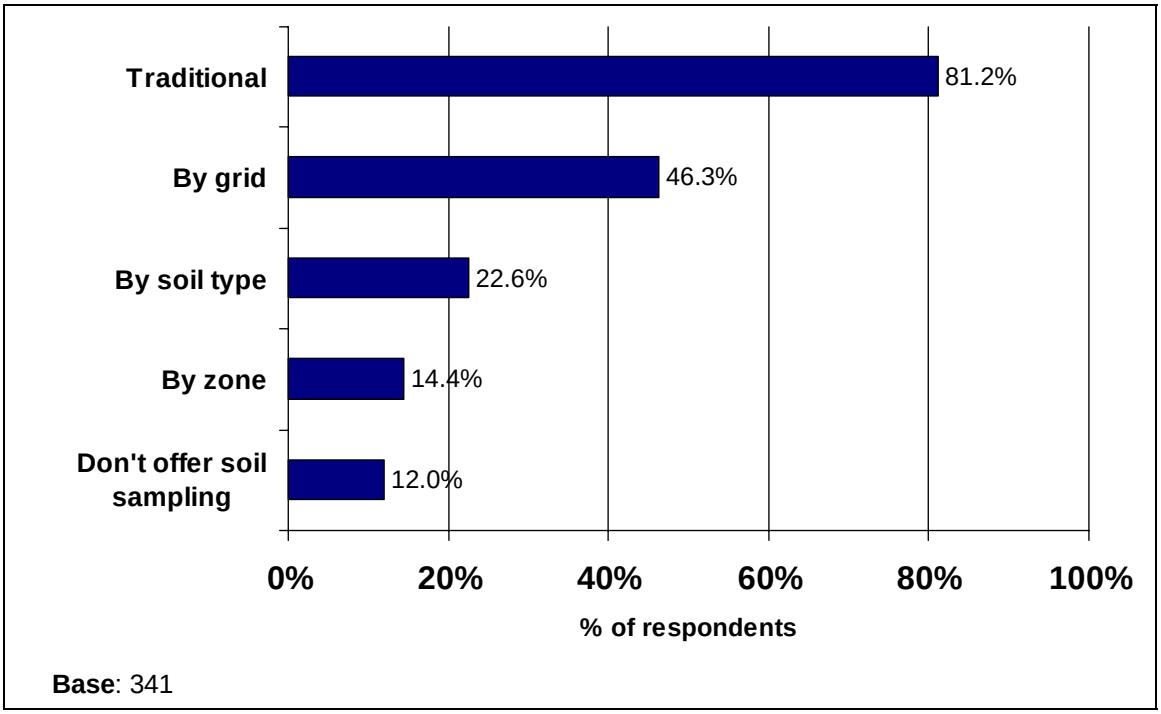
Figure 29. Precision Ag Services Offered by Organizational Type in the Midwest



A Focus on Soil Sampling

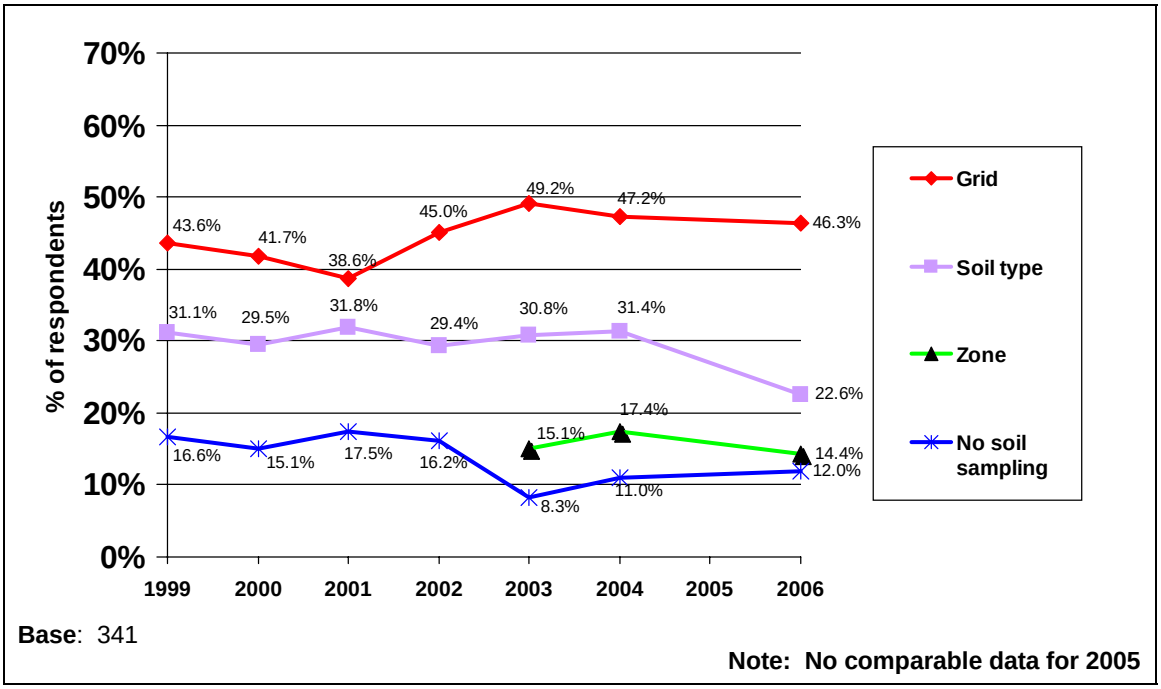
As in previous years, the types of soil sampling dealerships were offering – by grid or by soil type – were explored in more detail. Eighty-eight percent of the respondents offered some type of soil sampling with eight out of ten respondents indicating their dealership offered traditional soil sampling. Just under half of the respondents (46 percent) said they offered soil sampling by grid, while 23 percent offered soil sampling by soil type (Figure 30). Over time, these numbers have remained relatively constant, with some decrease in soil sampling by soil type (Figure 31). (Note that due to differences in wording of the questions, these percentages cannot be compared to last years' data but is comparable to data prior to 2005.)

Figure 30. Types of Soil Sampling Offered



Base: 341

Figure 31. Types of Soil Sampling Offered Over Time

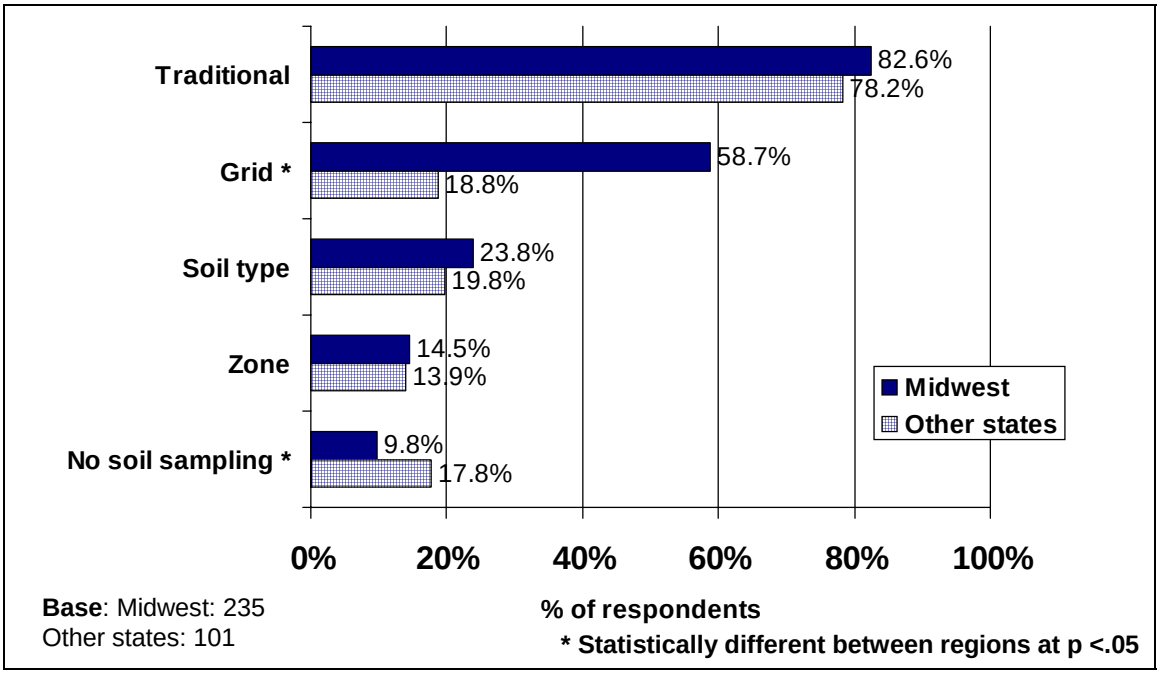


Base: 341

Note: No comparable data for 2005

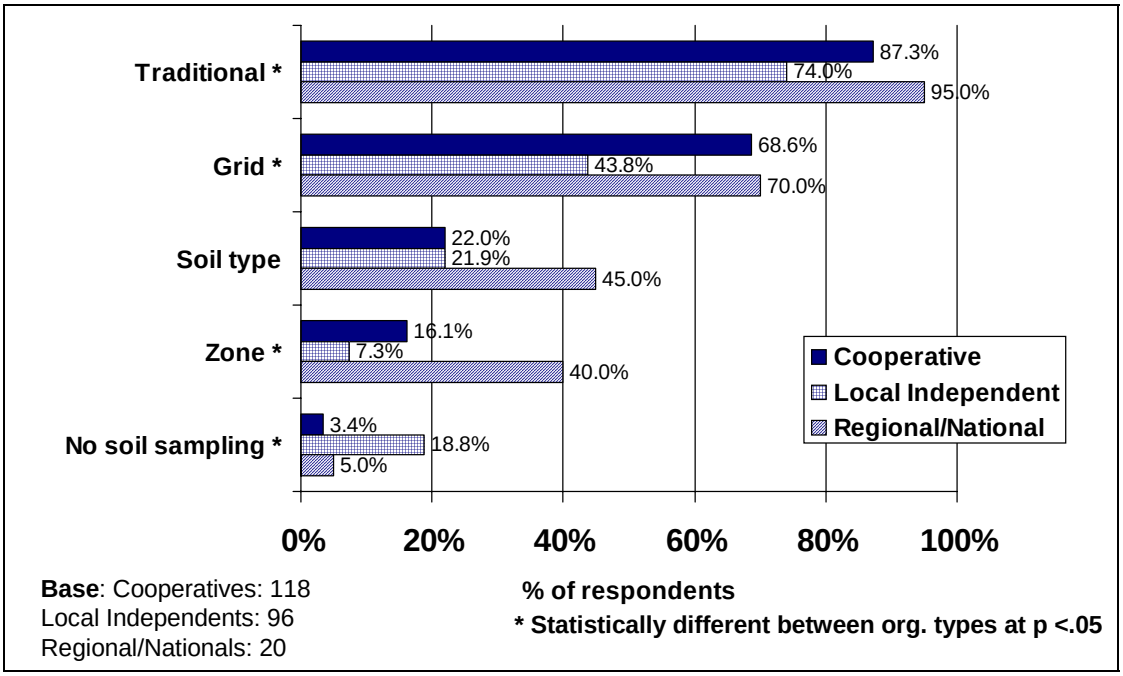
Soil sampling is more common in the Midwest than in other states (Figure 32) with 90 percent of the respondents in the Midwest saying their dealership offered some type of soil sampling, compared to 82 percent of the respondents from non-Midwestern states. The only specific type of soil sampling that varied by region was grid sampling – offered by three times as many dealerships in the Midwest compared to other states (59 percent compared to 29 percent).

Figure 32. Types of Soil Sampling Offered by Region



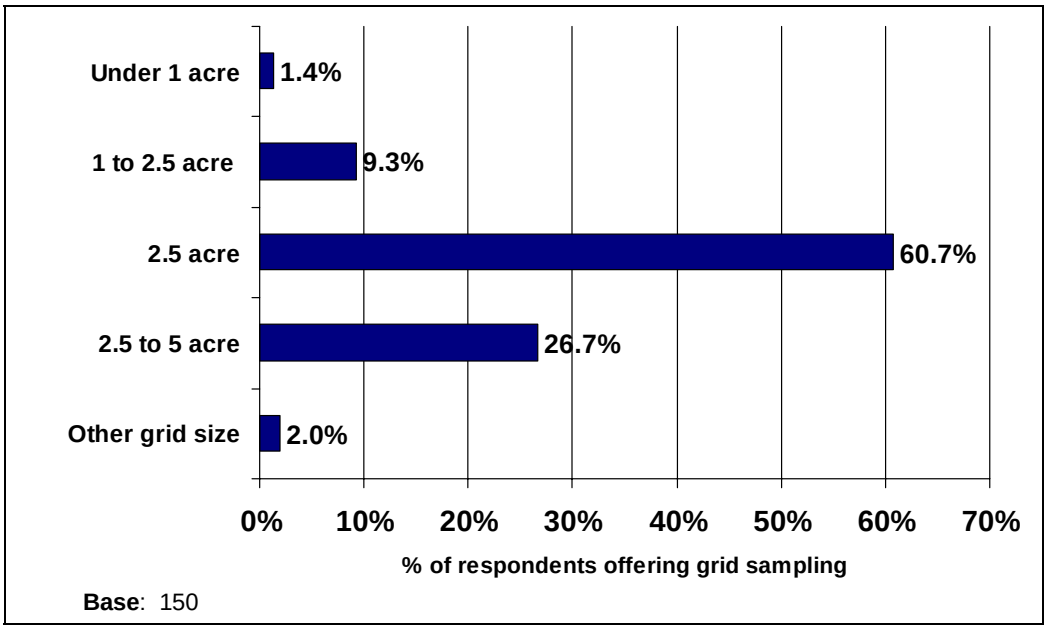
In the Midwest, the type of soil sampling also varied by organizational type. Consistent with precision service offerings, soil sampling as a service was more likely to be offered by cooperatives and national/regional dealerships (Figure 33). Traditional soil sampling and grid soil sampling were both likely to be offered by cooperatives and national/regional dealerships. Soil sampling by zone was offered by more than twice as many regional/national dealerships than by cooperatives or local independents.

Figure 33. Types of Soil Sampling Offered by Organizational Type in the Midwest



As the use of grid sampling has leveled out, the distribution of grid sizes has also remained fairly constant with the most common grid continuing to be 2.5 acres, followed by 2.5 to 5.0 acres (Figure 34). There was no variation in grid size by region or by organizational type within the Midwest.

Figure 34. Grid Sizes Used in Grid Sampling



Variable Rate Seeding

Variable rate seeding continues to be an area where dealerships show less interest relative to other precision services. In 2006, less than 10 percent of the responding dealerships offered variable seeding, either with or without GPS (Figure 35). Respondents in the Midwest were statistically more likely to be offering variable seeding with GPS than were respondents from non-Midwestern states (Figure 36). There were no statistical differences between organizational types in the Midwest (Figure 37).

Figure 35. Variable Rate Seeding Offered Over Time

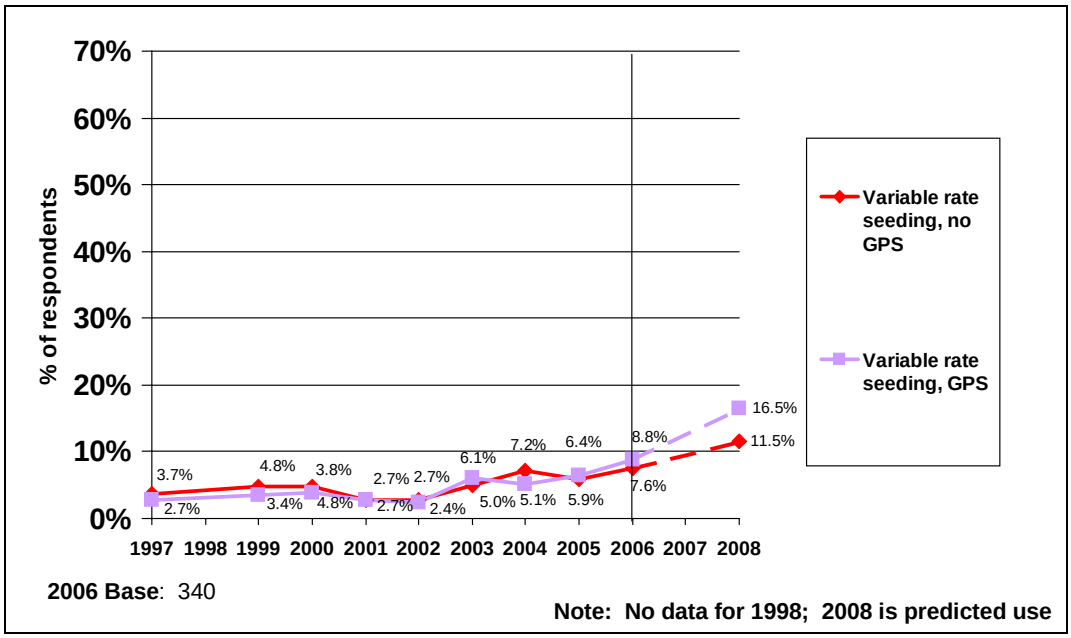


Figure 36. Variable Rate Seeding Offered by Region

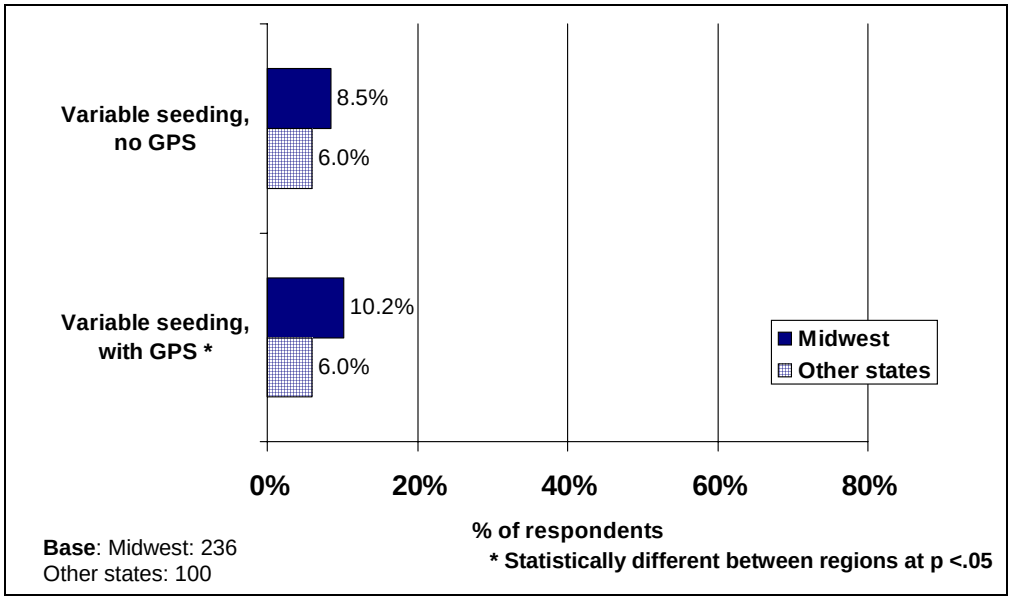
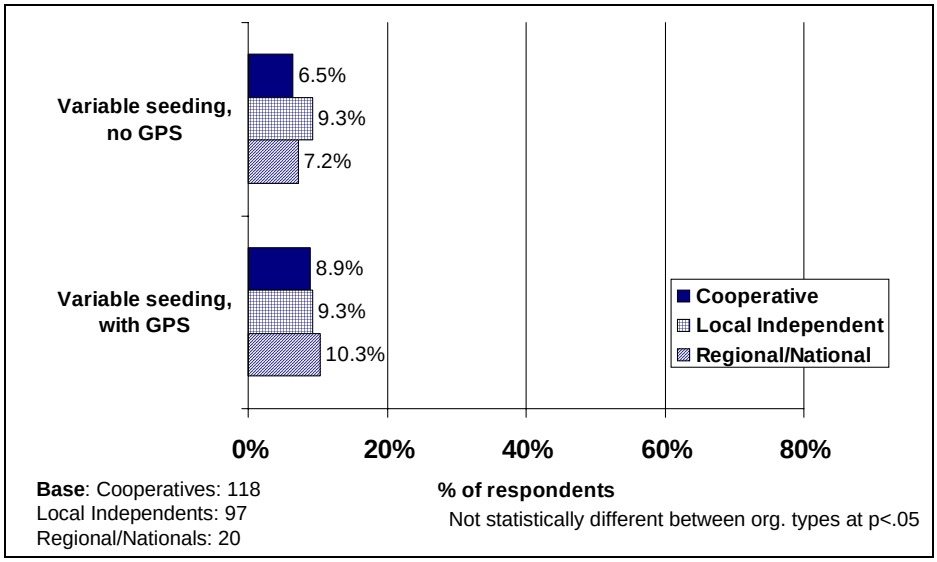


Figure 37. Variable Rate Seeding Offered by Organizational Type in the Midwest



Variable Rate Application

Variable rate custom application services have typically been provided along with traditional custom application services. Of the 87 percent of the dealerships who offered custom application, two-thirds expected to offer some type of variable rate application service by the fall of 2006 (including both controller-driven and manual variable rate application). Figure 38 shows the trends in variable rate application service offerings over time. Overall, there was some slight growth in the adoption all three types of variable rate application in 2006.

Figure 38. Precision Application Offered Over Time

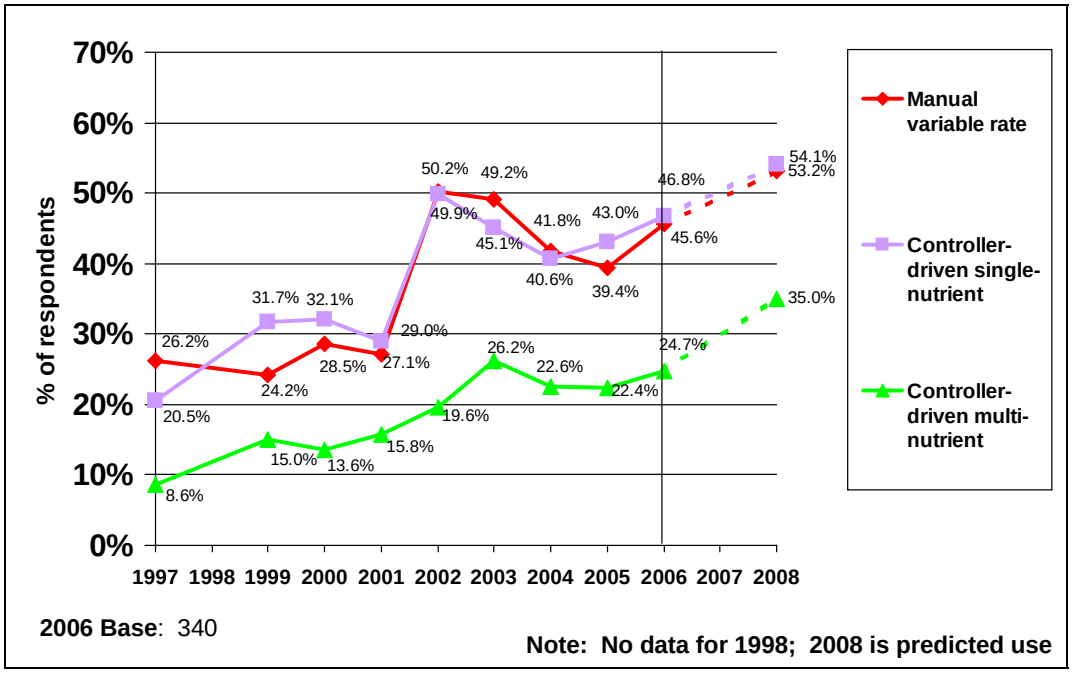
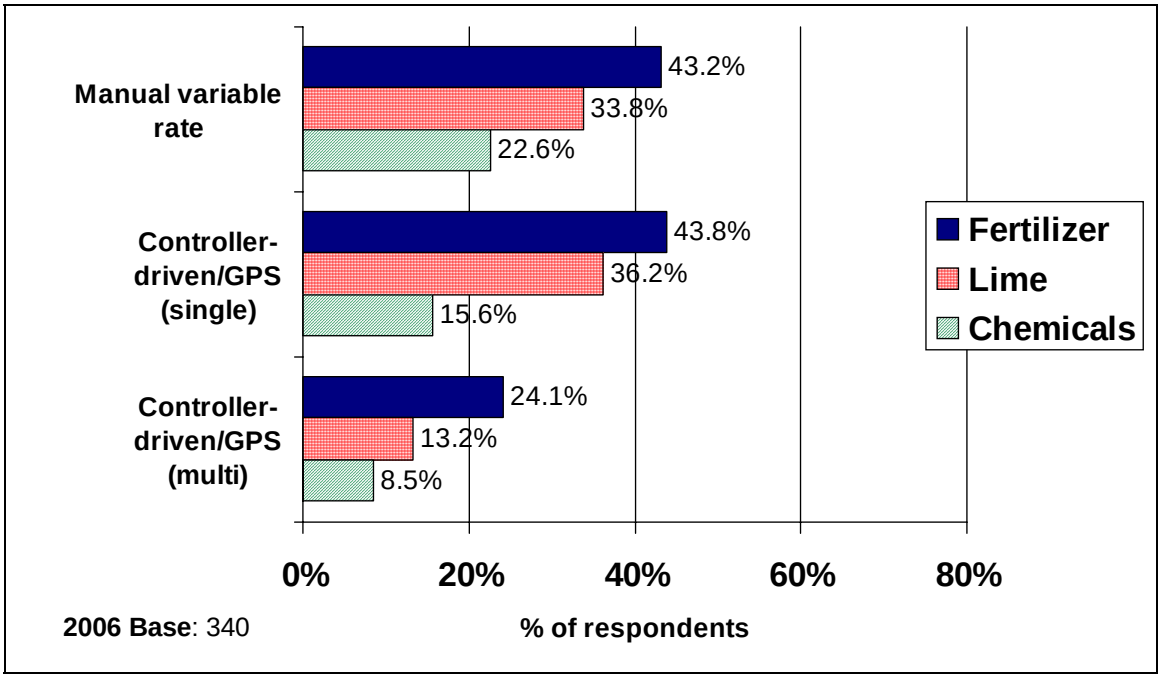


Figure 39 shows the offerings of specific controller-driven variable rate application services in 2006. Half of the respondents (51 percent) offered some form of controller-driven application of fertilizer, lime and/or chemicals – either single nutrient or multi-nutrient application. This was up from 45 percent in 2005. Single nutrient controller-driven application of fertilizer was the most common controller-driven variable rate application service offered, with 44 percent of the respondents expecting to offer the service by the fall of 2006. This figure was up from 39 percent offering the service in 2005. Multi-nutrient controller-driven application of fertilizer was virtually unchanged from last year, with 24 percent of the responding dealerships offering the service in 2006. Over a third of the respondents offered single-nutrient controller-driven variable rate application of lime and 13 percent offered it in combination with other materials in multi-nutrient controller-driven application.

Figure 39. Precision Application Offered for Each Input Type



Manual and controller-driven variable rate application was more common in the Midwest relative to the other states (Figure 40 to Figure 42). For fertilizer, half of the respondents (52 percent) expected to offer single nutrient controller-driven application in the Midwest by the fall of 2006 compared to only 25 percent of the respondents from other states (Figure 40). Both numbers were up 4 to 5 percentage points from 2005. Multi-nutrient controller-driven application of fertilizer in both Midwestern and non-Midwestern states were almost the same in 2006 as in 2005. In the Midwest, multi-nutrient controller-driven application of fertilizer was offered by 31 percent of the respondents while 10 percent of the respondents from non-Midwestern states expected to offer the service by fall 2006.

Controller-driven application of lime was offered at slightly lower levels than fertilizer in both regions (Figure 41), but like fertilizer, controller-driven application of lime was 2 to 3 times higher in the Midwest than in non-Midwestern states. For chemicals, variable rate application

was not as common as for fertilizer and lime (Figure 42) and there were no statistical differences across regions for variable rate chemical application.

Figure 40. Precision Application of *Fertilizer* Offered by Region

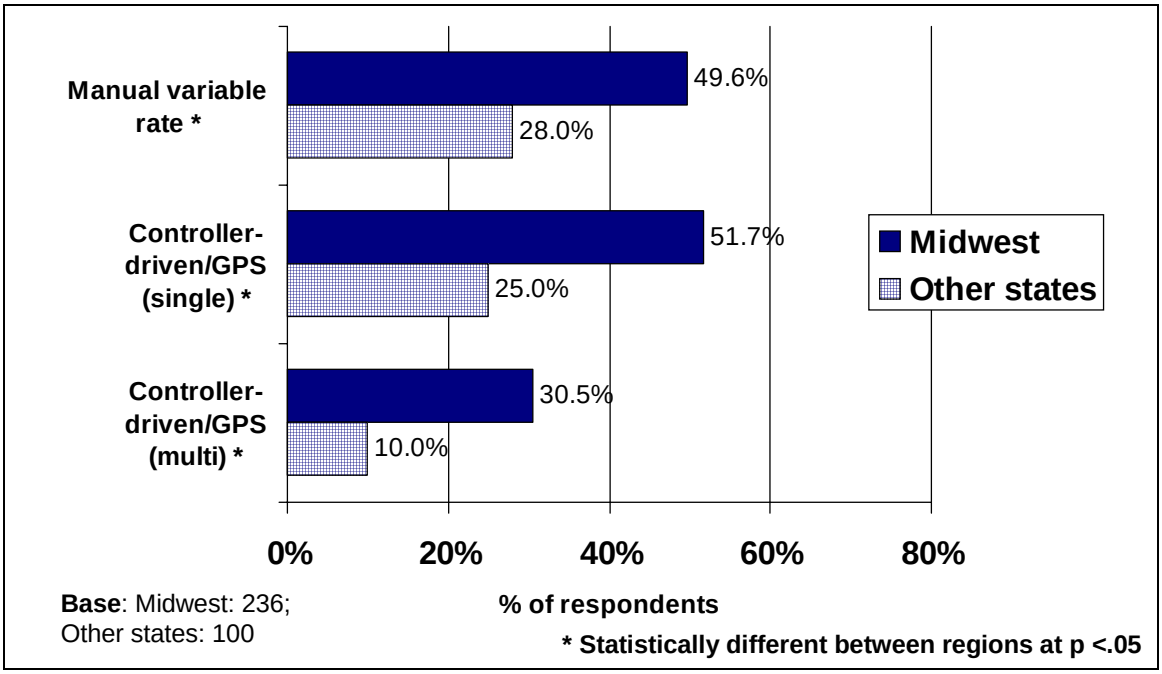


Figure 41. Precision Application of *Lime* Offered by Region

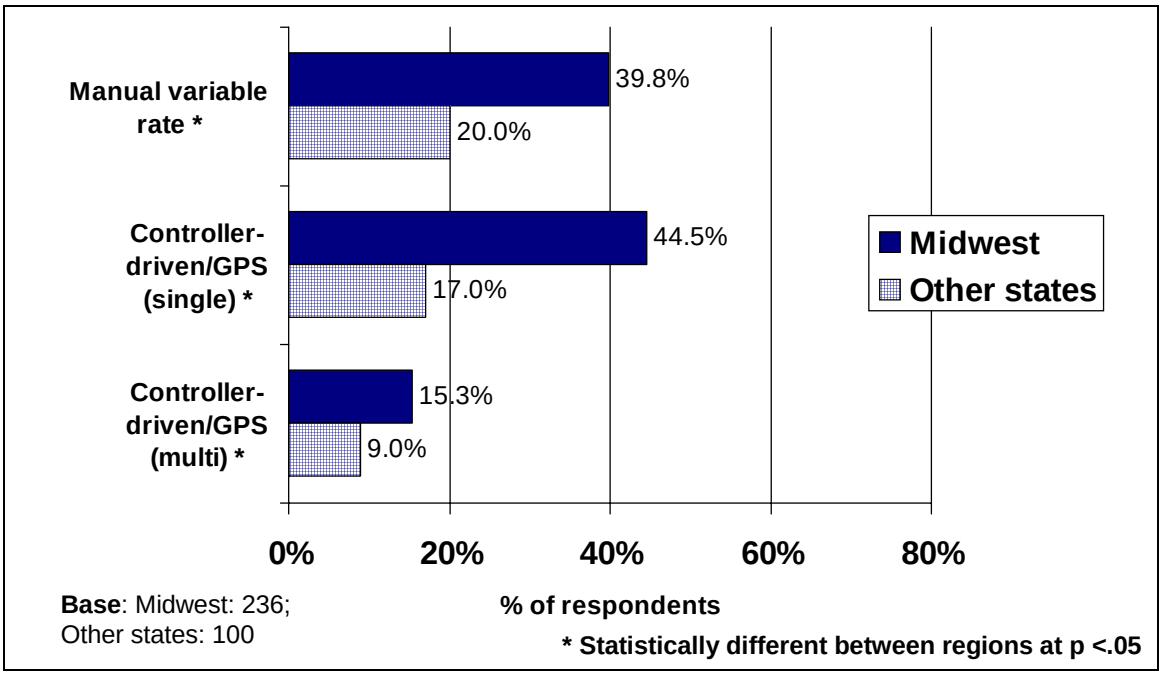
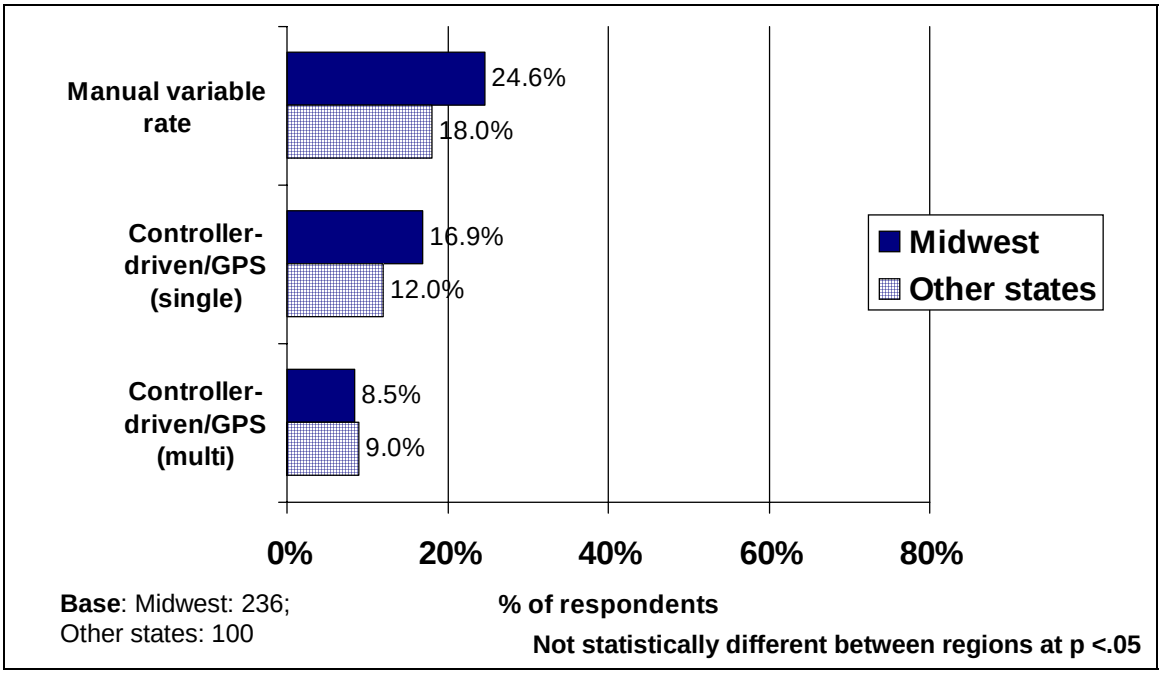


Figure 42. Precision Application of *Chemicals* Offered by Region



To give a perspective of overall adoption of controller-driven application in the Midwest, Figure 43 shows the level of variable application over the past 10 years. Both single-nutrient and multi-nutrient controller-driven application have grown steadily in those years, with reported offerings declining in only a few years.

Figure 43. Variable Rate Application Offered Over Time in the Midwest

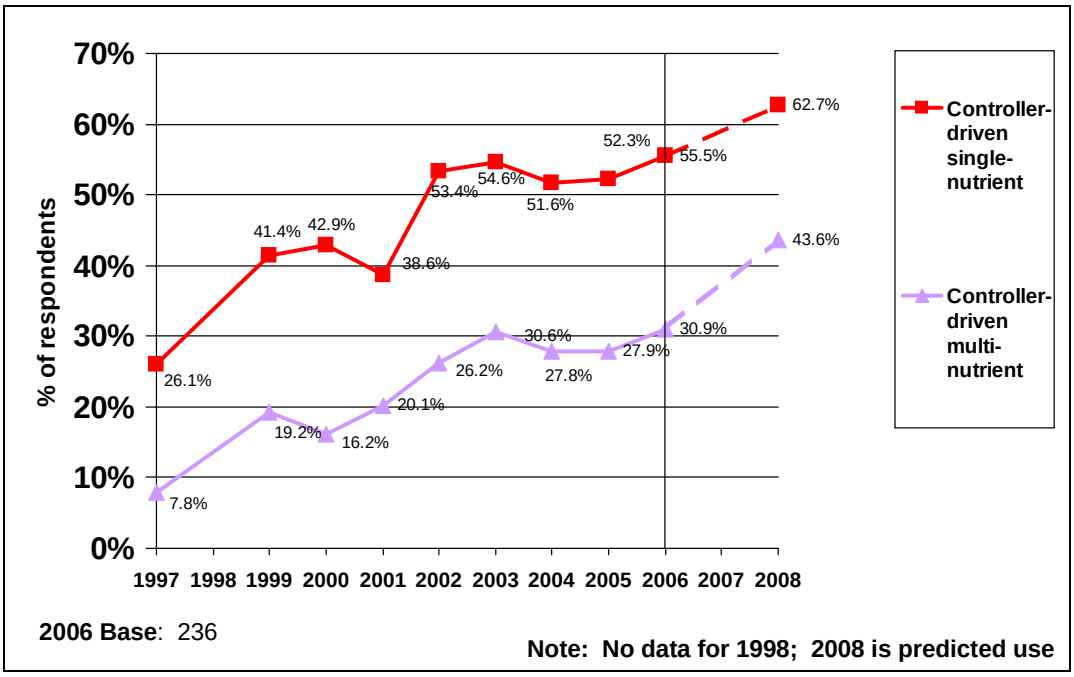


Figure 46 show the precision application offerings by organizational type in the Midwest. In general, the patterns are similar to those seen for other services, with regional/national outlets and cooperatives being more likely to offer precision application than local independents. For fertilizer, the largest difference between organizational types was seen for controller-driven multi-nutrient application, with 3 to 4 times as many cooperatives and regional/national organizations offering the service as compared to the local independents. This may reflect the higher cost of equipment and additional expertise involved and is consistent with last year's results. For lime, the cooperatives were significantly more likely to offer multi-nutrient controller-driven application than were regional/national dealerships or local independents. For chemicals, there were no significant differences between organizational types.

Figure 44. Precision Application of *Fertilizer* Offered by Organizational Type in the Midwest

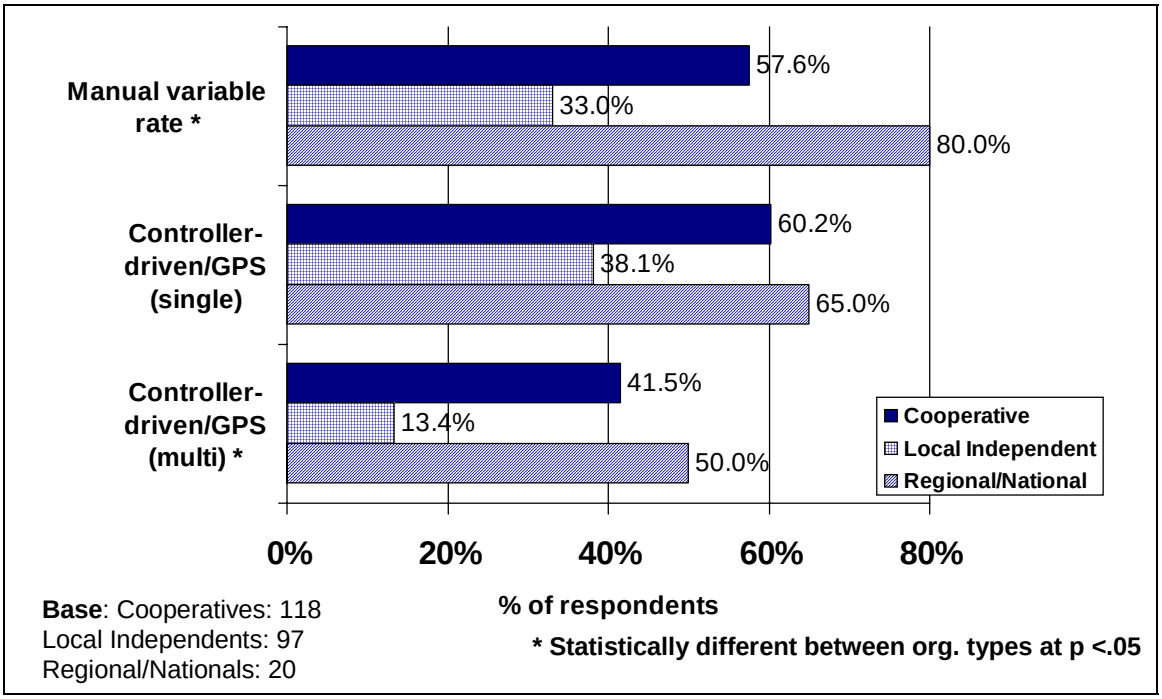
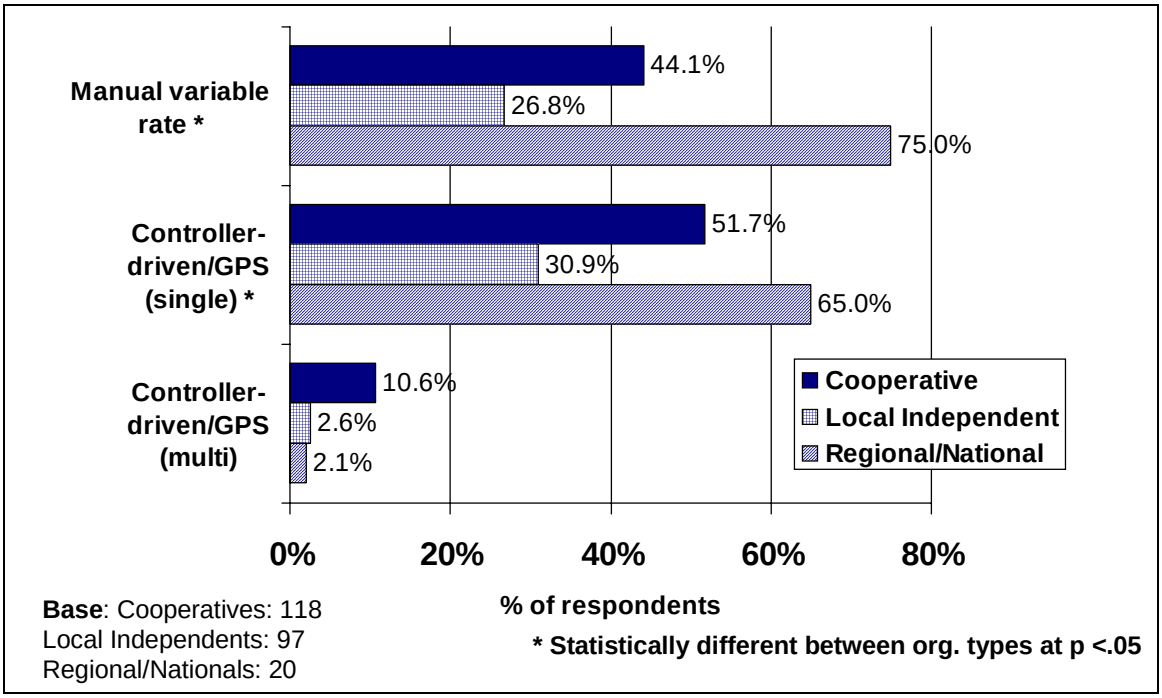
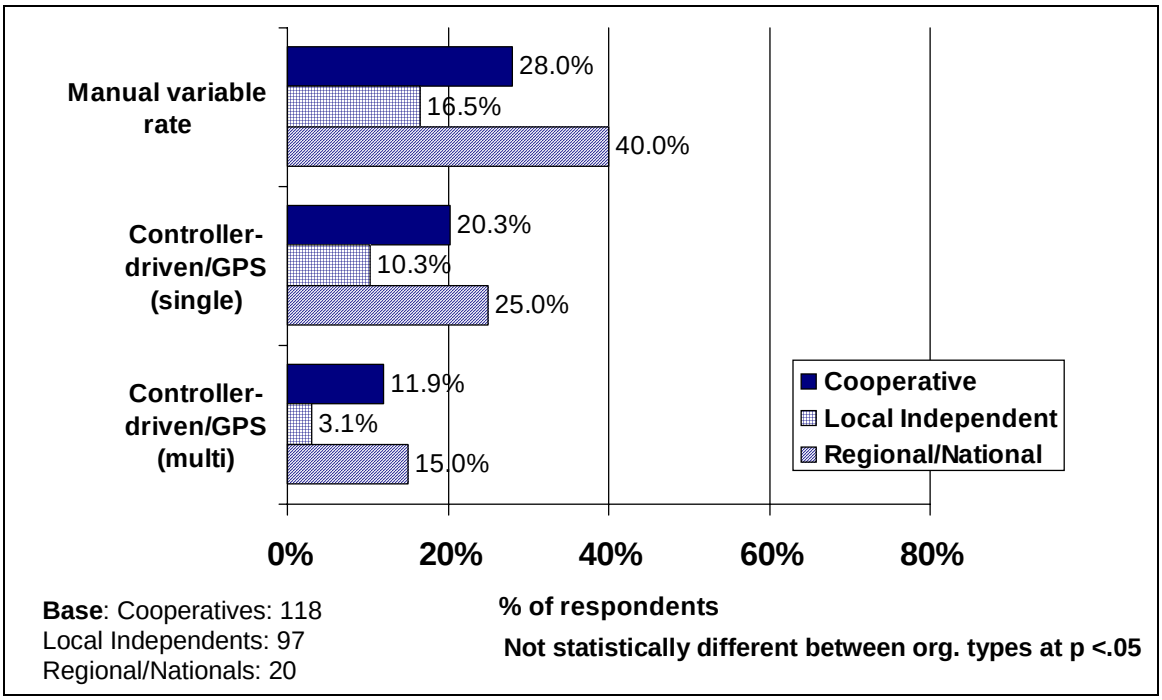


Figure 45. Precision Application of *Lime* Offered by Organizational Type in the Midwest



Base: Cooperatives: 118
Local Independents: 97
Regional/Nationals: 20

Figure 46. Precision Application of *Chemicals* Offered by Organizational Type in the Midwest



Base: Cooperatives: 118
Local Independents: 97
Regional/Nationals: 20

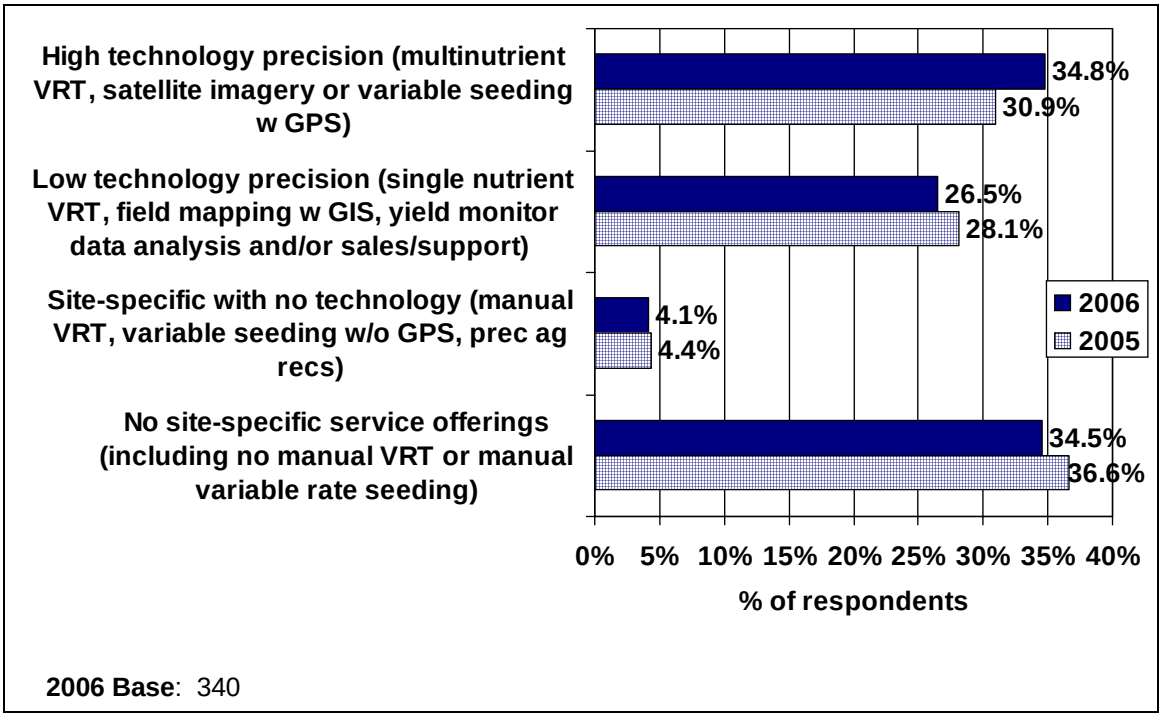
Levels of Precision Adoption

To summarize how extensively dealerships are incorporating precision technology into their service offerings, respondents were grouped into the following categories based on how extensive their precision service offerings were:

1. "High tech": Multi-nutrient variable rate application, satellite/aerial imagery and/or variable seeding with GPS
2. "Low tech": Single variable rate application, field mapping with GIS, yield monitor sales/support and/or data analysis, soil sampling with GPS
3. "Site-specific with no technology": Manual variable rate application, variable rate seeding with no GPS, and/or agronomic recommendations based on precision data gathered elsewhere
4. No site-specific services at all.

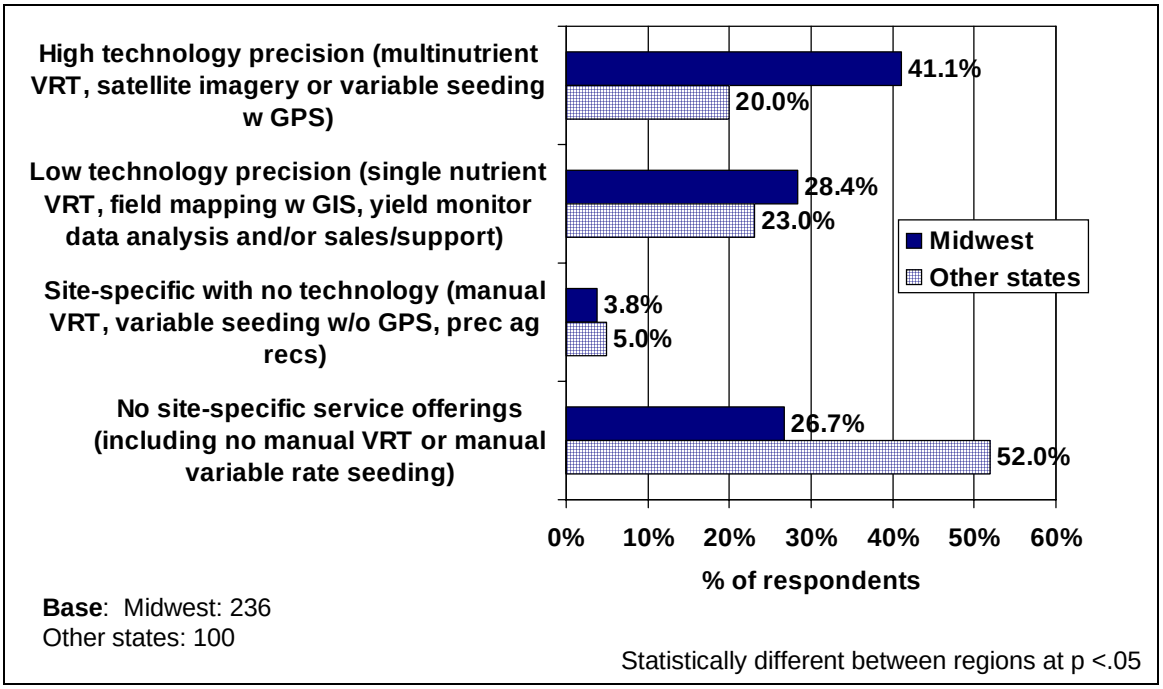
Just over a third of the respondents were in the "high tech" category (Figure 47), just over a quarter were in the "low tech" category and over a third offered no site-specific services at all (including manual variable rate application or making recommendations based on precision data). Very few respondents were offering manually-controlled site-specific services with no technology investment. These numbers were similar to 2005 results.

Figure 47. Levels of Precision Adoption



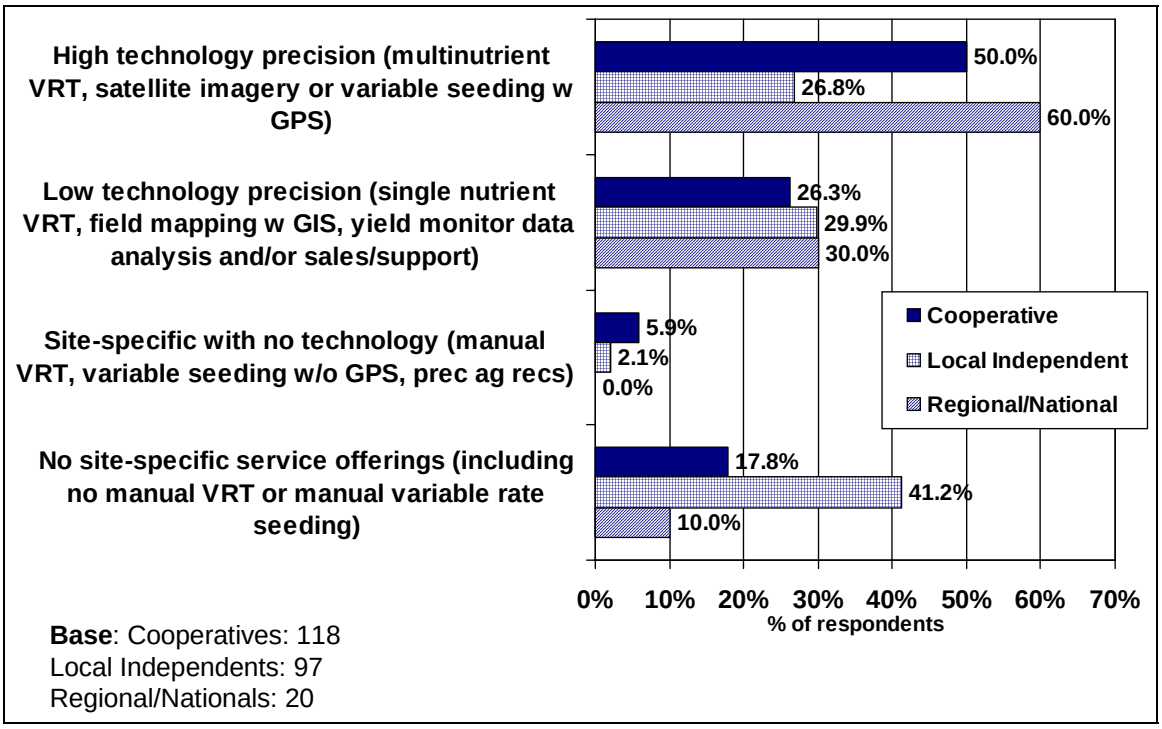
Precision technology varied greatly by region with four in 10 (41 percent) of the respondents from the Midwest being classified as "High tech" precision users compared to only 20 percent in the non-Midwestern states (Figure 48). Over half of the respondents from the non-Midwestern states offered no site-specific services at all, compared to only 27 percent of the respondents from the Midwest.

Figure 48. Levels of Precision Adoption by Region



In the Midwest, there were significant differences in levels of precision technology between the different types of organizations (Figure 49). Half of those representing cooperatives (50 percent) were classified as "High tech" precision users, as were 60 percent of the respondents from regional/national organizations. In contrast, only 27 percent of the respondents from local independents were classified as being "High tech."

Figure 49. Levels of Precision Adoption by Organizational Type in the Midwest



Pricing Site-Specific Services

Dealerships were asked to report the typical price they charge per acre for their precision services where they could. For those offering only packages or bundled pricing, it often wasn't possible to price out the components individually. Hence, far fewer respondents completed this question relative to some of the other questions in the survey.

Figure 50 and Figure 51 show the average prices charged per acre for each of the precision services. The bars indicate what the middle 80 percent of the dealers were charging (as with other years, the top 10 percent and bottom 10 percent were dropped to make the ranges a bit more consistent) while the squares show the average prices. Overall, the average prices charged were somewhat higher than those seen in previous years. There were no overall differences between prices charged in the Midwest and in other states.

Figure 50. Prices Charged for Precision Ag Services

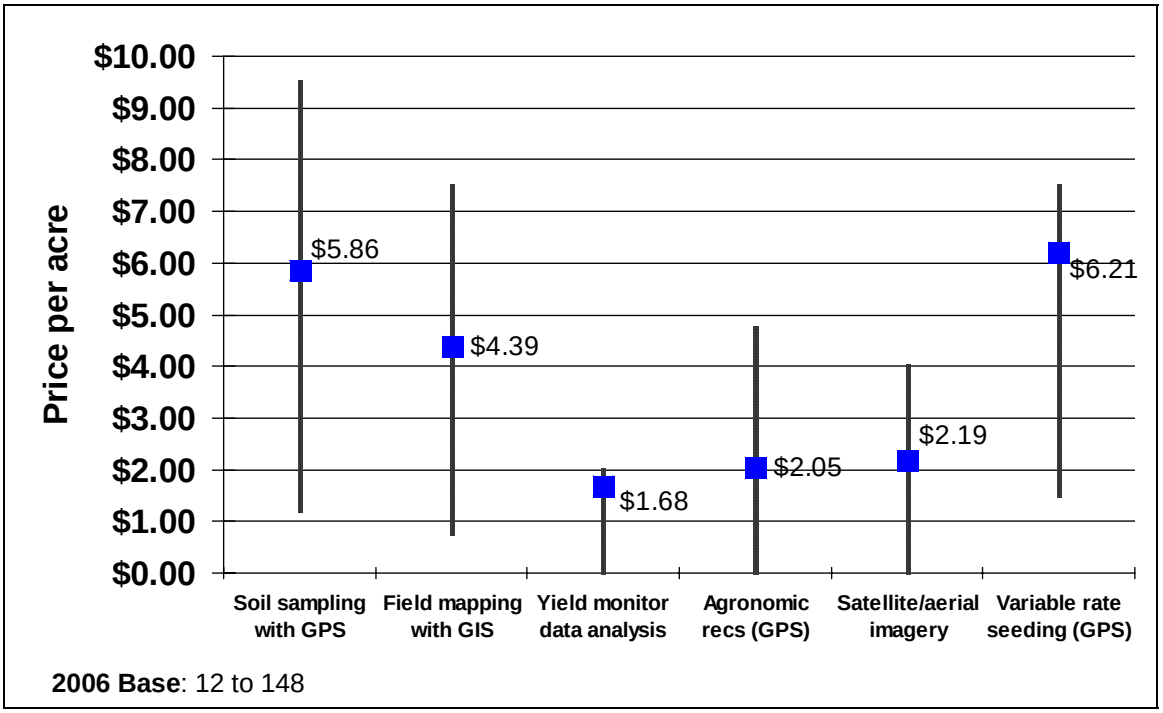
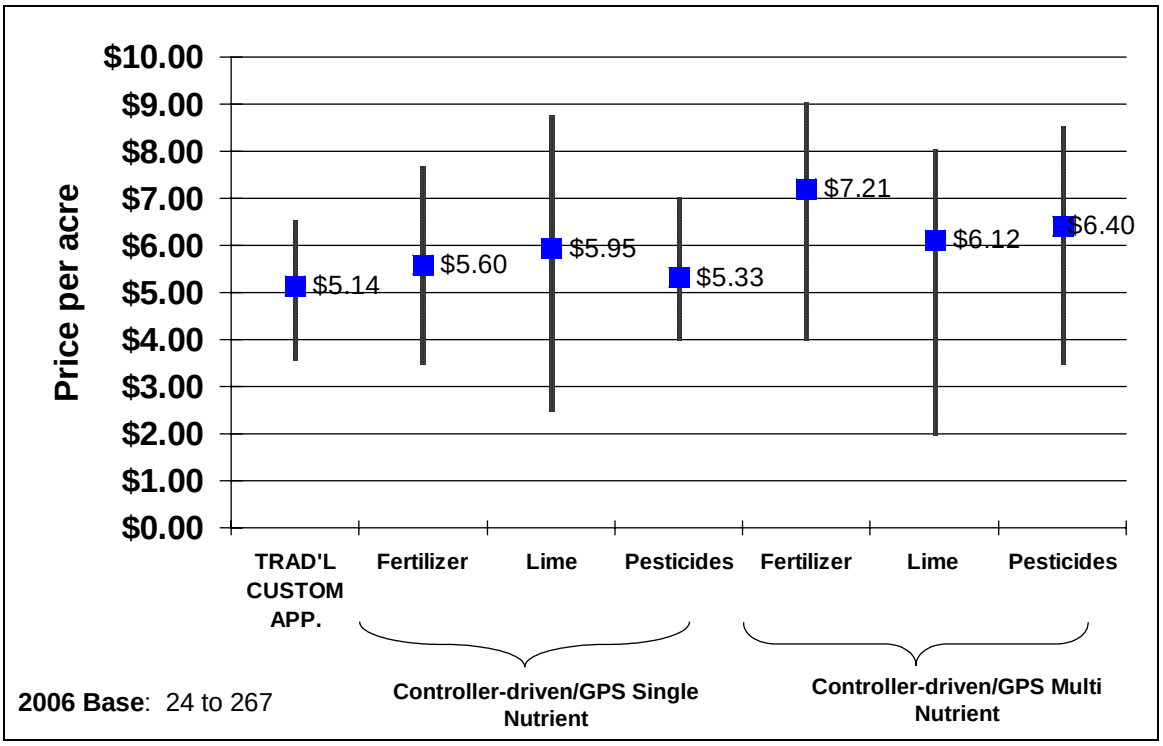


Figure 51. Prices Charged for Precision Application Services



Profitability of Precision Service Offerings

Dealerships were asked how profitable they felt their precision offerings were. Compared to last year, dealers seemed to have a better feel for the profitability of their precision service offerings; however, fewer dealerships reported that the precision services were profitable for their business compared to 2005.

Each bar in Figure 52 and Figure 53 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; and
- generating a profit.

Using soil sampling with GPS in Figure 52 as an example, four out of 10 of the respondents said the service generated a profit for their dealership (39.7 percent). Just over a quarter (28.5 percent) said that it just covered fixed and variable costs. One in 6 respondents (18.5 percent) felt that they were covering variable costs but not fixed costs for soil sampling with GPS and 6.6 percent said they were covering neither variable nor fixed costs. Only 6.6 percent of the respondents did not know how profitable soil sampling with GPS was for their dealership.

In looking at the precision services in both charts, the most profitable service appeared to be traditional, non-precision custom application followed by multi-nutrient controller-driven application. Forty-seven (47) percent of the respondents said they were making a profit on custom application while 44 percent of the respondents who offered multi-nutrient controller-driven application said that it was generating a profit. This was similar to 2005. Almost as many respondents (42 percent) said that single-nutrient controller-driven application generated a profit. Soil sampling with GPS generated a profit for 40 percent of the respondents.

Similar to last year, the least profitable of the precision services were variable seeding with GPS and yield monitor data analysis, with fewer than half of the dealerships offering the services saying they at least covered fixed and variable costs. Respondents were most uncertain about the profitability of variable seeding with GPS (though these results were based on fewer responses).

Overall, respondents were confident about the profitability of their total precision service offerings. Almost four out of ten of the respondents indicated their precision package generated a profit while another 32 percent said they were covering both the fixed and variable costs of providing the services. The perception of the profitability of the different precision service offerings did not vary across regions or across organizational types in the Midwest.

Figure 52. Profitability of Precision Service Offerings

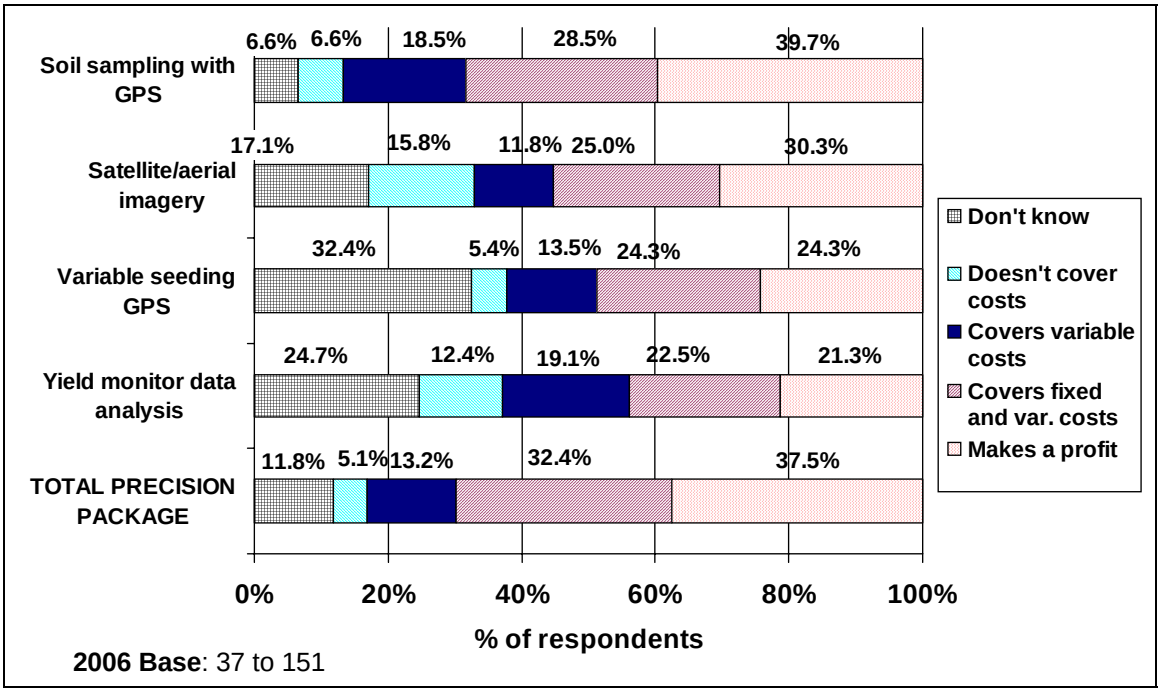


Figure 53. Profitability of Precision Application Offerings

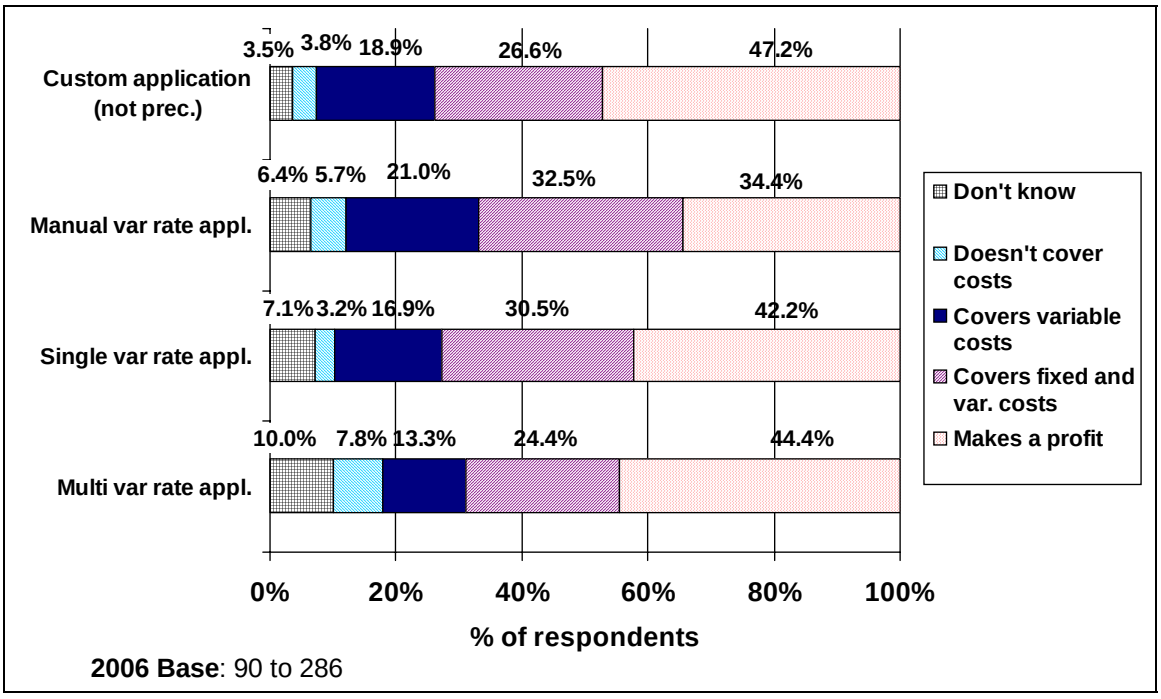


Figure 54 shows the profitability of the services across time, with the percentage showing those respondents reporting a profit on the service. Numbers were fairly consistent from 2003 to 2006, with this year showed a slight increase in profitability of satellite/aerial imagery, variable seeding with GPS and yield monitor data analysis.

To get a better perspective of the profitability trends in the Midwest, Figure 55 shows the same trends broken down just for the respondents from the Midwest. After a dip in 2004, multi-nutrient controller-driven application once again was the most profitable precision service, with 45 percent of the respondents saying they were generating a profit with the service. The other services showed a similar profit pattern to that of the entire sample shown in Figure 54.

Figure 54. Respondents Generating a Profit from Precision Services

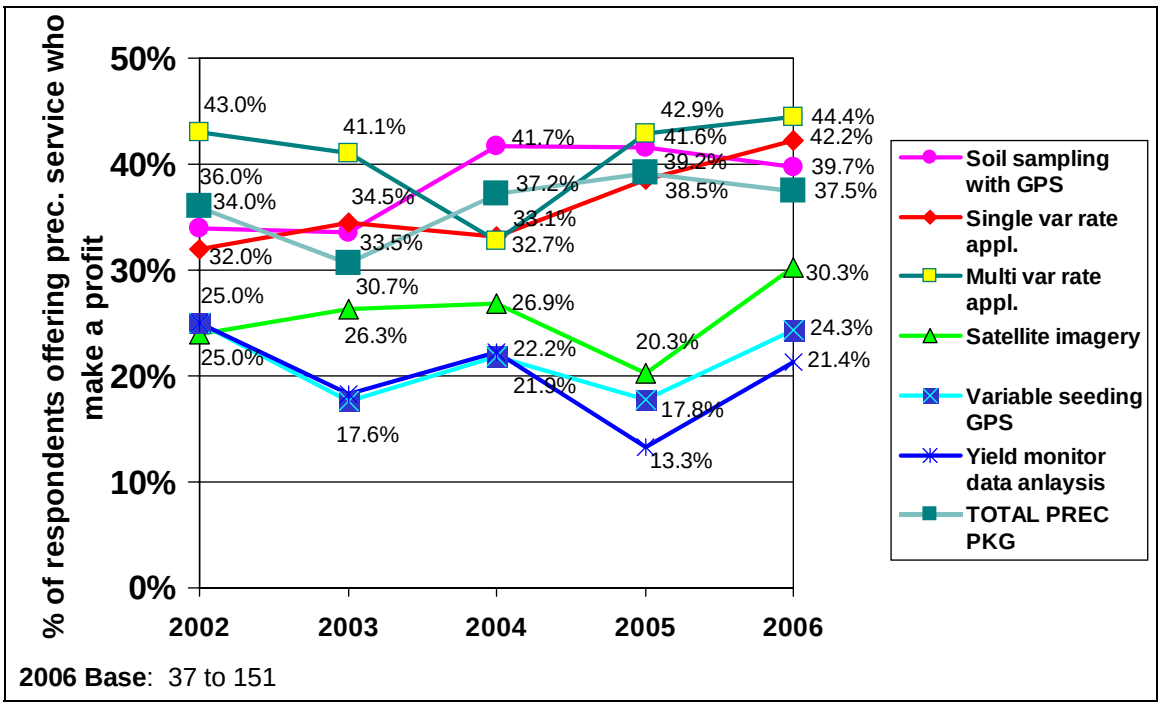
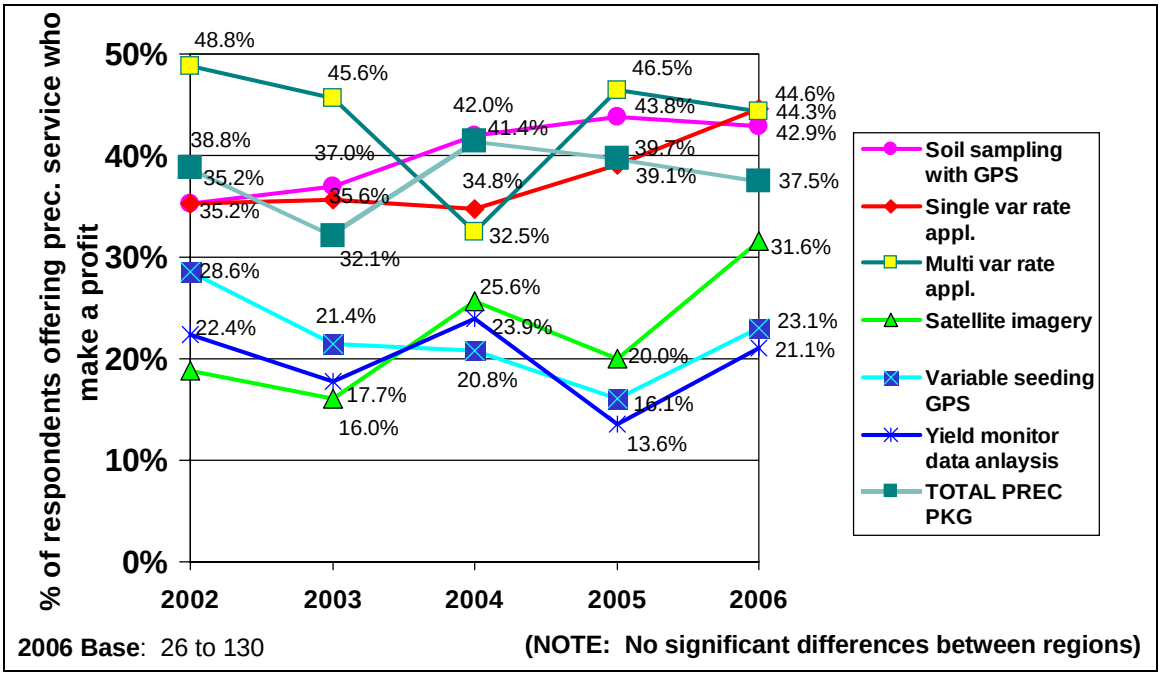


Figure 55. Respondents Generating a Profit from Precision Services in the Midwest



Customer Use of Site-Specific 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) was using various site-specific management services currently, and, in their opinion, what proportion of the local market acres would be using these services in 3 years. Figure 56 to Figure 59 show the trends over time in the estimated market use of specific precision agriculture management services.

Overall there was not much growth seen in average market acreage using the specific precision technologies. Most services were used more intensely than in previous years but nothing showed substantial growth.

Figure 56. Estimated Market Area Using Precision Services

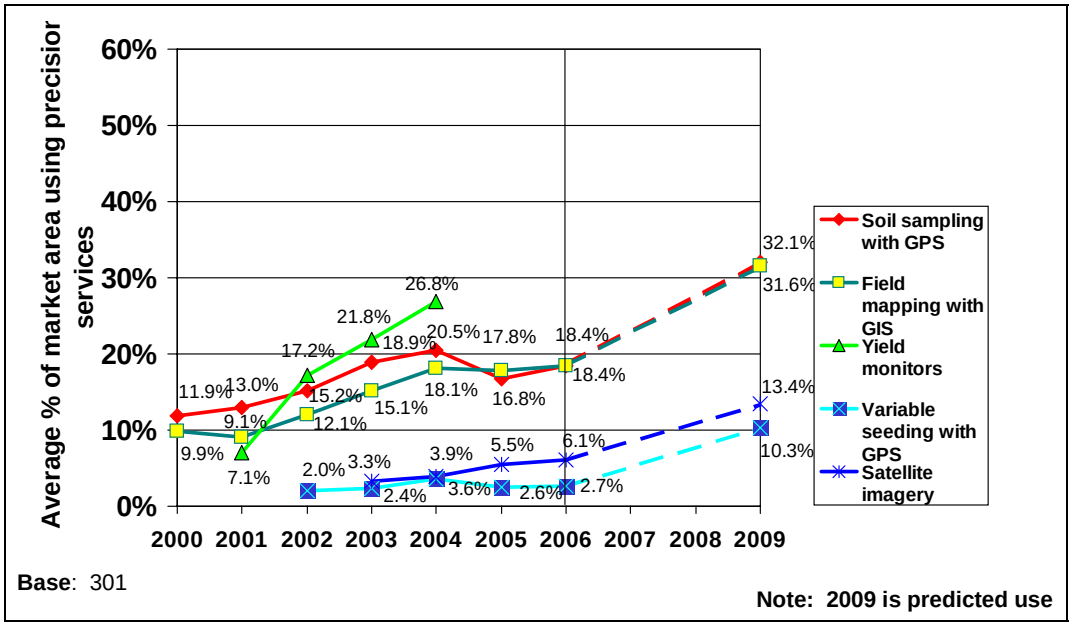
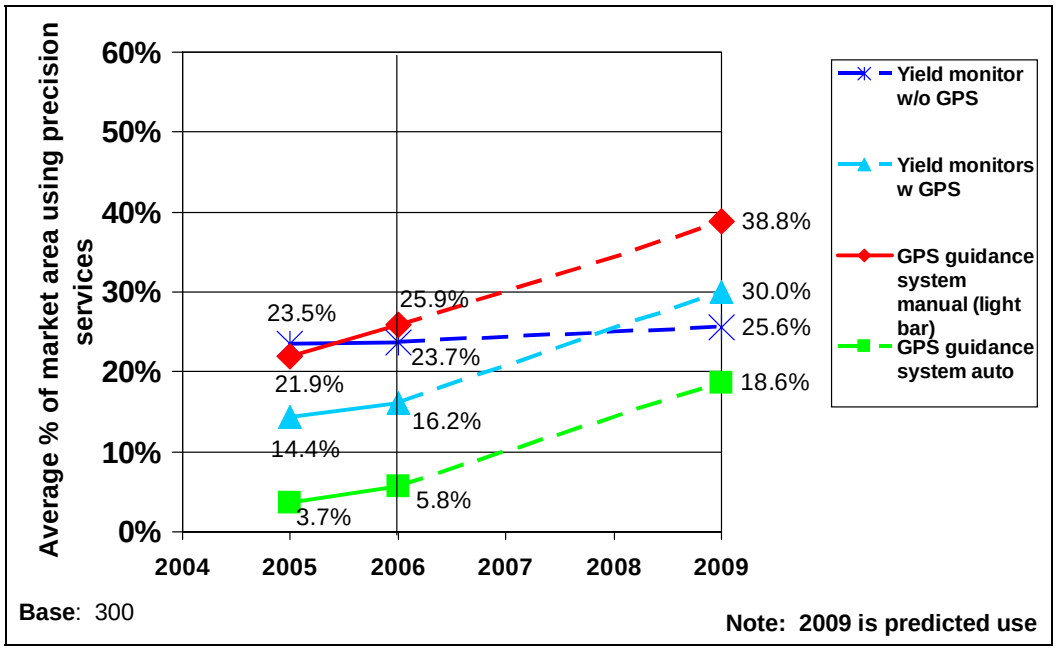


Figure 57 shows the use of yield monitors with and without GPS as well as use of the different types of guidance systems. On average, almost a quarter of each respondent's market area (24 percent) was using yield monitors without GPS, virtually unchanged from 2005. Yield monitors with GPS were used on an average of 16 percent of the market area. The use of GPS guidance systems with light bars grew from an average of 22 percent to 26 percent of the local markets while autosteer GPS guidance systems grew from an average of 4 percent to 6 percent of the market acres.

Figure 57. Estimated Market Area Using Yield Monitors and Guidance Systems



The use of variable rate application remained stable from 2005 to 2006 (Figure 58 and Figure 59), but slow growth was expected into 2009. By 2009, respondents estimated that, on average, approximately a quarter of their market acreages would be having fertilizer and/or lime applied in a single-nutrient controller-driven application (25 and 24 percent of the markets, respectively), both growing from an estimated 15 percent of market acres in 2006. Expected growth rates in the use of multi-nutrient controller-driven application were greater, with all types of multi-nutrient controller-driven application expecting to be doubled in use in the next 3 years.

Figure 58. Estimated Market Area Using Single Nutrient Controller-Driven Application

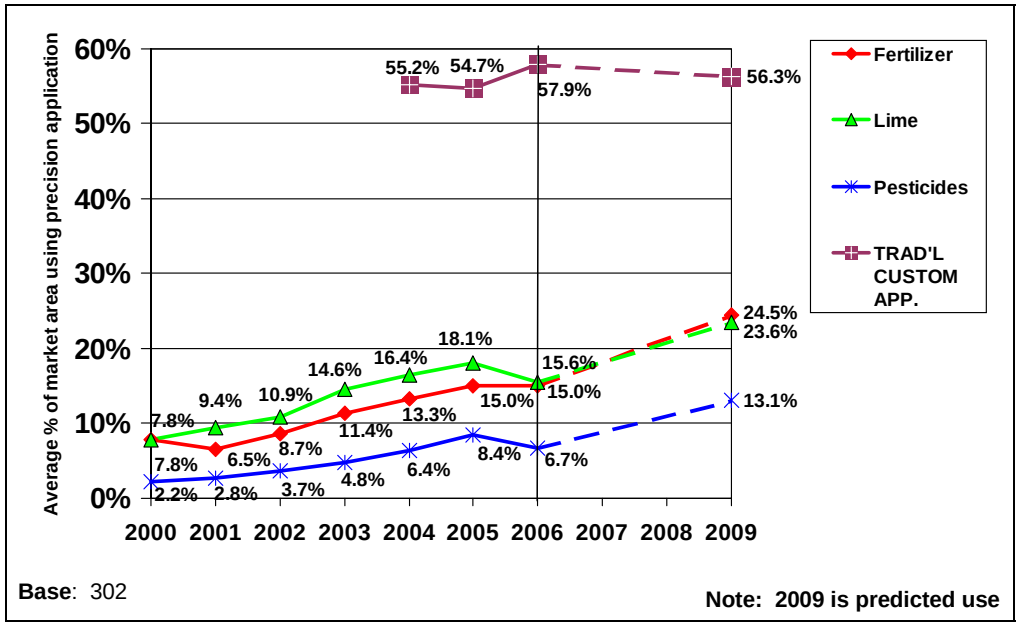


Figure 59. Estimated Market Area Using Multi-Nutrient Controller-Driven Application

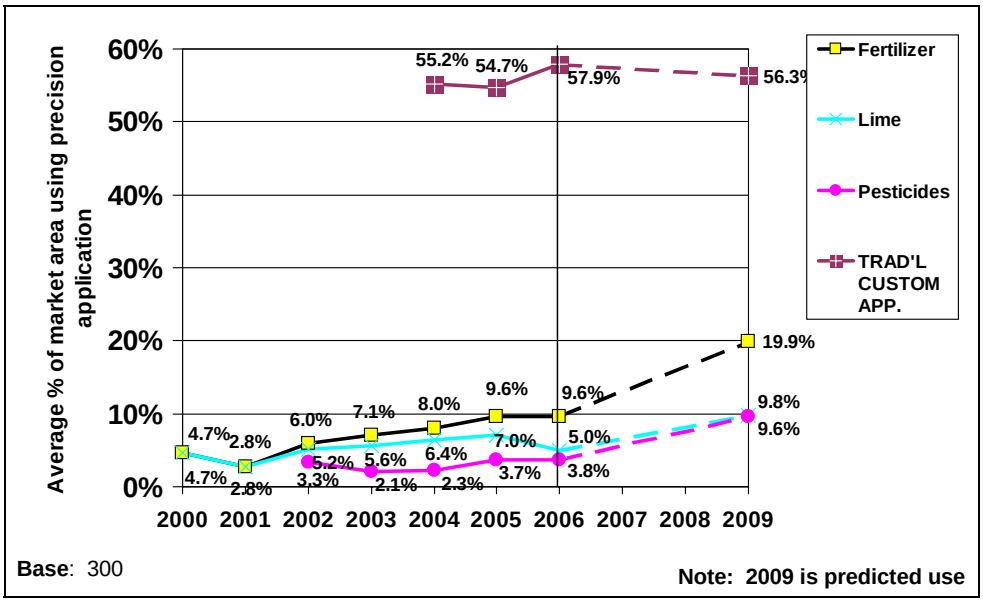


Figure 60 to Figure 67 break out estimated market usage of precision services by region. Some market use estimates were significantly higher in the Midwest than in other states. Current usage was significantly higher in the Midwest for soil sampling with GPS, field mapping with GIS, yield monitors both with and without GPS, manual GPS guidance systems (lightbars), and single and multi-nutrient controller-driven application of fertilizer and lime. The biggest expected growth over the next 3 years in the Midwest was for autosteer GPS guidance systems.

Figure 60. Estimated Market Area Using Precision Services in the Midwest

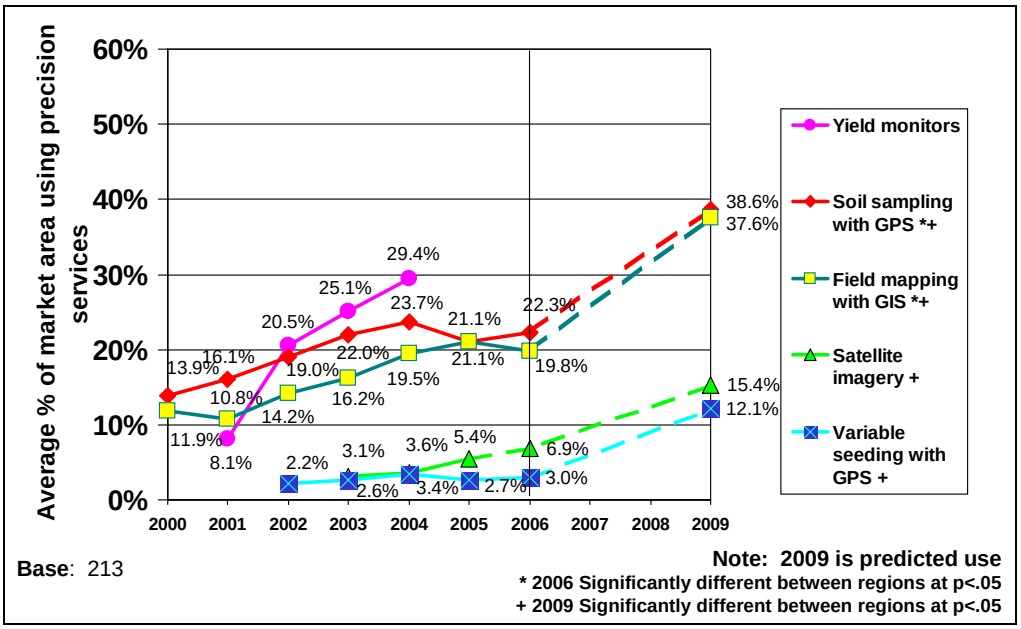


Figure 61. Estimated Market Area Using Precision Services in the Other States

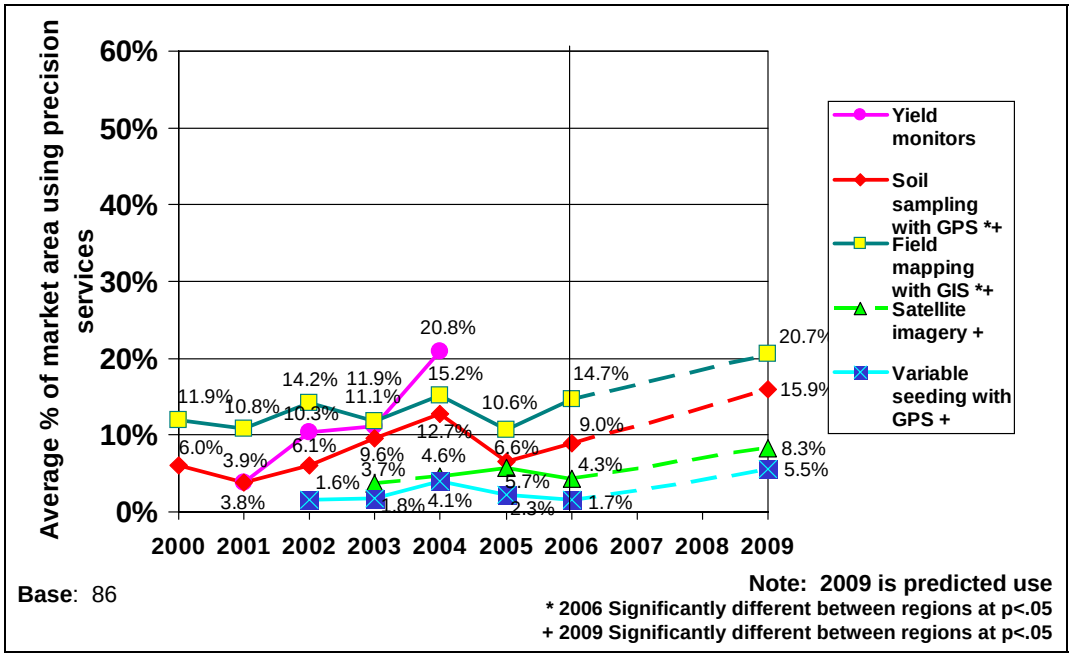


Figure 62. Estimated Market Area Using Yield Monitors and Guidance Systems in the Midwest

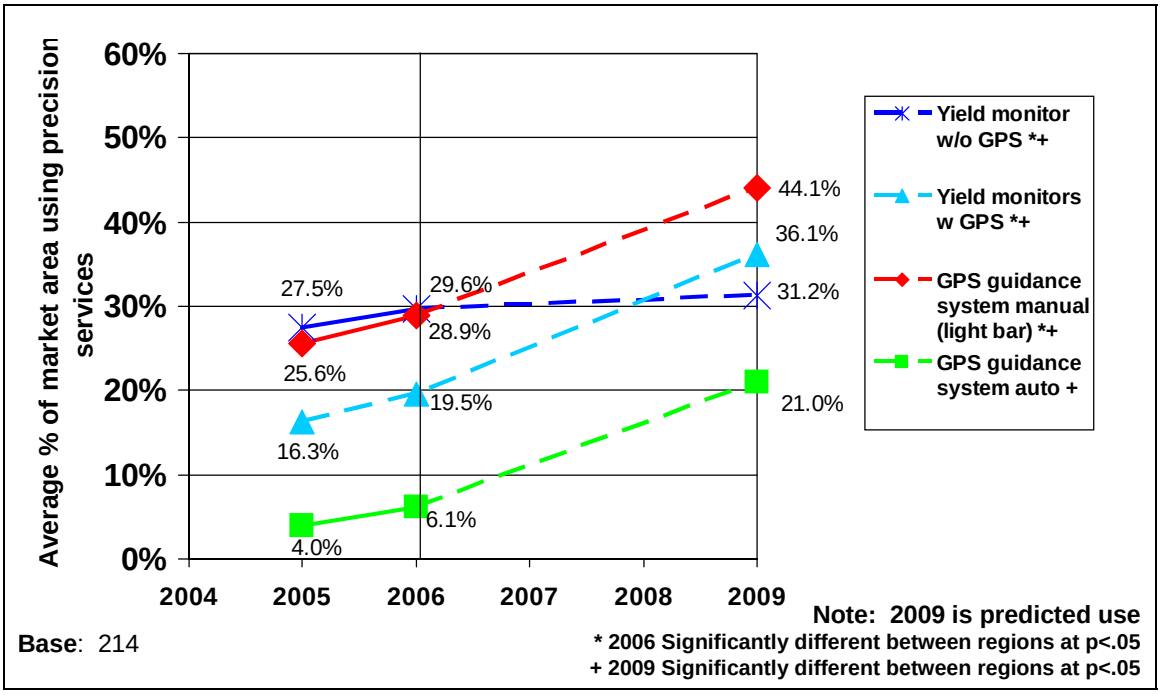


Figure 63. Estimated Market Area Using Yield Monitors and Guidance Systems in Other States

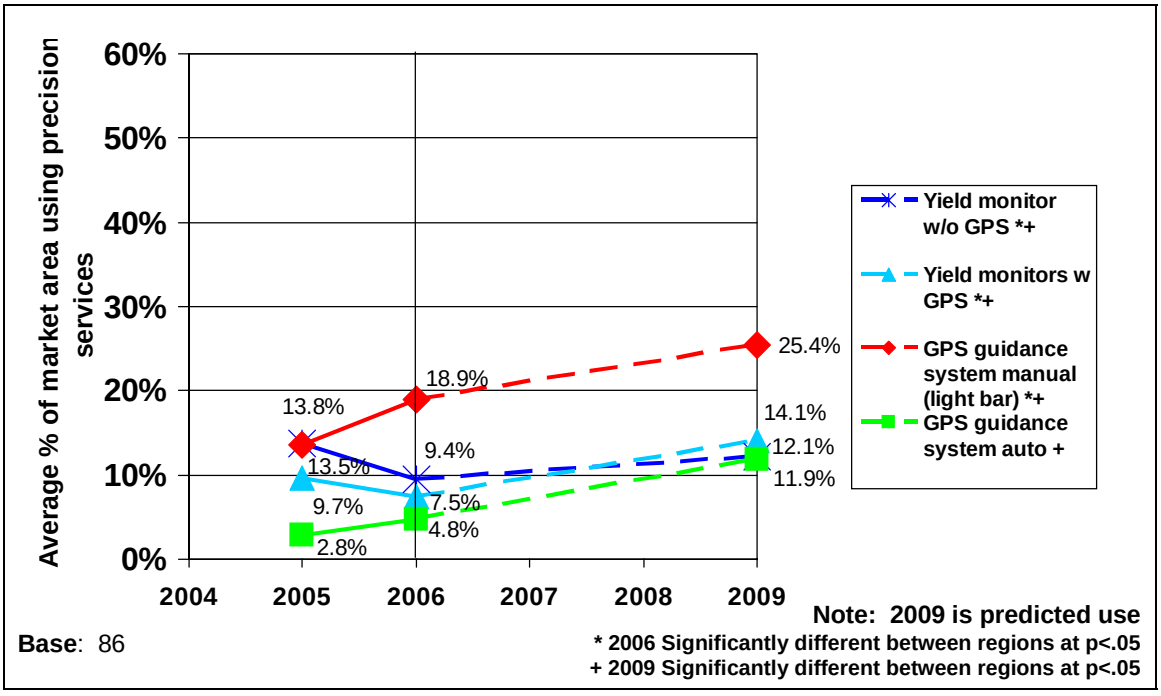


Figure 64. Estimated Market Area Using Single Nutrient Controller-Driven Application in the Midwest

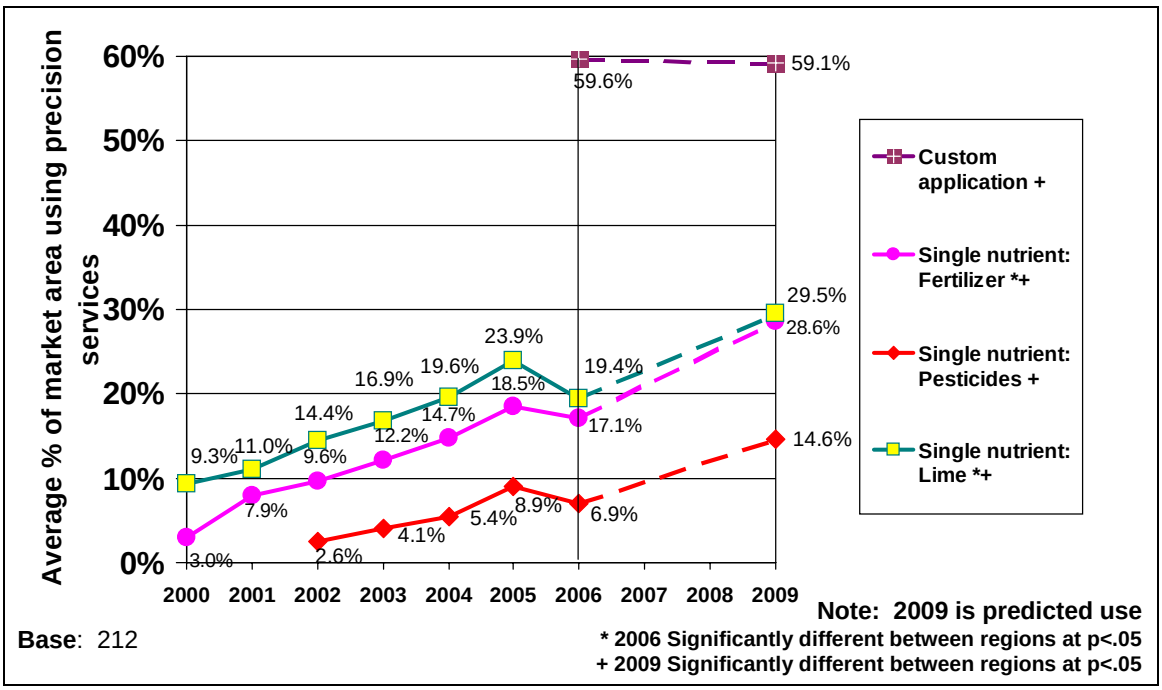


Figure 65. Estimated Market Area Using Single Nutrient Controller-Driven Application in Other States

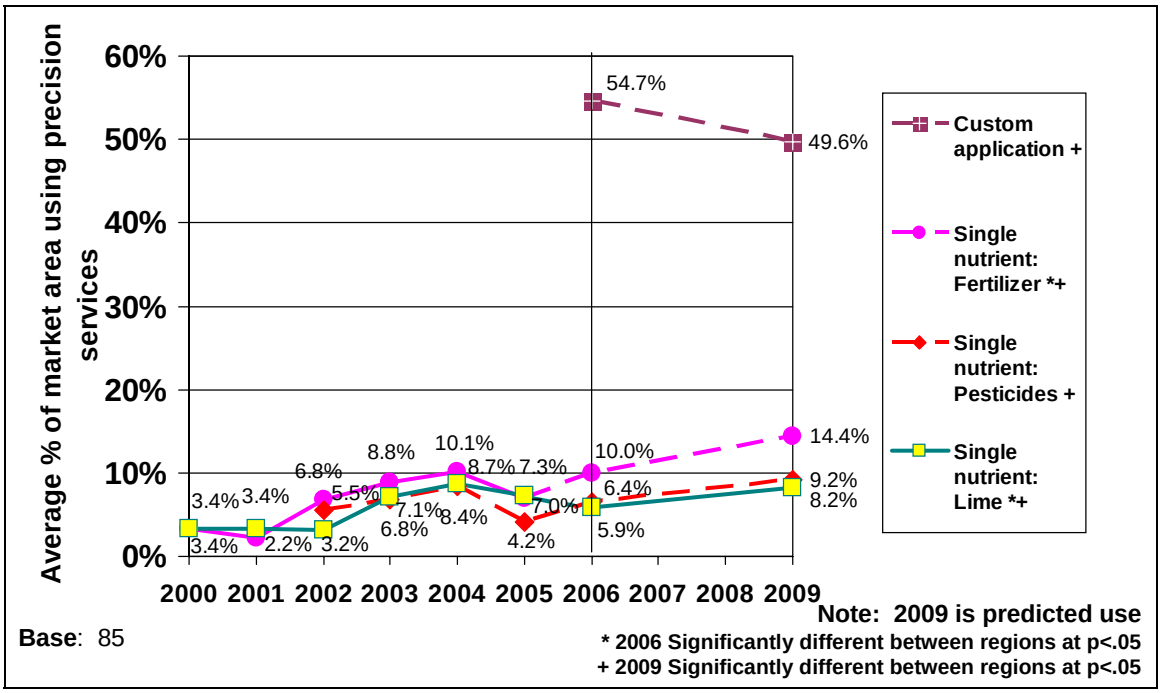
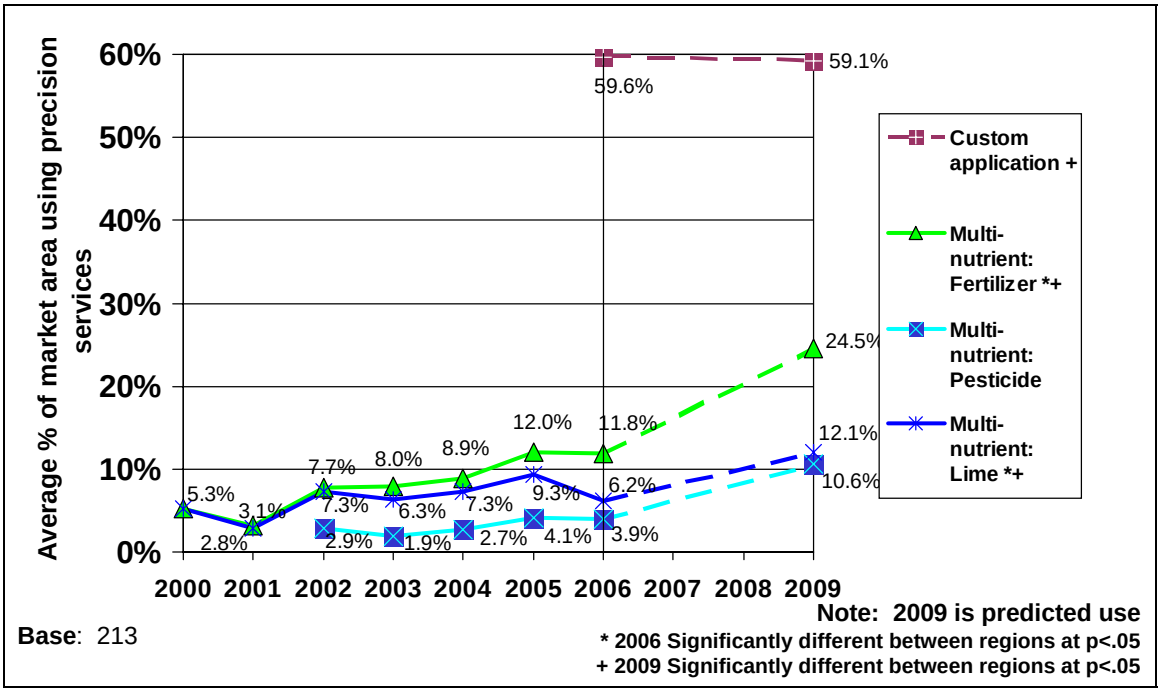


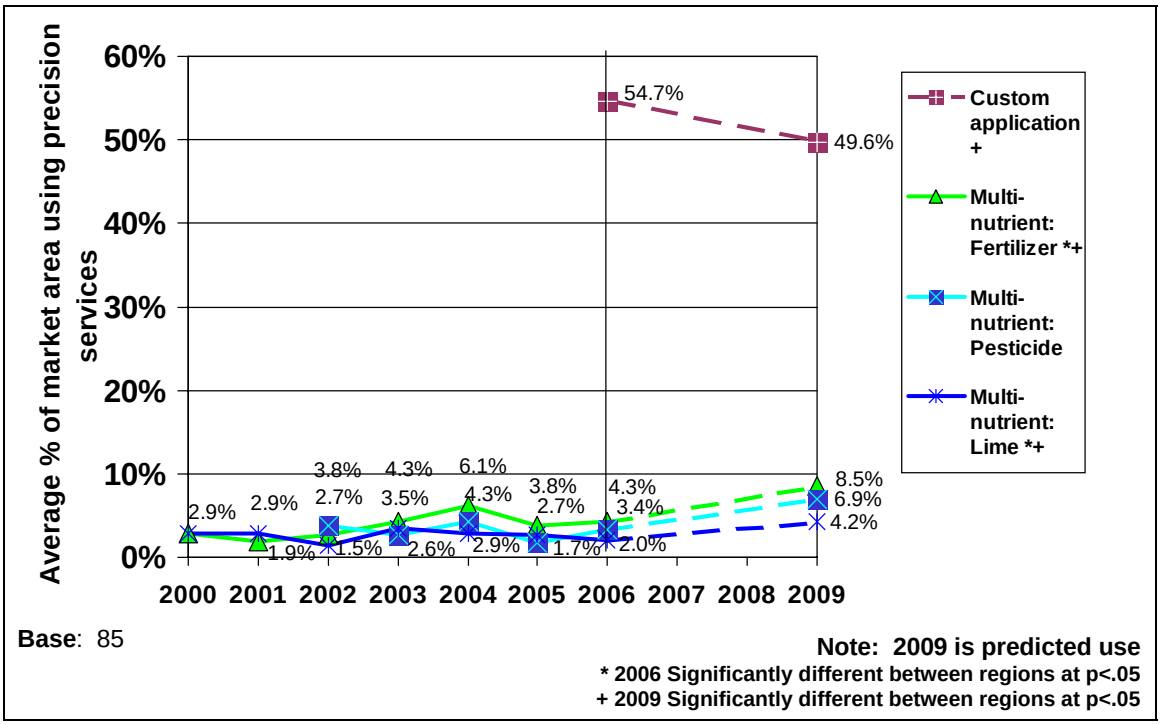
Figure 66. Estimated Market Area Using Multi Nutrient Controller-Driven Application in the Midwest



Base: 213

Note: 2009 is predicted use
*** 2006 Significantly different between regions at p<.05**
+ 2009 Significantly different between regions at p<.05

Figure 67. Estimated Market Area Using Multi Nutrient Controller-Driven Application in Other States



Base: 85

Note: 2009 is predicted use
*** 2006 Significantly different between regions at p<.05**
+ 2009 Significantly different between regions at p<.05

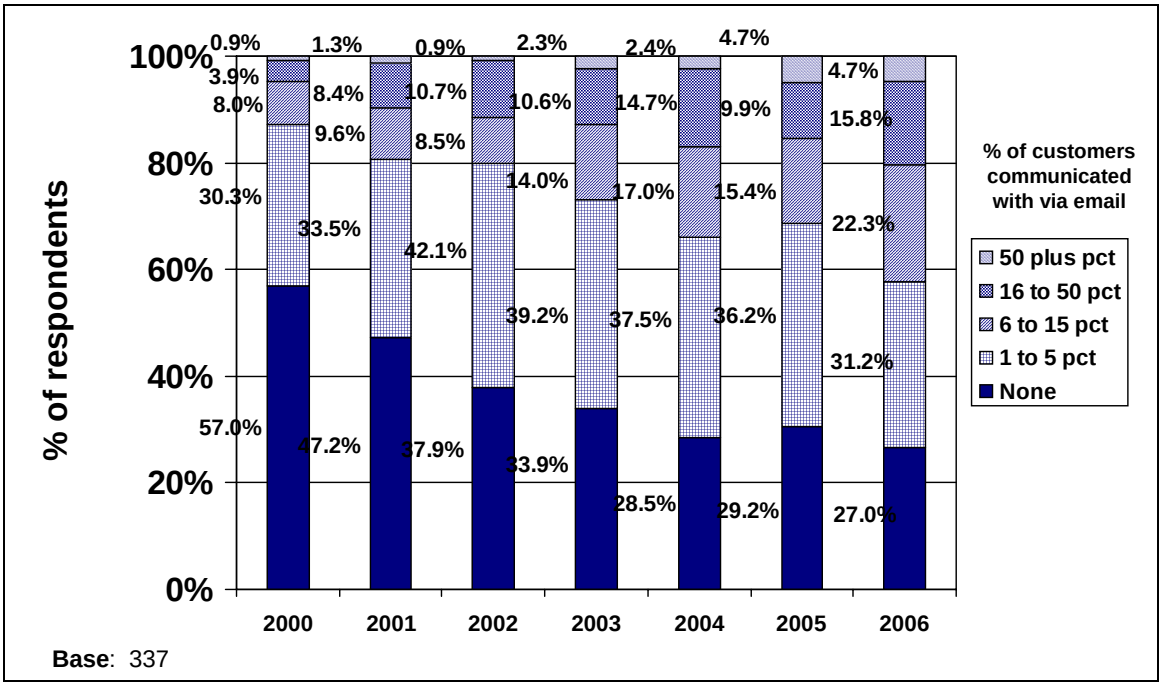
Use of Email

The survey also looked at email as another type of technology that is changing how business is conducted in today's market. Dealerships were asked how many of their customers they were communicating with via email. From 2005 to 2006, few additional dealerships added the email option; however those who were already using email tended to use it somewhat more intensely.

Figure *68* shows that more than 7 out of 10 of the respondents (73 percent) used email to communicate with at least some of their customers but only 5 percent were using it with half or more of their customers.

Though there were no regional differences in the use of email, in the Midwest regional/national dealerships were more likely to use email with their customers than either cooperatives or local independents. This is likely related to the more extensive use of email between dealerships within the larger organizations.

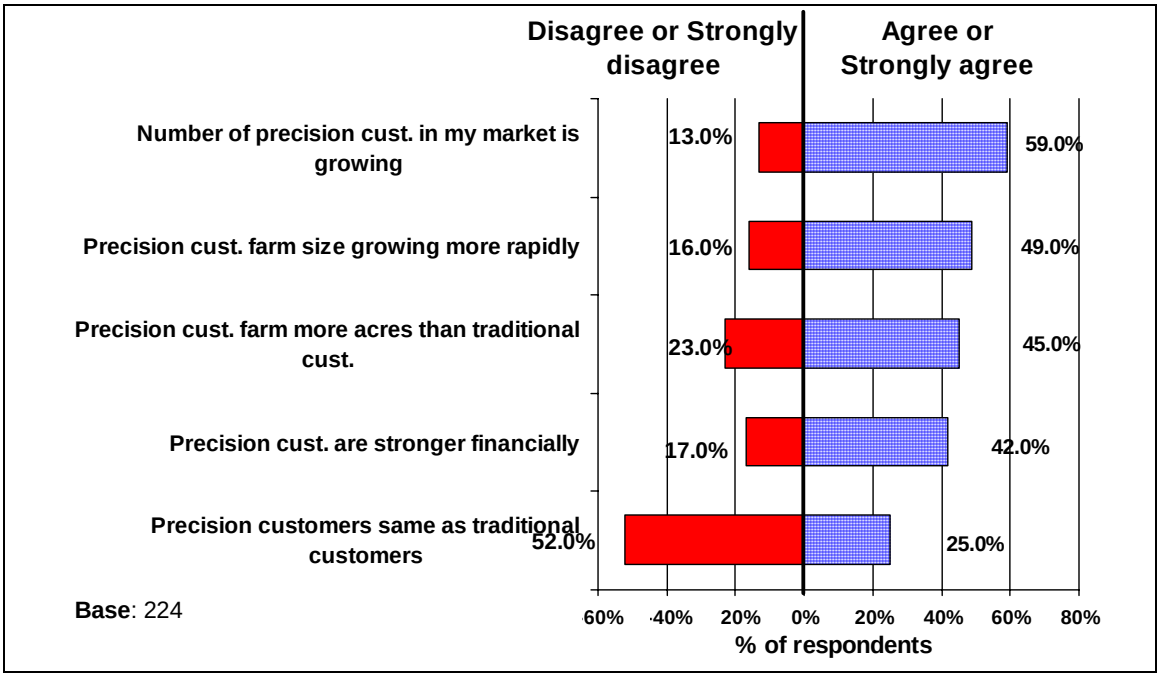
Figure 68. Customers Communicated With Via Email



Comparing Precision Customers to Non-Precision Customers

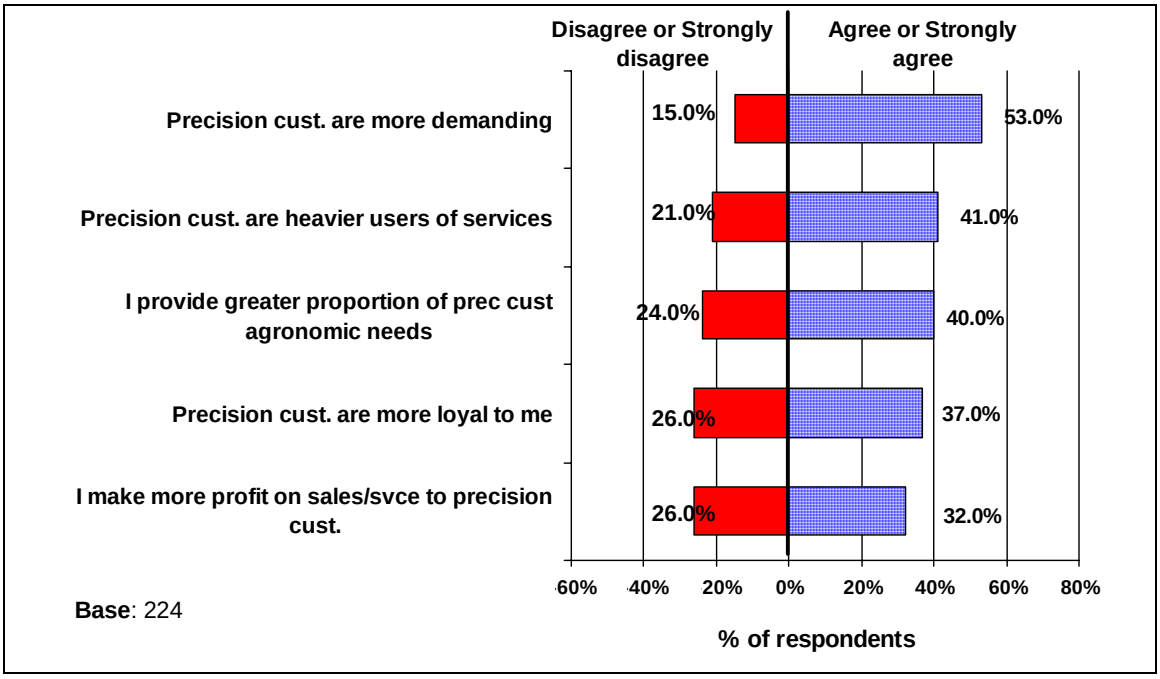
This year, dealers were asked how their precision customers differed from traditional customers and how these precision customers impacted the dealerships' businesses. Over half of the respondents agreed or strongly agreed that the number of precision customers in their market was growing (59 percent) (Figure 69). Three-quarters of the respondents felt that precision customers were not the same as traditional customers. Respondents agreed or strongly agreed that precision customers tended to have larger farm sizes and be growing more rapidly than those customers using traditional agronomic services. Respondents also felt that precision customers were stronger financially than the traditional customers.

Figure 69. Precision Customers' vs. Traditional Customers' Operations



Respondents also felt that precision customers differed in how they did business with their dealership. Over half agreed that precision customers are more demanding than traditional customers (53 percent) (Figure 70). Four out of ten (41 percent) of the respondents agreed that precision customers were heavier users of the dealership's services, and, conversely, 40 percent agreed that the dealership provided a greater proportion of their precision customers' agronomic needs than for traditional customers. However, only 37 percent thought that precision customers were more loyal than traditional customers and fewer than a third of the respondents (32 percent) agreed that they made more profit on the sales and service they provided to precision customers than to traditional customers. There were few differences in opinion by either region or by organizational type within the Midwest.

Figure 70. Precision Customers' vs. Traditional Customers' Impact on Dealership



Summary

Precision technology continues to evolve in the agricultural marketplace. Currently, growth in the use of precision technology is seen primarily within the dealership instead of in services directed at growers. Dealerships also have to manage the changing market demands due to different expectations on the part of precision customers relative to traditional customers. More demanding customers present the opportunity to create a point of difference in the market. At the same time, dealerships must continue to explore ways of creating such differences as efficiently as possible. Utilizing precision service offerings to create more loyal and profitable customers will remain front and center for dealership leaders in 2006 and beyond.

APPENDIX I: Questionnaire

11th ANNUAL 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 10, 2006.***

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. Please indicate the number of full-time staff agronomists you have access to at your location or you share with other locations:

Full-time agronomists **at your location**: _____ "0" if None
Full-time agronomists shared **with other locations**: _____ "0" if None

3. 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)

4. What were the **total annual retail sales** (in dollars) of agronomic products and services (fertilizer, chemicals, seed, services) **at this location** in 2005?

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

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

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

6. What is the average size (in acres) of your customers? [*check one*]

☐ Under 200 acres ☐ 501 to 1000
☐ 201 to 500 ☐ Over 1000

7. Do you provide custom application? ☐ No → go to Question 12 ☐ Yes → continue with Question 8

8. 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 12
☐ Under 10,000 acres ☐ 25,001 to 50,000 acres
☐ 10,001 to 25,000 acres ☐ over 50,000 acres

9. In 2005, approximately what proportion of your total fertilizer sales were custom applied? _____%

10. In 2005, approximately what proportion of your total herbicide/pesticide sales were custom applied? _____%

11. In 2005, 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

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

- ☐ Traditional
- ☐ Grid pattern — Grid size most commonly used?
  - ☐ < 1 acre ☐ 1 ac. - 2.49 ac. ☐ 2.5 ac. ☐ 2.51 ac. - 5 ac. ☐ Other:_____
- ☐ Soil type
- ☐ By zone other than soil type ☐ Other: _____
- ☐ Don't offer soil sampling

13. 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 (Veris) mapping
- ☐ 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
- ☐ Sensors mounted on a pick-up, applicator, or tractor (example: pH soil sensor, chlorophyll/greenness sensor)
- ☐ **Don't use precision technology**

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

Service	By Fall 2006	Offer by 2008	Never/ Don't Know	Don't offer now but did
Field mapping (with GIS)	☐	☐	☐	☐
Manual variable rate application				
Fertilizer	☐	☐	☐	☐
Lime	☐	☐	☐	☐
Chemicals	☐	☐	☐	☐
Controller-driven (GPS), **single** nutrient variable rate application				
Fertilizer	☐	☐	☐	☐
Lime	☐	☐	☐	☐
Chemicals	☐	☐	☐	☐
Controller-driven (GPS), **multiple** nutrient variable rate application				
Fertilizer	☐	☐	☐	☐
Lime	☐	☐	☐	☐
Chemicals	☐	☐	☐	☐
Yield monitor sales/support/rental	☐	☐	☐	☐
Yield monitor data analysis	☐	☐	☐	☐
Variable seeding rates without GPS	☐	☐	☐	☐
Variable seeding rates with GPS	☐	☐	☐	☐
Satellite/aerial imagery	☐	☐	☐	☐
Agronomic recommendations based on GPS/GIS data	☐	☐	☐	☐
Soil sampling with GPS	☐	☐	☐	☐

15. If you currently offer any of these services/products, what is the average per acre/per unit price you charge for individual services? ***(do not include bundled pricing)***

Service	Price $/acre	Price $/other units ($/map, $/hour, etc.)
Custom application (not precision)	$_____/acre	$_____/(specify units)_____
Field mapping (with GIS)	$_____/acre	$_____/(specify units)_____
Manual variable rate application		
Fertilizer	$_____/acre	$_____/(specify units)_____
Lime	$_____/acre	$_____/(specify units)_____
Chemicals	$_____/acre	$_____/(specify units)_____

Service	Price $/acre	Price $/other units ($/map, $/hour, etc.)
Controller-driven (GPS), **single** nutrient variable rate application		
Fertilizer	$_____/acre	$_____/(specify units)_____
Lime	$_____/acre	$_____/(specify units)_____
Chemicals	$_____/acre	$_____/(specify units)_____
Controller-driven (GPS), **multiple** nutrient variable rate application		
Fertilizer	$_____/acre	$_____/(specify units)_____
Lime	$_____/acre	$_____/(specify units)_____
Chemicals	$_____/acre	$_____/(specify units)_____
Yield monitor data analysis	$_____/acre	$_____/(specify units)_____
Variable seeding rates without GPS	$_____/acre	$_____/(specify units)_____
Variable seeding rates with GPS	$_____/acre	$_____/(specify units)_____
Satellite/aerial imagery	$_____/acre	$_____/(specify units)_____
Agronomic recommendations based on GPS/GIS data	$_____/acre	$_____/(specify units)_____
Soil sampling with GPS	$_____/acre	$_____/(specify units)_____

16. 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
Manual variable rate application	1	2	3	4	5	6
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
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
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.)

17. If you offer precision services, think about customers who are heavy users and how they compare with your traditional customers. Rate the following statements on how much you agree or disagree with them.

1=Strongly disagree 2=Disagree 3=Neither agree nor disagree 4=Agree 5=Strongly Agree

My precision customers are basically the same as my traditional customers	**1**	**2**	**3**	**4**	**5**
I make more profit on sales/services offered to my precision customers relative to my traditional customers	**1**	**2**	**3**	**4**	**5**
My precision customers farm more acres than my traditional customers	**1**	**2**	**3**	**4**	**5**
I provide a greater proportion of my precision customers' total agronomic needs relative to traditional customers	**1**	**2**	**3**	**4**	**5**
My precision customers are heavier users of other services I offer relative to my traditional customers	**1**	**2**	**3**	**4**	**5**
My precision customers are in a stronger financial position than my traditional customers	**1**	**2**	**3**	**4**	**5**
My precision customers are more demanding than my traditional customers	**1**	**2**	**3**	**4**	**5**
My precision customers are more loyal to me than my traditional customers	**1**	**2**	**3**	**4**	**5**
My precision customers' farm size is growing more rapidly than the farm size of my traditional customers	**1**	**2**	**3**	**4**	**5**
The number of precision customers in my market is growing	**1**	**2**	**3**	**4**	**5**

18. **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 2009)?

Practice	% of market acres (fill in blank with a percentage; *indicate 0 if none*) Currently	3 years from now (2009)
Custom application of any type	_____%	_____%
Field mapping (with GIS)	_____%	_____%
Controller-driven (GPS), **single** nutrient variable rate application		
Fertilizer	_____%	_____%
Lime	_____%	_____%
Chemicals	_____%	_____%
Controller-driven (GPS), **multiple** nutrient variable rate application		
Fertilizer	_____%	_____%
Lime	_____%	_____%
Chemicals	_____%	_____%
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.)	_____%	_____%
Yield monitor without GPS	_____%	_____%
Yield monitor with GPS	_____%	_____%
Variable seeding rates with GPS	_____%	_____%
Satellite/aerial imagery	_____%	_____%
Soil sampling with GPS	_____%	_____%

19. What proportion of your customers has your location communicated with via e-mail during the last 12 months?
☐ None ☐ 1%-5% ☐ 6%-15% ☐ 16%-25% ☐ 26%-50% ☐ Over 50%

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.