2001 Precision Agricultural Services and Enhanced Seed Dealership Survey Results

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Introduction

Though precision technologies have been available to the agricultural industry for well over a decade now, farmers and dealers are still experimenting with how and where the technology best fits in their businesses. While precision technologies are becoming more standardized, growers have become more knowledgeable about what they're looking for from their dealerships, and dealerships have been fine-tuning their strategies in the precision arena. However, users in many locales are still evaluating the economics of various precision components and packages.

In 1999/2000, after several years of steady growth in the adoption of precision services, adoption rates took a bit of a 'breather' with precision offerings slightly below earlier levels. This trend continued in 2000/2001 as precision service offerings by retail dealers dropped slightly more. Talking with dealers around the country, three potential reasons for this 2000/2001 dip were given: 1) continued evaluation as to the profitability of specific precision services; 2) the general slump in farm commodity prices; and 3) poor fall weather which prevented fall precision field work in some parts of the country. While some precision service offerings were lower on the year, other uses of precision technologies in dealerships grew rapidly – for example GPS used in guidance systems for custom application and GIS field mapping used for legal/billing purposes.

This year marked the 6th year for the annual Precision Agriculture and Enhanced Seed Dealership Survey sponsored by *CropLife* magazine and Purdue University's Center for Food and Agricultural Business. As in previous years, the survey was designed to gain a better understanding of who is adopting precision technologies and how quickly they're adopting.

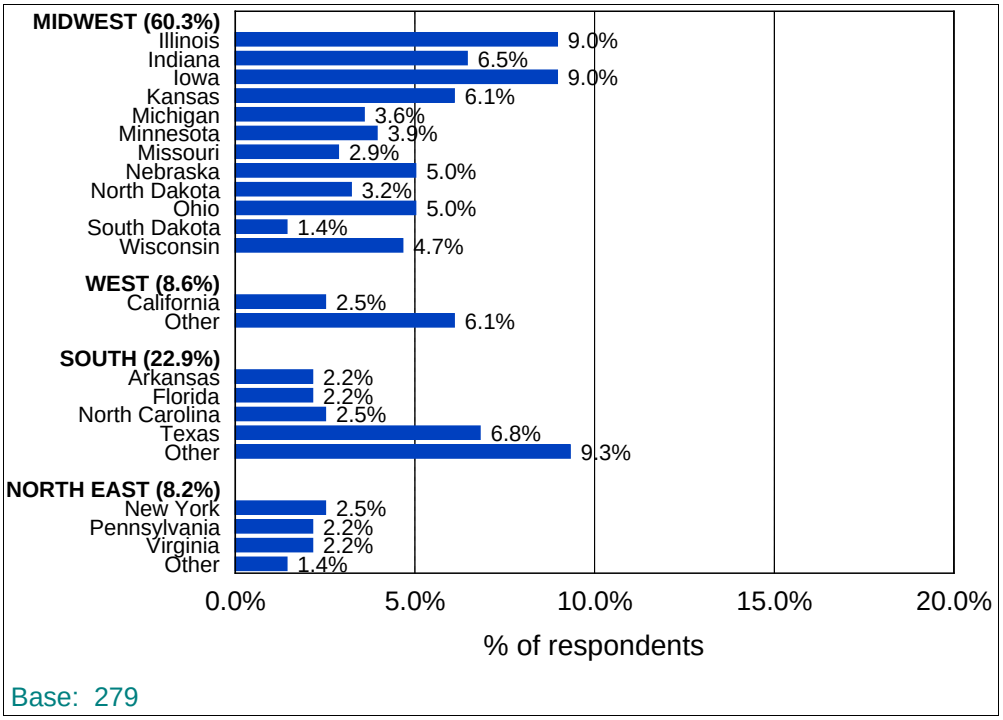
The survey was conducted in March 2001 and the questionnaire was sent to 2500 retail agronomy dealerships across the US. A second questionnaire was mailed to participants approximately two weeks after the first one as a reminder to complete it and send it back. (See the Appendix I to this report for a copy of the questionnaire.) A total of 280 questionnaires were returned and usable, providing an 11 percent response rate. This response rate was considerably lower than the response rate in recent years (ranging from a high of 38 percent in 1996 to a low of 16 percent in 1997). The lower response rate can be attributed to several reasons: questionnaires were sent out later than in previous years, the questionnaire was longer (6 pages instead of 4), and questionnaires were identified in order to reduce the number of questionnaires mailed for the reminder round.

Survey participants were asked a wide range of questions. Some of these included: the types of precision services the dealerships were currently offering and their future plans for offering these services; the fees they were charging for the services they were offering; how profitable various precision components were; how quickly their customers were adopting precision agricultural practices; and how much enhanced seed contributed to their overall sales revenue. This year's survey looked at the profitability of precision services in more depth but most of the other questions were worded similarly to those questions asked in previous years.

The Respondents

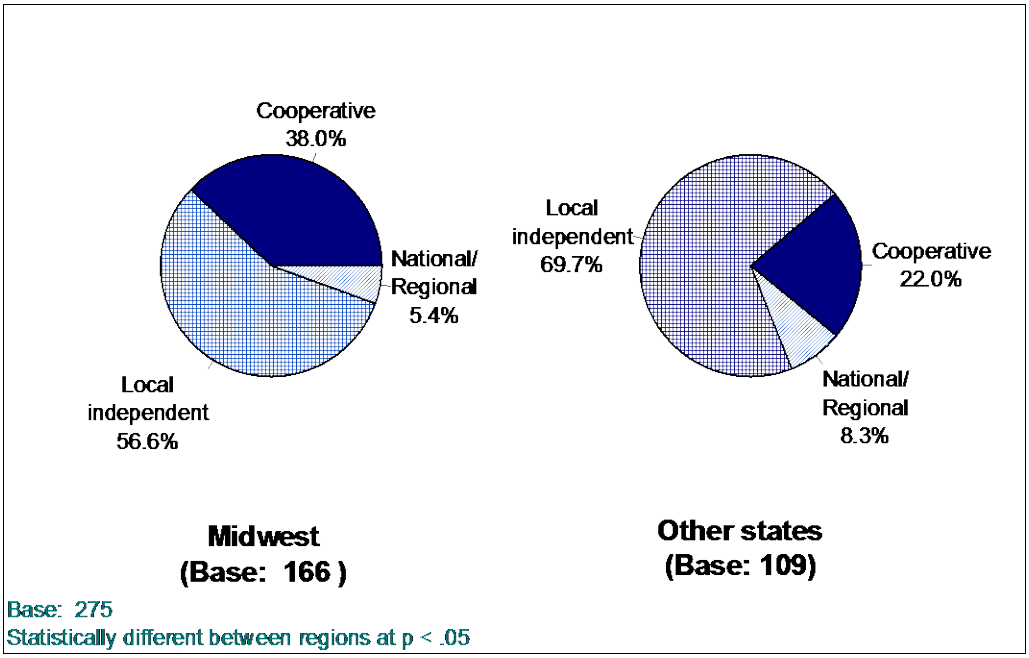
The Midwest was heavily represented in the distribution of respondents, with six out of ten of the respondents from the Midwest states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North and South Dakota, Ohio and Wisconsin (Figure 1). Almost a quarter of the respondents (23 percent) were from the South, 9 percent were from the West and 8 percent were from the Northeast. This reflects a higher proportion of respondents from the South and fewer from the Midwest than were represented in the 2000 and 1999 surveys.

Figure 1. States Represented



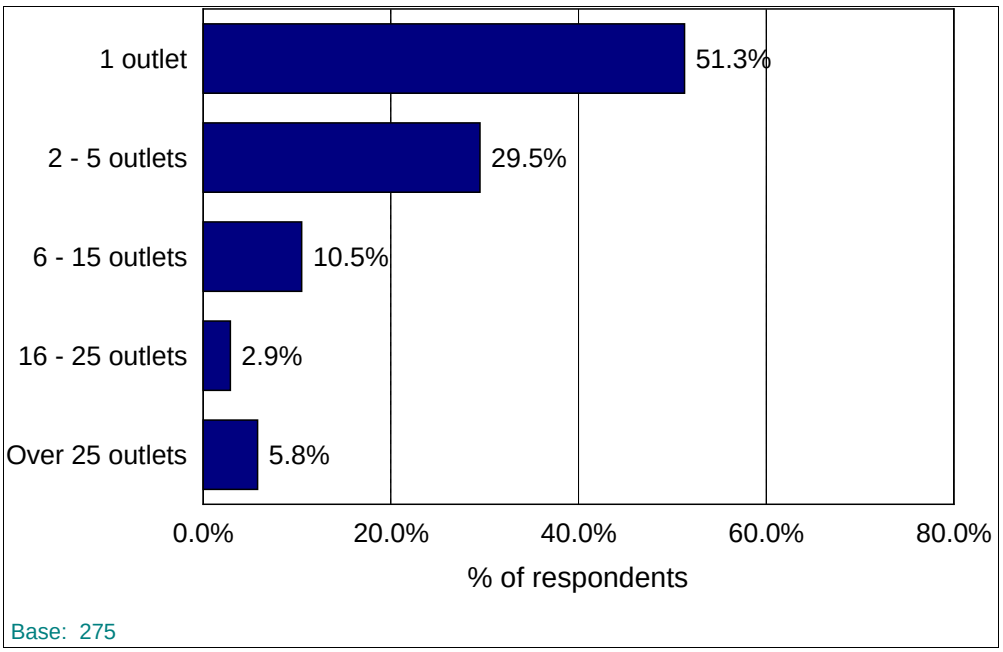
Responding dealerships represented a wide variety of organizational types with more than 6 out of 10 being local independents (62 percent), while 32 percent were cooperative dealerships, and the remaining 6 percent were part of a national or regional chain of dealerships. Compared to 2000, this represents significantly more local independents (49 percent in 2000) and fewer cooperatives (37 percent in 2000) and regional/national organizations (14 percent in 2000). As in previous years, cooperatives were more heavily represented in the Midwest than in the other states, with just over a third of the Midwestern respondents being from cooperative firms compared to only 22 percent outside the Midwest (Figure 2). Correspondingly, the proportion of local independent respondents was much higher outside the Midwest (70 percent) relative to the proportion of such dealerships in the Midwest (57 percent).

Figure 2. Organization Types by Region



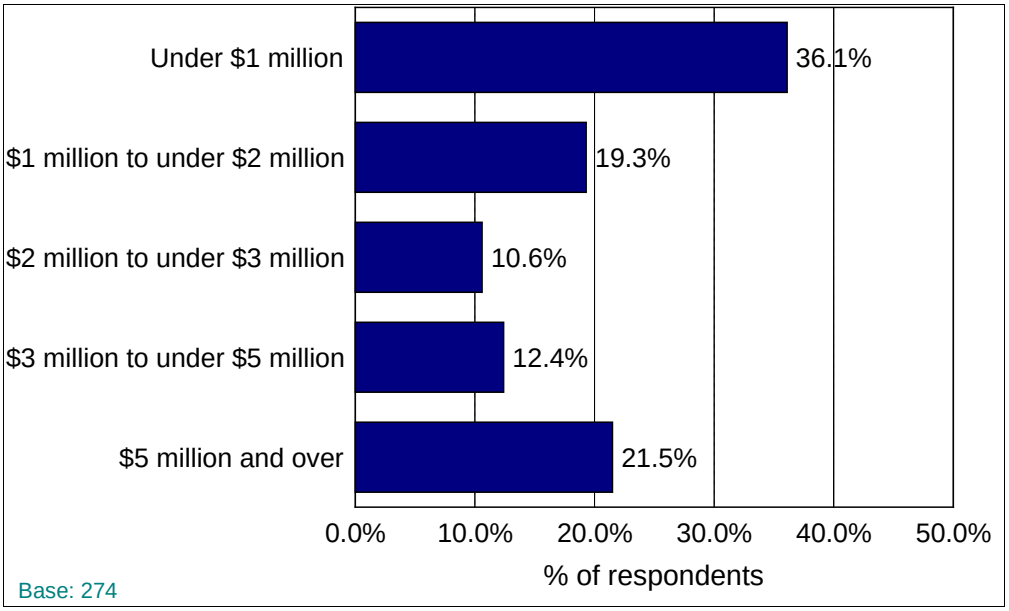
The size of the responding dealerships ranged from one outlet (51 percent of the respondents) to more than 25 outlets (6 percent of the respondents) (Figure 3). Respondents were more heavily weighted toward smaller dealerships than in any other year. There were no differences in the number of outlets per dealership across regions.

Figure 3. Number of Outlets Owned or Managed



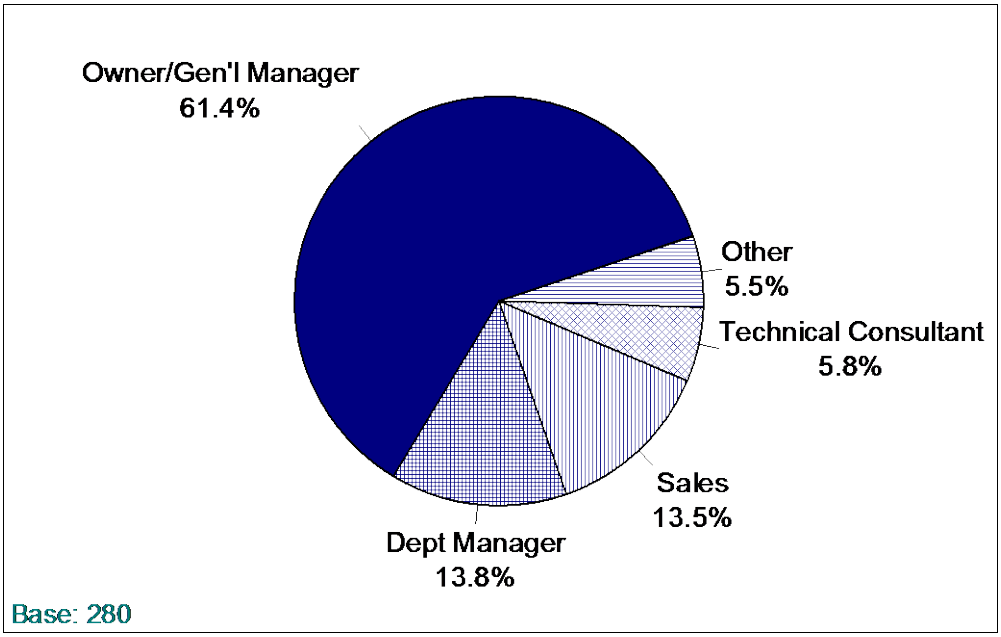
There was also a range of individual location sizes represented by the respondents, though overall, the respondents were smaller than they were in 2000. Of this year's respondents, 36 percent had annual agronomic sales of less than $1 million at their location (compared to 22 percent of the 2000 respondents) while 22 percent had $5 million or more in agronomic sales (Figure 4). Sales at individual locations did not vary by region.

Figure 4. Total 2000 Annual Agronomic Sales at Location



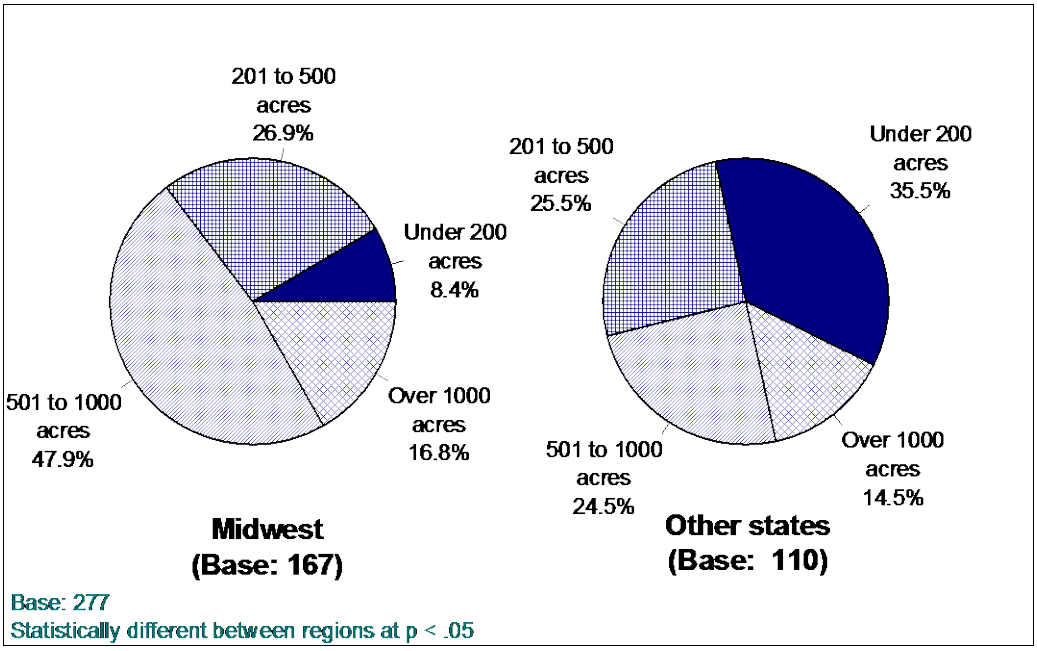
The outlet's owner/manager completed the questionnaire over half of the time (61 percent), followed by departmental managers (14 percent), and sales personnel (14 percent) (Figure 5).

Figure 5. 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. Over half of the respondents said their average customer farmed more than 500 acres (54 percent) with 16 percent indicating their average customer farmed more than 1000 acres. As expected, the average customer size varied greatly across the geographic regions. Almost half of the respondents in the Midwest said their average customer farmed between 501 and 1000 acres (48 percent) and another 17 percent of the respondents said their average customer farmed over 1000 acres. The average customer sizes for dealerships in other (non-Midwest) states were more evenly divided among the four size categories (Figure 6).

Figure 6. Average Customer Size by Region



Statistically Weighting the Data

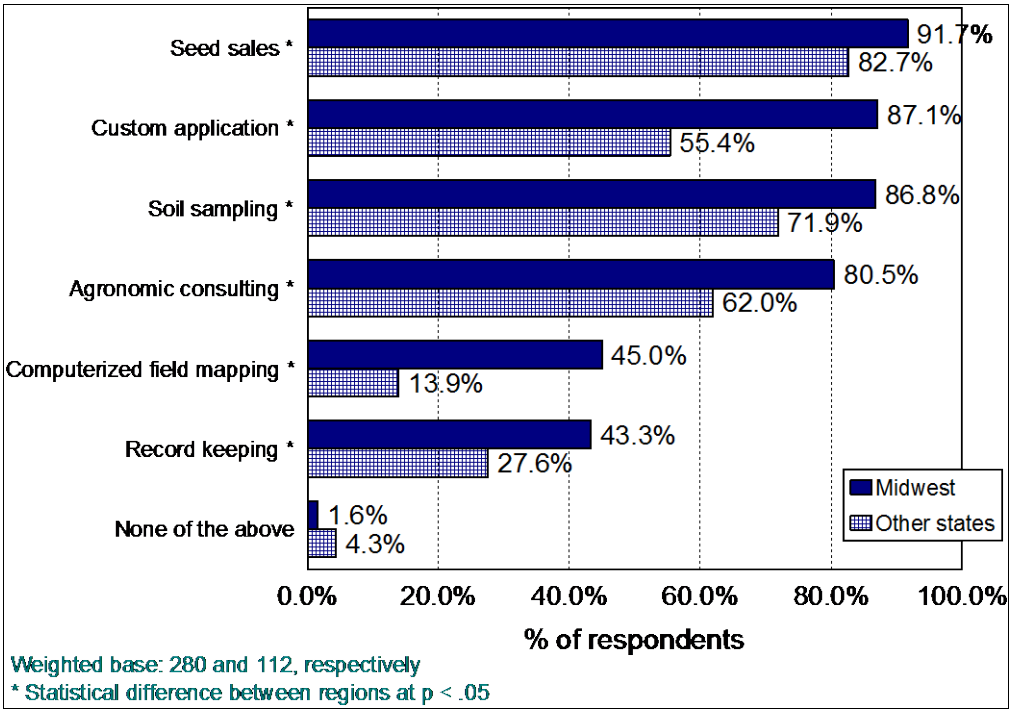
Several factors combined to make the 2001 survey results not directly comparable to the 2000 and 1999 survey results. First, due to the timing of when the questionnaire was mailed (6 weeks later in 2001 compared to 2000) and a few modifications to the survey instrument resulting in a 6-page questionnaire instead of a 4-page questionnaire, the response rate was considerably lower in 2001 relative to 2000 and 1999. Also, the 2001 sample was more heavily weighted toward the South than in previous years, and there were also a greater proportion of smaller, local independents in the 2001 sample. Consequently, to make the 2001 results comparable with the 2000 and 1999 results, the 2001 results were statistically weighted to reflect the same percentages of outlet sizes, organizational types, and geographic locations as the 1999 (and 2000) data. See Appendix II for the statistical weightings used.) All remaining statistics in this report reflect data that have been weighted back to the 1999 sample numbers to make the results more directly comparable across the three years. The result of this weighting is an increase in the base numbers reported on the bottom of the figures – from the 2001 sample size of 280 to the 1999 sample size of 420.

Traditional Services Currently Offered by Respondents

The most common traditional agronomic services offered by the responding dealerships were seed sales and soil sampling (89 and 83 percent of the respondents, respectively). Custom application was also offered by 78 percent of the respondents while three-quarters of the respondents offered some form of agronomic consulting (75 percent). Only 2 percent of the respondents did not provide at least one of the traditional agronomic services listed on the questionnaire. All of these service offerings varied statistically by region and were most commonly offered in the Midwest where only 2 percent of the respondents did not offer at least one of the traditional services compared to 4 percent in the other non-Midwestern states (Figure 7).

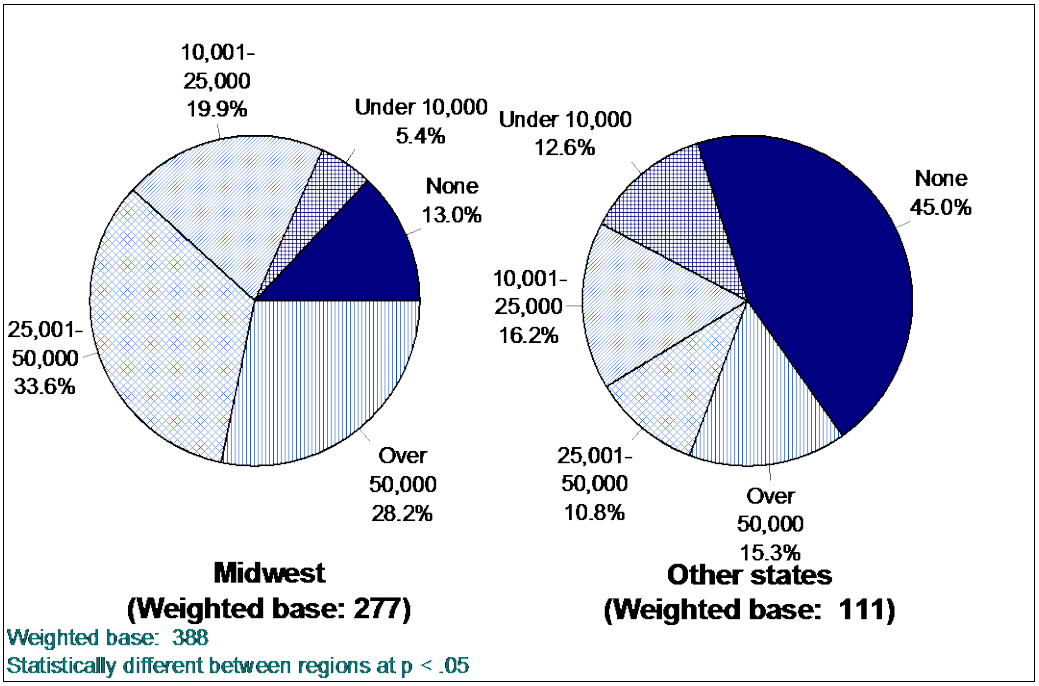
Compared to the 2000 results, a few of the traditional services dropped significantly in offerings. Custom application dropped from 83 percent of the respondents offering the service in 2000 to 78 percent in 2001. Record keeping continued its downward decline, dropping from 42 percent offering the service in 2000 to 39 percent offering the service in 2001. These changes could be an indication of a different group of respondents participating in this year's survey rather than an overall reduction in offerings across the US.

Figure 7. Traditional Agronomic Services Offered by Region



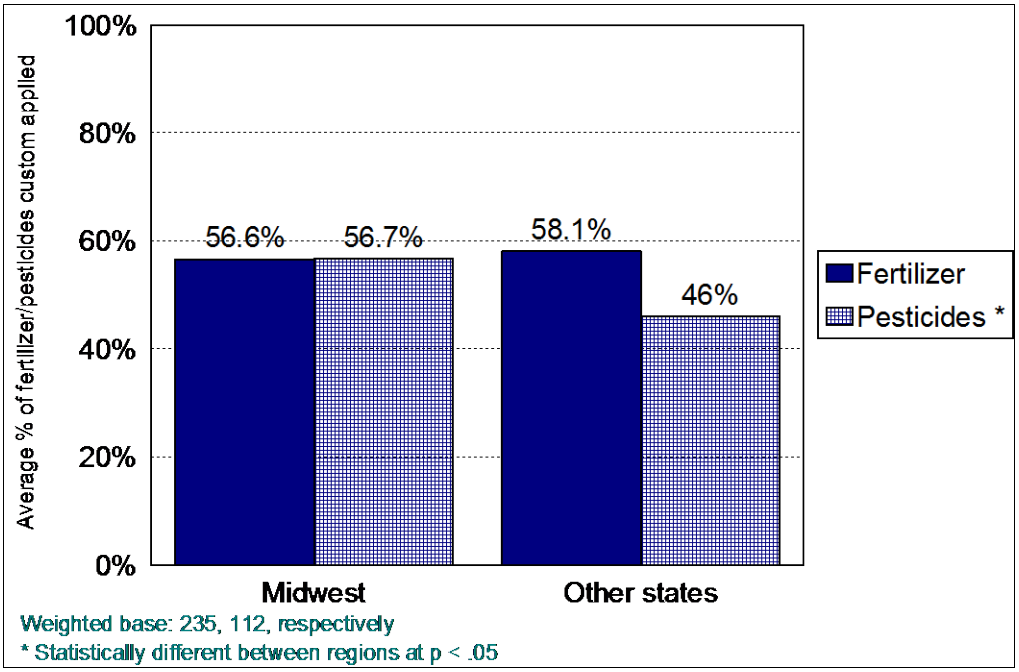
Looking at custom application in more detail, over half of the respondents custom applied more than 25,000 acres per year (52 percent). (Custom application here is defined as dealership application of fertilizer, pesticides, and/or custom seeding.) Across the US, however, custom application was most common in the Midwest where 87 percent of the respondents offered custom application services compared to 55 percent of the respondents from other states (Figure 8).

Figure 8. Acres Custom Applied by Region



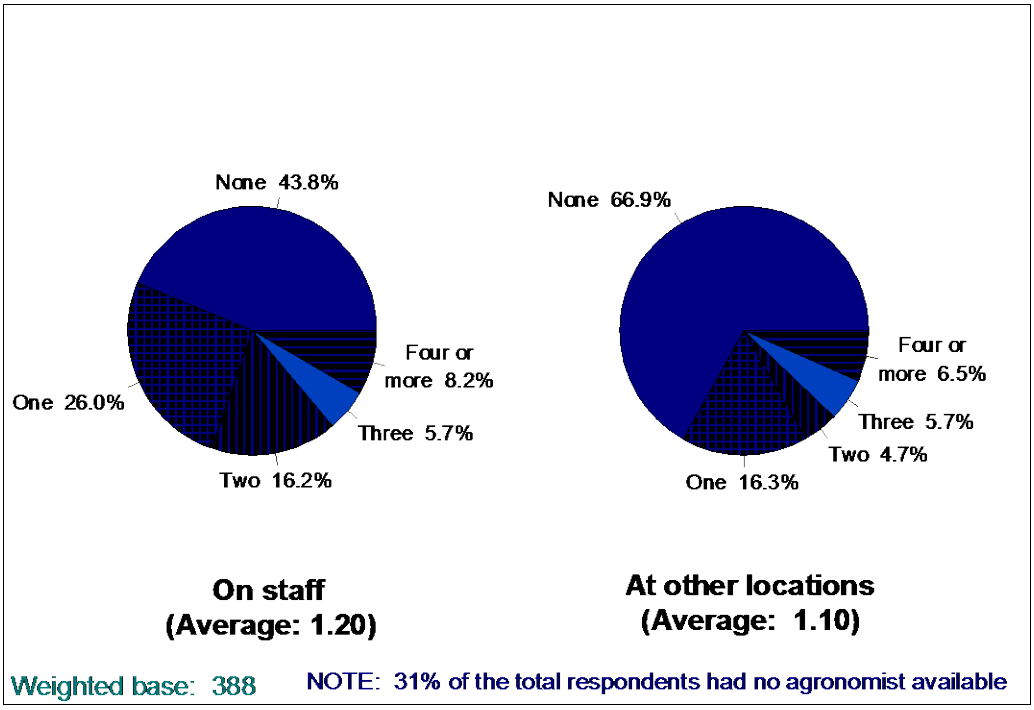
When asked specifically about custom application of fertilizer versus pesticides, respondents custom applied a slightly greater proportion of fertilizer than pesticides. On average, respondents applied 57 percent of the fertilizer sold. Those from the Midwest also applied 58 percent of the pesticides they sold while those from non-Midwestern states applied an average of only 46 percent of the pesticides sold (Figure 9).

Figure 9. Custom Application of Fertilizer and Pesticides by Region



To support these services, many dealerships had agronomists available, either full-time on staff or shared with other locations. On average, the respondents had 1.2 full-time agronomists available on staff and shared an average of approximately one agronomist with other locations (1.1). Over half of the responding dealerships had at least one full-time agronomist on staff at their location (56 percent) (Figure 10), however several of those with no full-time agronomist at their location did have one available for their use at another location. Less than a third of the respondents had no full-time agronomist available to them at all.

Figure 10. Full-time Agronomists Available



Use of Precision Technologies and Offerings of Site-Specific Services

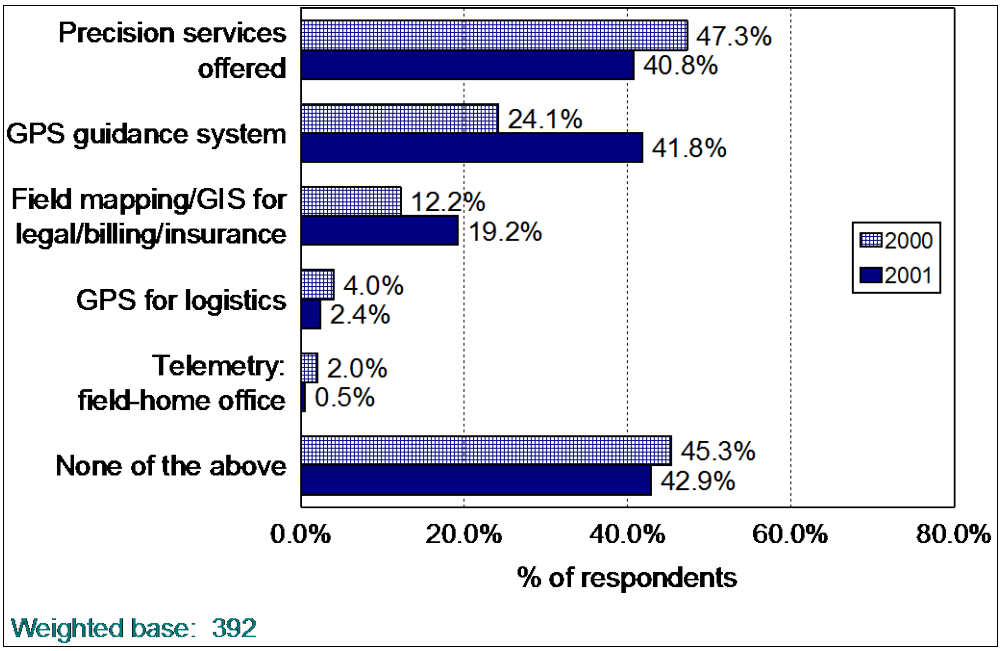
Respondents were asked several questions about their use of precision technologies and which site-specific services they were currently offering (or would be offering by the fall of 2001). The following figures present the 2001 survey results followed by a comparison of offerings from 1997 to 2001 where possible.

Use of Precision Technologies

Respondents were asked how they were ~~asked how they were~~ using precision technologies in their dealerships – from offering their customers precision/site-specific services to using precision technologies internally for guidance systems, billing/insurance/legal activities, logistics management, or field-to-home office communications (Figure 11). Over half of the respondents used precision technologies for some purpose (57 percent) with 41 percent offering their customers at least one precision service. This represented a decline from the previous year when 47 percent were offering at least one precision service. Almost half of the respondents were using GPS (Geographical Positioning System) guidance systems to reduce skips and overlaps when custom applying uniform rates of fertilizer and chemicals (42 percent). This use of GPS guidance systems showed the most growth of all the precision technology activities, increasing from only 24 percent of the respondents in 2000. Nineteen percent were using field mapping with GIS (Geographical Information Systems) to document work for billing/insurance/legal purposes (up from 12 percent in

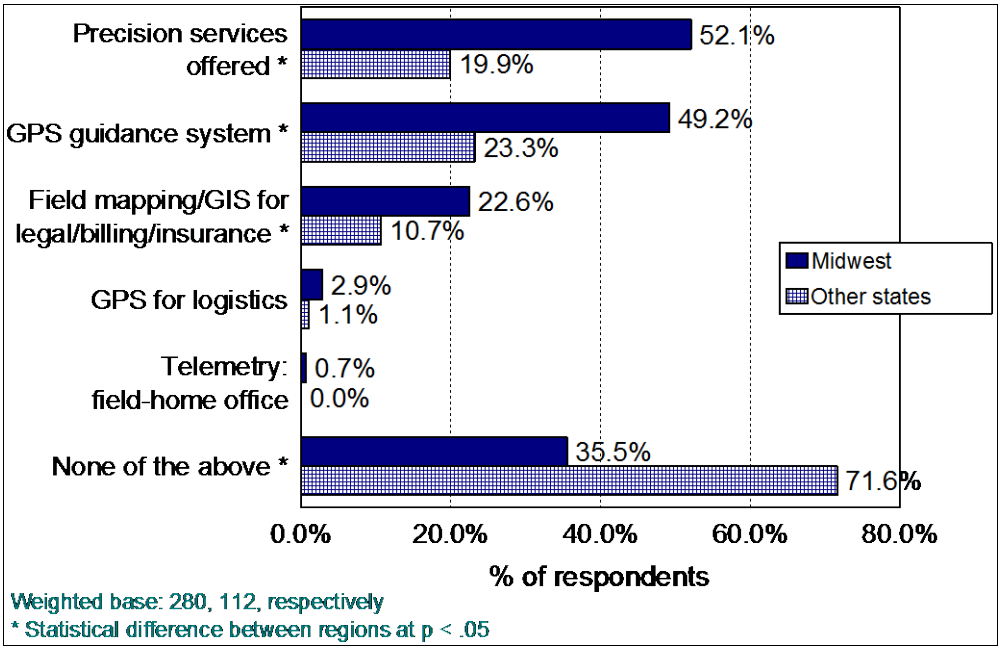
2000). Only 2 percent said they were managing vehicle logistics with GPS and less than 1 percent was using telemetry to send field information from the field to the home office.

Figure 11. Use of Precision Technology



Precision technologies were being used to offer precision services and for GPS guidance systems by significantly more dealerships in the Midwest than in non-Midwestern states (Figure 12). Over half of the Midwestern respondents offered precision services (52 percent) compared to only 2 out of 10 of the non-Midwestern respondents. GPS was used in a guidance system by 49 percent of the Midwestern dealerships compared to only 23 percent of the non-Midwestern respondents. The biggest change from 2000 to 2001 was in the Midwest where use of GPS in a guidance system increased 21 percentage points from 28 percent to 49 percent of the respondents. The biggest declines were in precision services offered in non-Midwestern states, representing a 10-percentage point drop from almost 30 percent of the respondents in 2000 to only 20 percent in 2001.

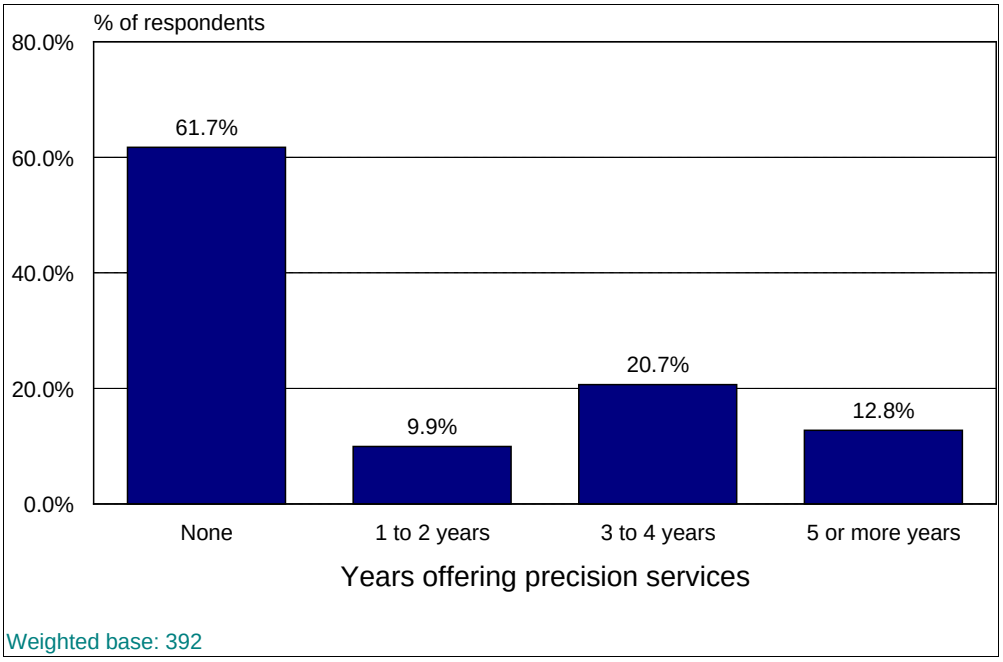
Figure 12. Use of Precision Technology by Region



Experience with Precision Services

Respondents were asked how many years they had offered precision services to their customers. Only 13 percent of the respondents said they had offered these services for 5 years or more while 21 percent said it had been 3 to 4 years (Figure 13). Reflecting declining numbers in the past 2 years, only 10 percent of the respondents indicated they had begun offering precision services 1 to 2 years ago.

Figure 13. Years Offering Precision Services



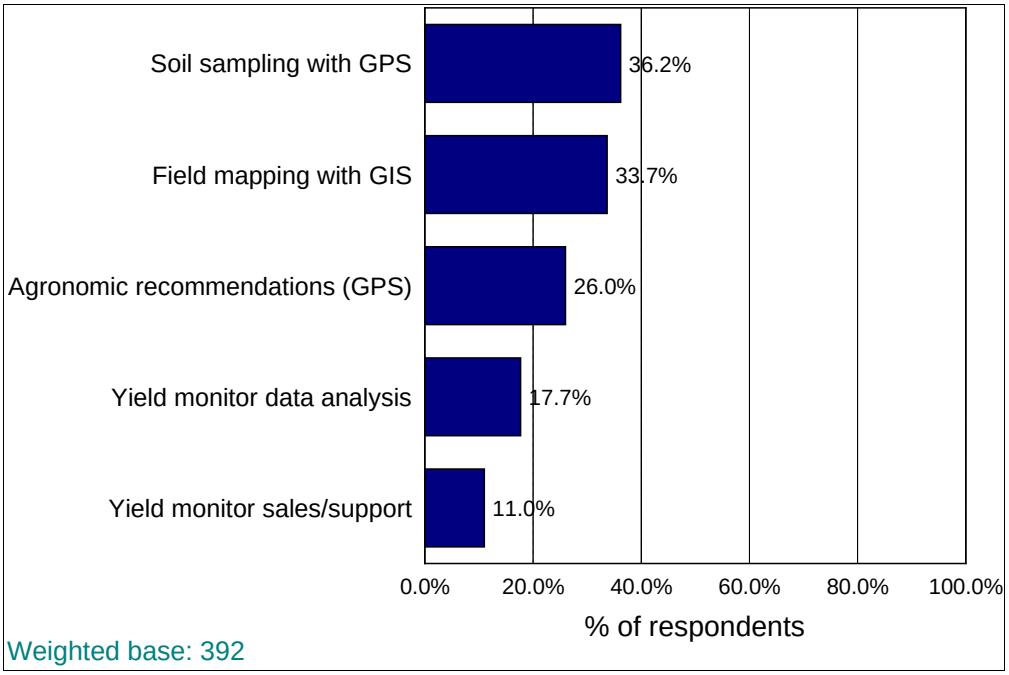
Soil Sampling, Field Mapping and Yield Monitors

Of all the precision service offerings asked about in the survey, the most common precision service offered by the dealerships in 2001 was soil sampling with GPS. By the end of 2001, 36 percent of the respondents said they would be offering soil sampling with GPS (Figure 14). The second-most common precision service offering was field mapping with GIS – to be offered by a third of the respondents by fall of 2001 (33 percent).

As their customers ask for help in interpreting precision data, some dealerships have found that they need to offer agronomic recommendations based on GPS data even if they do not offer any of the specific technical services. Over a quarter of the respondents expected to be offering agronomic recommendations based on GPS data by the fall of 2001 (26 percent).

Yield monitors often represent the first step into the precision agricultural arena for farmers. Hence, dealerships often get involved in this area as well – either in the form of sales/rental/support of the units or else through the analysis of the resulting yield data. By the end of 2001, only 18 percent of the respondents said they would offer yield monitor data analysis. A smaller group offered yield monitor sales/rental/support services with 11 percent saying they would be offering the service by the end of 2001.

Figure 14. Precision Ag Services/Technologies Offered: Soil Sampling, Field Mapping and Yield Monitors

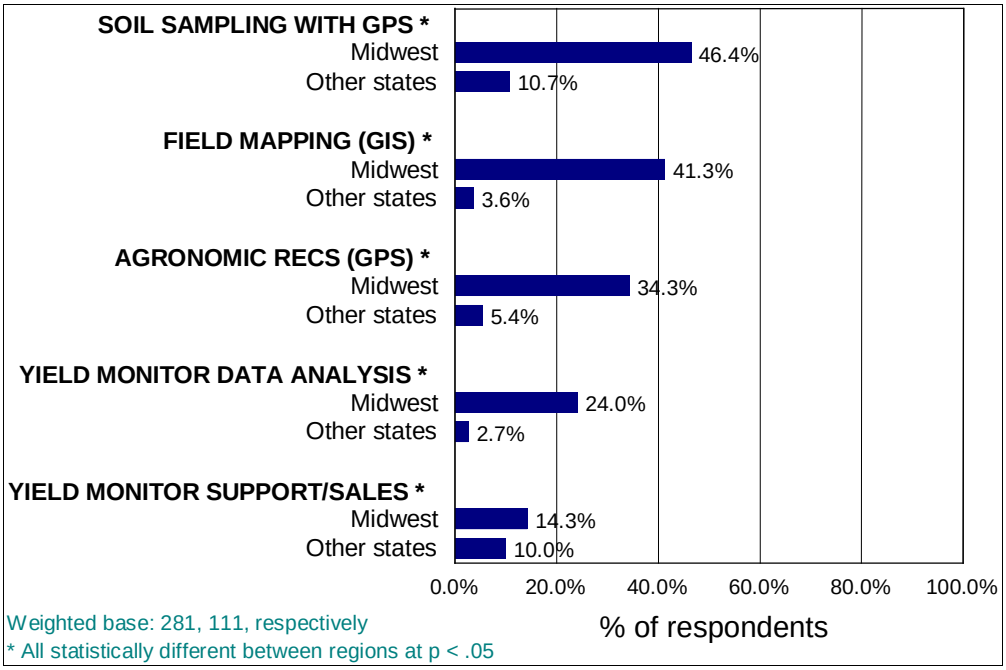


All of these precision service offerings were significantly more common in the Midwest than in other states (Figure 15). For soil sampling with GPS, by fall 2001, 46 percent of the responding dealerships from the Midwest indicated they would be offering this service compared to only 11 percent in the other states. This was the only service that was offered more frequently in the Midwest, increasing from 44 percent of respondents in 2000. Soil sampling with GPS in non-Midwestern states dropped by 50 percent from 22 percent of the respondents in 2000 to only 11 percent in 2001.

Field mapping with GIS was more than 10 times more common in the Midwest compared to other states, offered by 41 percent of the Midwestern respondents compared to less than 4 percent of the respondents from other states. This gap was also reflected in agronomic recommendations based on GPS data, offered by 34 percent of the respondents in the Midwest but only 5 percent of the respondents in other states.

Yield monitor data analysis and yield monitor sales/support were also more common in the Midwest relative to the other states. A quarter of the responding dealerships in the Midwest offered yield monitor data analysis compared to only 3 percent in non-Midwest states, both numbers falling from 2000 offerings.

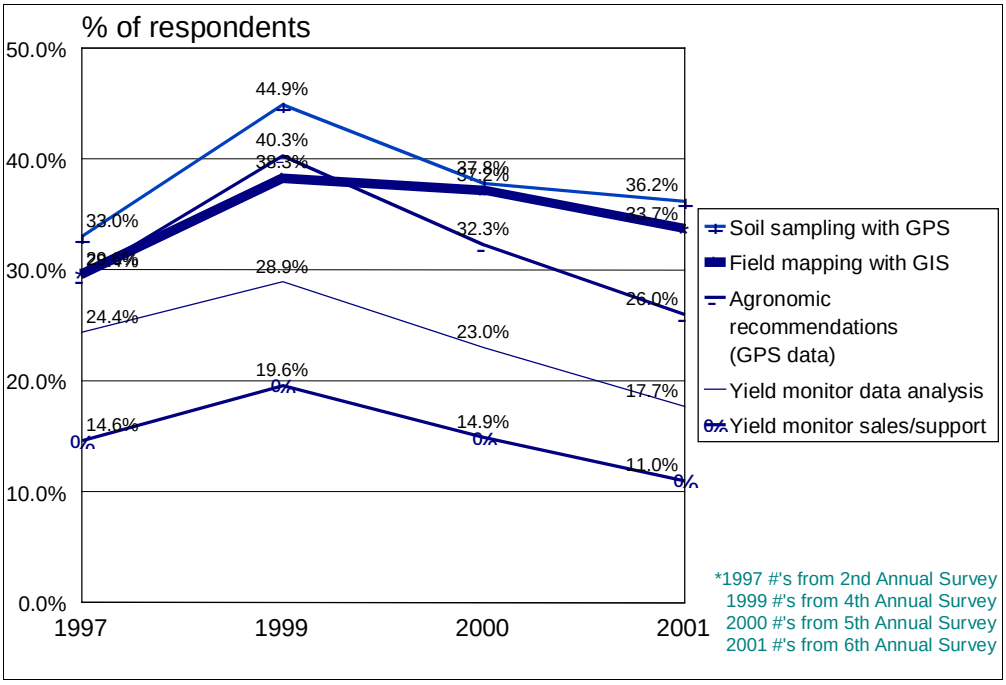
Figure 15. Soil Sampling, Field Mapping and Yield Monitors Offered by Region



In looking at the trends over time, all of these services peaked in 1999 and have shown continued decline since that point (Figure 16). The biggest decline has been in agronomic recommendations based on GPS data. This service was offered by 40 percent of respondents in 1999 while only 26 percent of the respondents said they offered the service in 2001. Similarly, yield monitor data analysis peaked at 29 percent in 1999 and dropped to 18 percent of respondents in 2001. The service that has shown the most consistency is field mapping with GIS. In 1999, 38 percent of respondents offered the service and this declined only 4 percentage points to 34 percent in 2001.

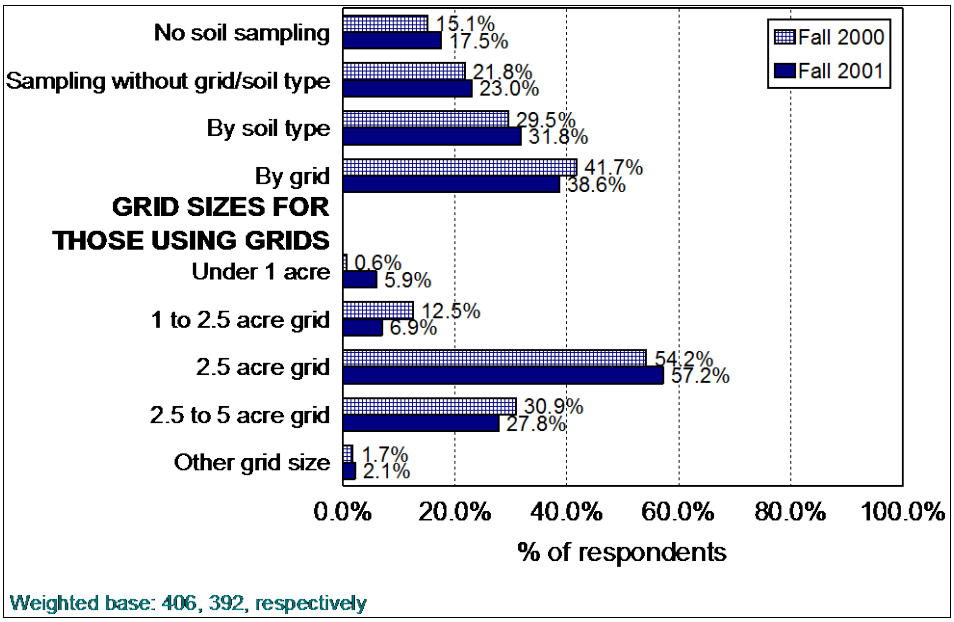
This decline may be due to several factors. A few dealerships may have actually dropped precision services; the decline may reflect dealerships not rolling out this service as planned for the fall of 1999 and 2000 due to the previously mentioned challenges in the market environment; or~~, as pointed earlier,~~ some of this difference may simply be due to differences in who responded to the survey each year. (It is important to note that even statistical weighting cannot correct for differences in survey respondents from year to year.)

Figure 16. Soil Sampling, Field Mapping and Yield Monitors Offered Over Time



When asked more detail about the type of soil sampling dealerships were offering – by grid or by soil type – most of those offering soil sampling with GPS were sampling by grid, with over half using a 2.5 acre grid (Figure 17). Sampling by soil type was used by 32 percent of the respondents. Only 23 percent of the respondents offered soil sampling (with or without GPS) but did not offer it either by soil type or by grid. As in other years, those in the Midwest were more likely than other dealerships to sample by grid (35 percent versus 23 percent of the respondents in other states). There have been very few significant changes in the pattern of soil sampling over the years. Grid size has slowly converged on the 2.5-acre grid size, though other grid sizes continue to be used. Those outside the Midwest were more likely to use smaller grids than those in the Midwest, potentially because they were soil sampling for different crops. Soil sampling by grid and type have remained fairly consistent as well, though grid sampling appears to be becoming slightly less popular while soil type sampling expanded in popularity this year.

Figure 17. Soil Sampling



Variable Rate Seeding

Variable rate seeding continues to be an area where dealerships show less interest compared to other precision technologies. Less than 10 percent of the responding dealerships offered variable seeding, either with or without GPS in 2001 (Figure 18). These numbers were very similar to those of previous years. Variable rate seeding was more common in the Midwest than in other states (Figures 19).

Figure 18. Precision Ag Services/Technologies Offered: Variable Rate Seeding

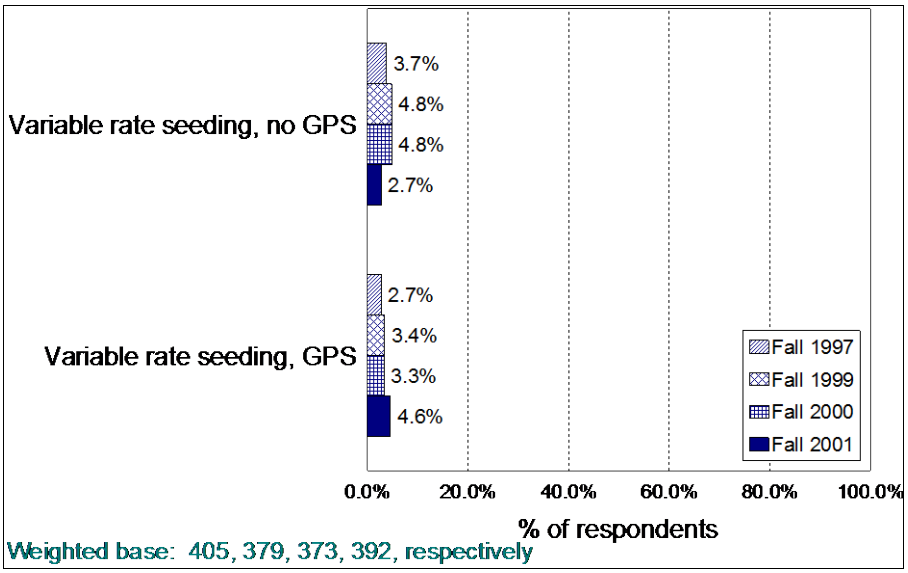
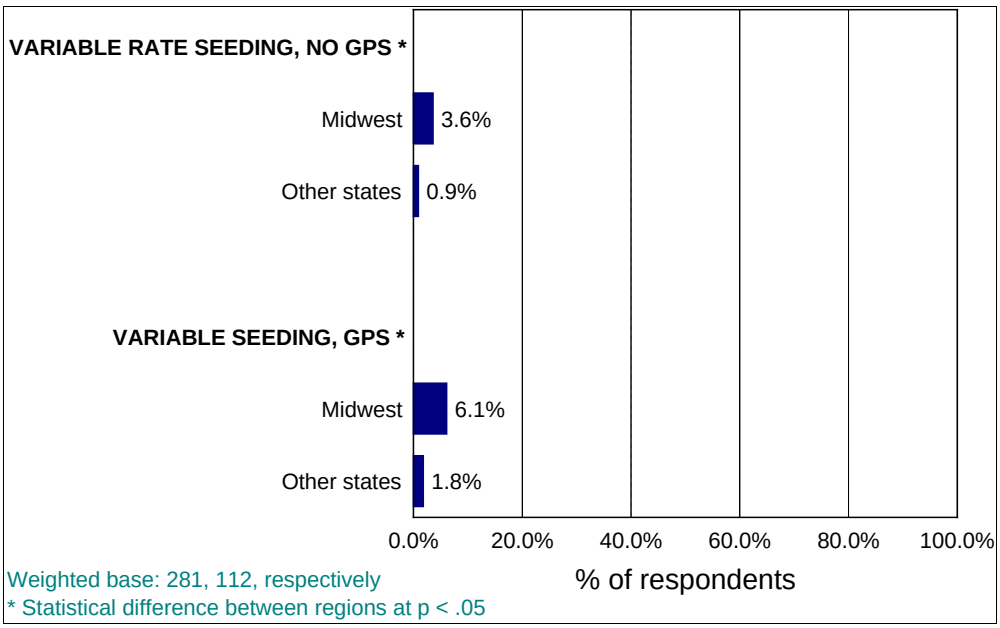


Figure 19. Variable Rate Seeding Offered by Region

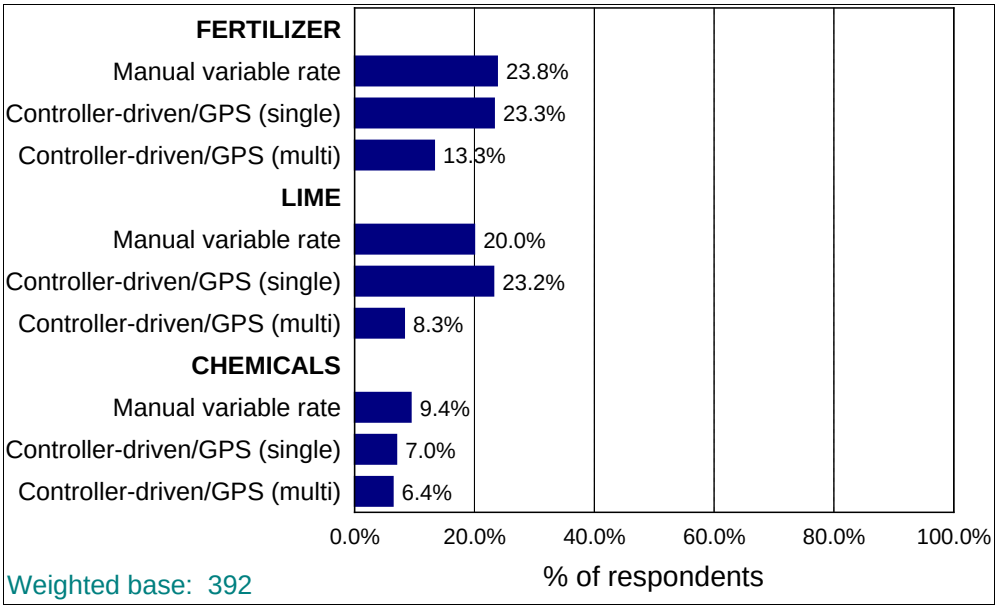


Variable Rate Application

Among this group of dealerships, variable rate custom application services were often provided along with traditional custom application. Of the 78 percent who offered any custom application, almost half of them expected to offer some type of variable rate application (including manual variable rate application) by the end of 2001. Overall, a third of the respondents (33 percent) offered some form of controller-driven application of fertilizer, lime and/or chemicals.

Unlike previous years, this year's questionnaire asked specifically about variable rate application of fertilizer, lime and chemicals. Figure 20 shows the expected use of the different types of variable rate application by the fall of 2001. Just under a quarter of the respondents said they offered manual variable rate application of fertilizer. An equal number offered controller-driven variable rate application of single nutrients for fertilizer or lime. Fewer respondents (13 percent) offered multi-nutrient controller-driven application of fertilizers. Almost 10 percent of the respondents offered manual variable rate application of pesticides, while just over 10 percent offered controller-driven application of pesticides.

Figure 20. Precision Ag Services/Technologies Offered: Variable Rate Application



Manual and controller-driven variable rate application was more common in the Midwest relative to the other states (Figures 21 to 23). For fertilizer, 31 percent of the respondents expected to offer single nutrient controller-driven application in the Midwest by the fall of 2001 compared to only 5 percent of the respondents from other states. Multi-nutrient controller-driven application of fertilizer in non-Midwestern states was offered at similar rates to that of single nutrient controller-driven fertilizer application (5 percent of respondent). In the Midwest, multi-nutrient controller-driven application was offered by half the number of respondents who offered single nutrient variable rate application (17 percent versus 31 percent offering single-nutrient controller-driven application) (Figure 21). Lime was offered at similar levels to that of fertilizer application (Figure 22). For chemicals, variable rate application was not as common as for fertilizer and lime but the same pattern held across regions (Figure 23).

Figure 21. Variable Rate Application for *Fertilizer* Offered by Region

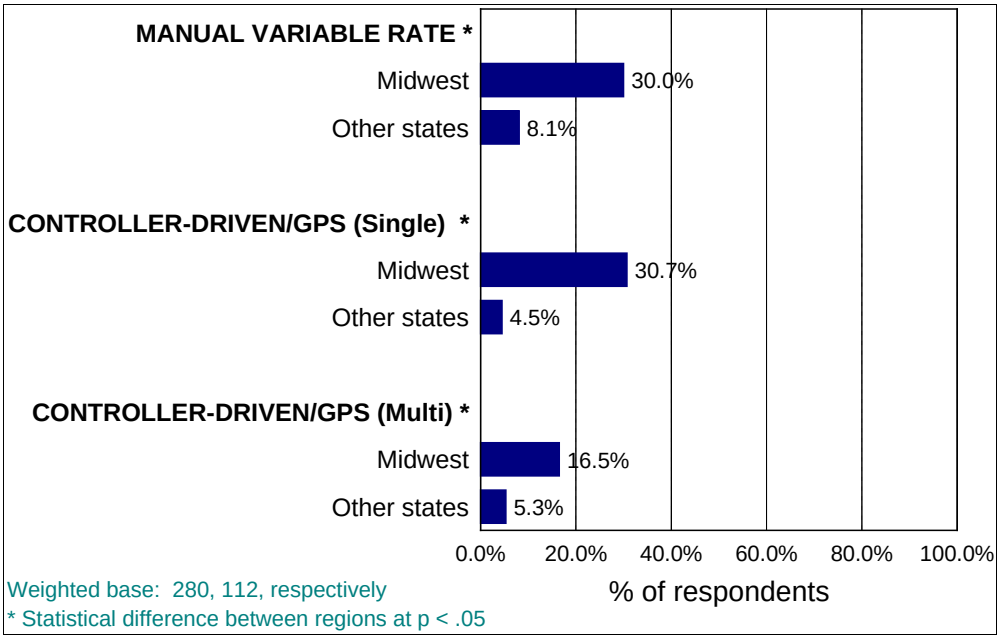


Figure 22. Variable Rate Application for *Lime* Offered by Region

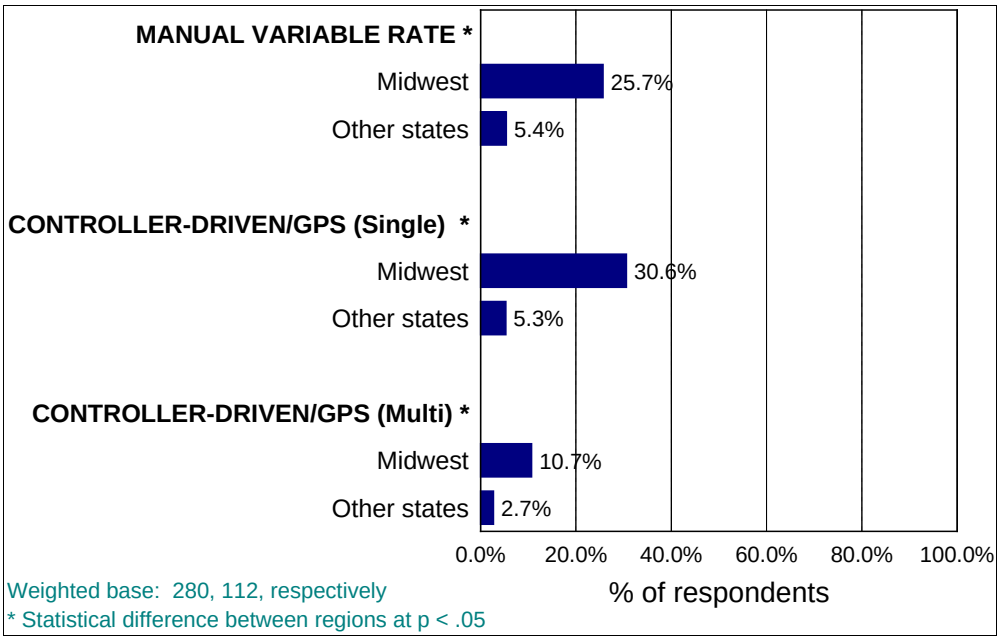
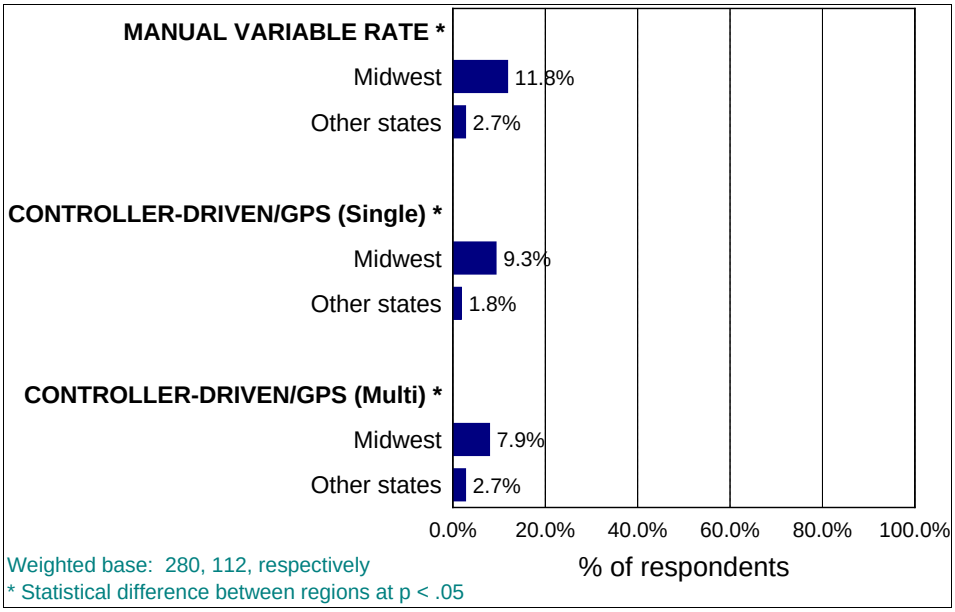
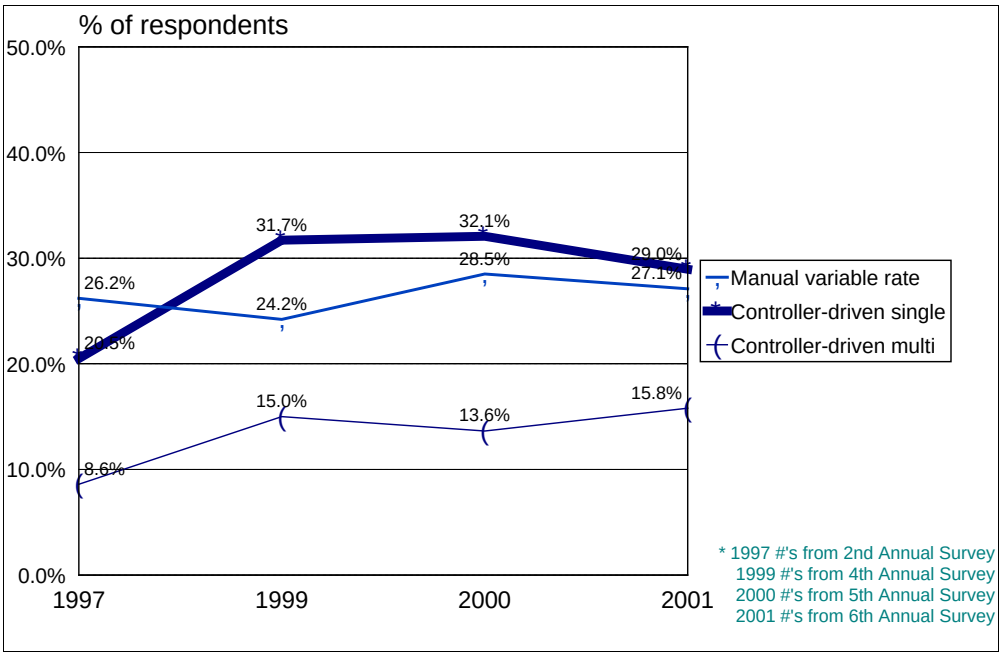


Figure 23. Variable Rate Application for *Chemicals* Offered by Region



Over time, possibly because of the capital investment involved, variable rate application has not shown the same amount of decline as some of the other precision service offerings (Figure 24). Multi-nutrient controller-driven application actually increased slightly from 2000 to 2001 (14 percent of respondents to 16 percent in 2001). When these service offerings are split out by region, most of the decline has been in non-Midwestern states with Midwestern respondents only slightly increasing or decreasing their variable rate application service offerings.

Figure 24. Variable Rate Application Offered Over Time

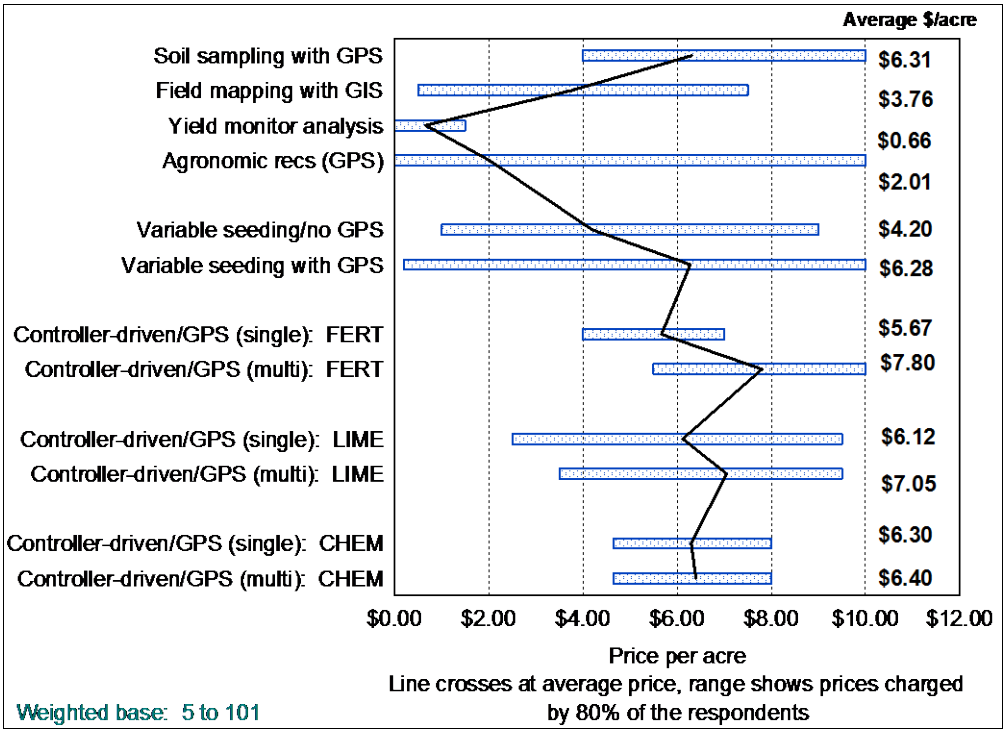


Pricing Site-Specific Services

As new services become established in a market, there may be considerable variation in price from supplier to supplier given uncertainty in key areas such as customer willingness to pay, competitive price response, and the actual cost of providing the service. As the services become more familiar to both dealerships and their customers, this variation may shrink and prices tend to stabilize in the marketplace. In 2001, there is still substantial variation in prices charged for these services in the market. To better understand what is going on with respect to pricing, we asked the responding dealerships to tell us 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 specific components individually.

Figure 25 shows the average prices charged per acre for each of the precision services. The bar indicates what the middle 80 percent of the dealers were charging (the top 10 percent and bottom 10 percent were dropped to make the ranges a bit more consistent). As is evident by the figure, there is still a wide range of pricing strategies in place, depending on the competitive situation in the local market, the dealer's costs of providing the services, and the benefit local growers receive from precision services. From 2000 to 2001, the biggest change in prices was in controller-driven application of pesticides, which rose almost $1/acre.

Figure 25. Prices Charged for Precision Ag Services



Profitability of Precision Service Offerings

To get a better idea of how much profit these prices were generating, this year respondents were asked how profitable individual precision services offerings were. Figure 26 summarizes the results of the question: Does the revenue you charge for these services cover variable and/or fixed costs? Variable costs were defined as the costs of actually performing the service (fuel, supplies, etc.) while fixed costs were defined as the costs of making the service available (depreciation, labor, training, etc.). The 5 choices participants were given were: (1) they did not know how profitable the service was; (2) they were not close to breaking even; (3) they were just covering variable costs; (4) they were covering both variable and fixed costs; and (5) they were generating a profit. Custom application was used as a benchmark to compare the profitability of precision services against. Figure 26 shows that over half of the respondents said they were making a profit on custom application and another 27 percent were covering both fixed and variable costs of custom application.

The most profitable precision service was soil sampling with GPS where over a third of the respondents said they were generating a profit (35 percent) and almost a third (29 percent) said they were covering both fixed and variable costs. Single nutrient controller-driven application was similar in its level of profitability. The service that respondents knew was not as profitable was yield monitor data analysis (35 percent said they were not covering fixed costs). For satellite imagery and variable seeding with GPS, over half said they did not know if it was covering costs or not. Almost two-thirds of the respondents said that their total precision package was at least covering fixed and variable costs. This suggests that profitability for those dealerships continuing to offer precision services has increased over previous years.

Figure 26. Profitability of Precision Service Offerings

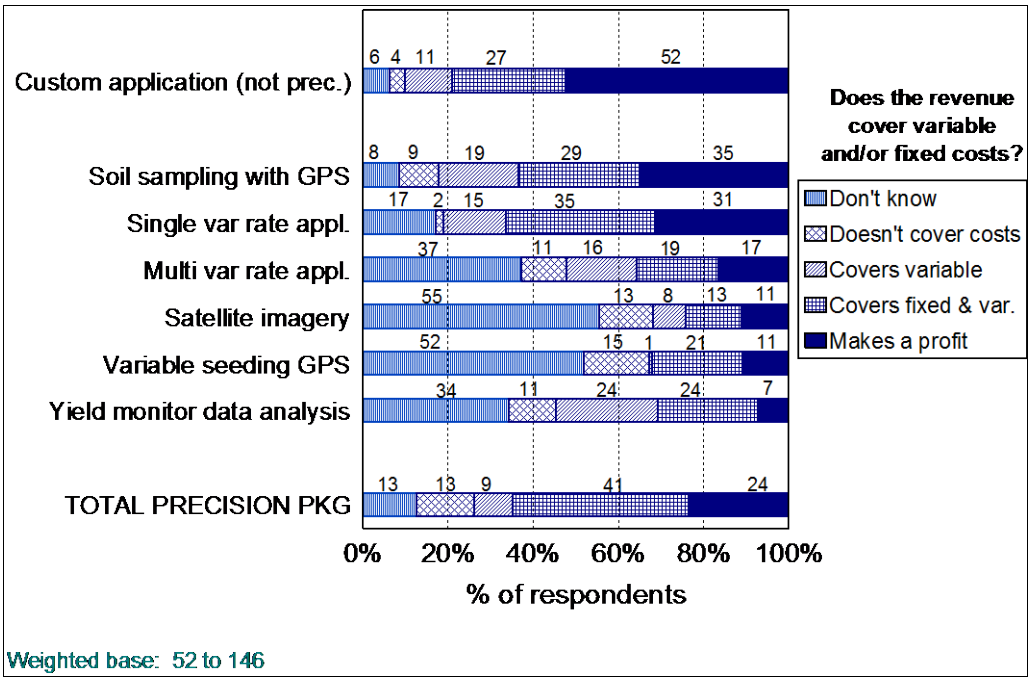
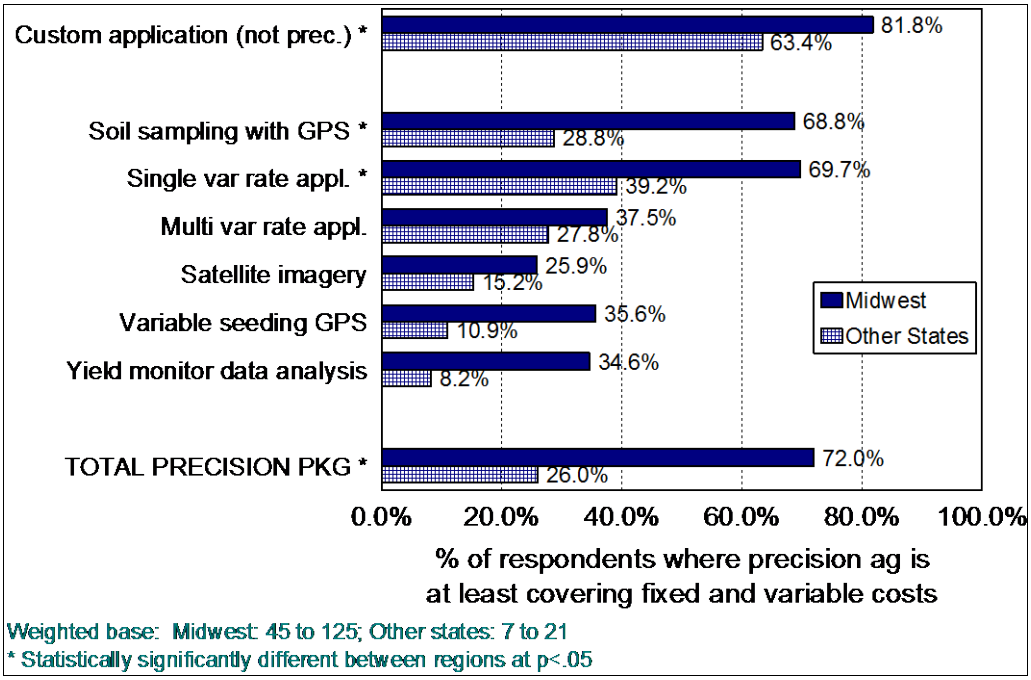


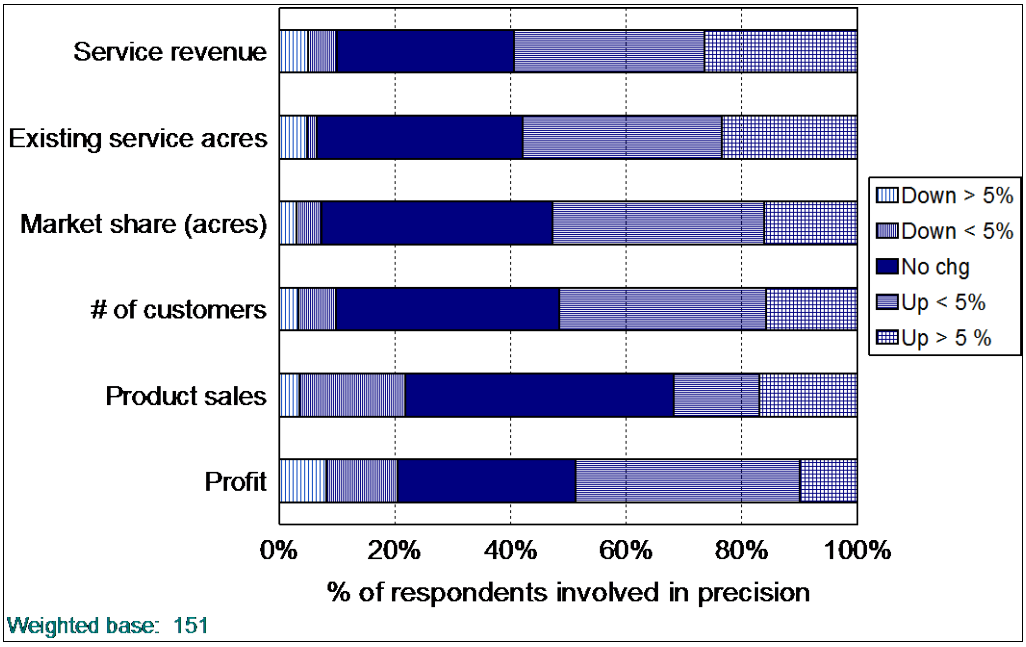
Figure 27 breaks out profitability estimates by region and indicates the percentage of respondents who said that the service either covered fixed and variable costs or it generated a profit. In all cases, precision services appear to be more profitable in the Midwest than in non-Midwestern states. An example is the total precision package in which almost three-quarters of the Midwestern participants feel it is covering fixed and variable costs compared to only a quarter of the non-Midwestern participants.

Figure 27. Profitability of Precision Service Offerings by Region



Survey participants were also asked to indicate what impact precision services have had on various aspects of their businesses. The biggest impact appears to be service revenue (Figure 28). A quarter of the respondents (26 percent) indicated that service revenue was up over 5 percent due to precision agriculture. Another third indicate that service revenue is up but less than 5 percent. Existing service acres, market share, and number of customers show similar patterns, though the increases are not as great. Respondents indicated the most decline has been seen in product sales with 21 percent indicating their product sales had dropped due to precision agriculture. This was offset by 32 percent who felt product sales had increased. In keeping with the profitability estimates, half of the respondents felt that, overall, profit had increased while 20 percent indicated that profit had decreased.

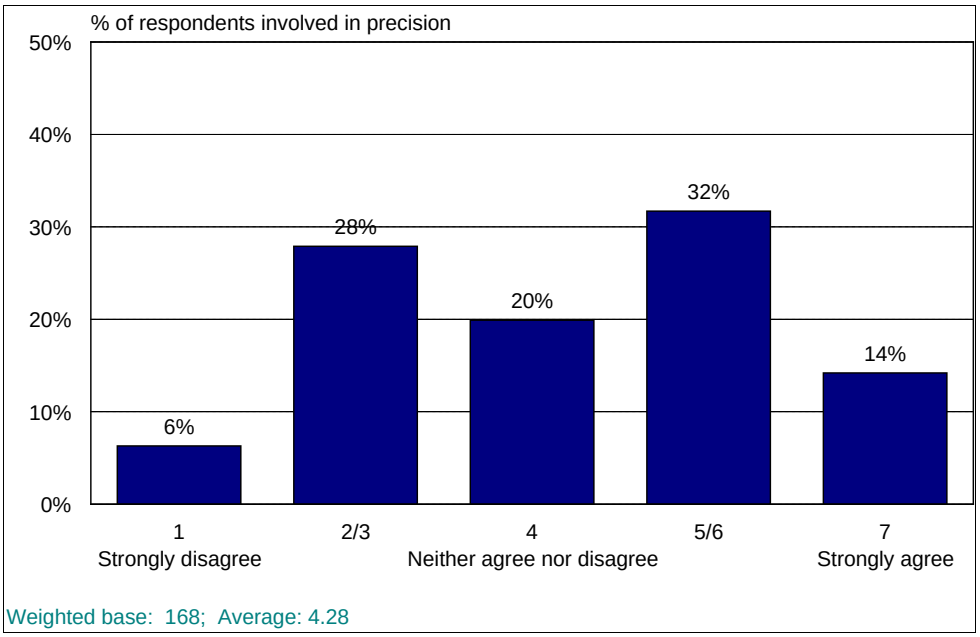
Figure 28. Impact of Precision Services on Business



To get a better understanding of the long term role of precision technology in the agricultural industry, respondents were asked to rate how strongly they agreed or disagreed with three statements about precision technology. The results of these are shown in Figures 29 to 31. There were no differences between regions in how respondents rated any of the statements.

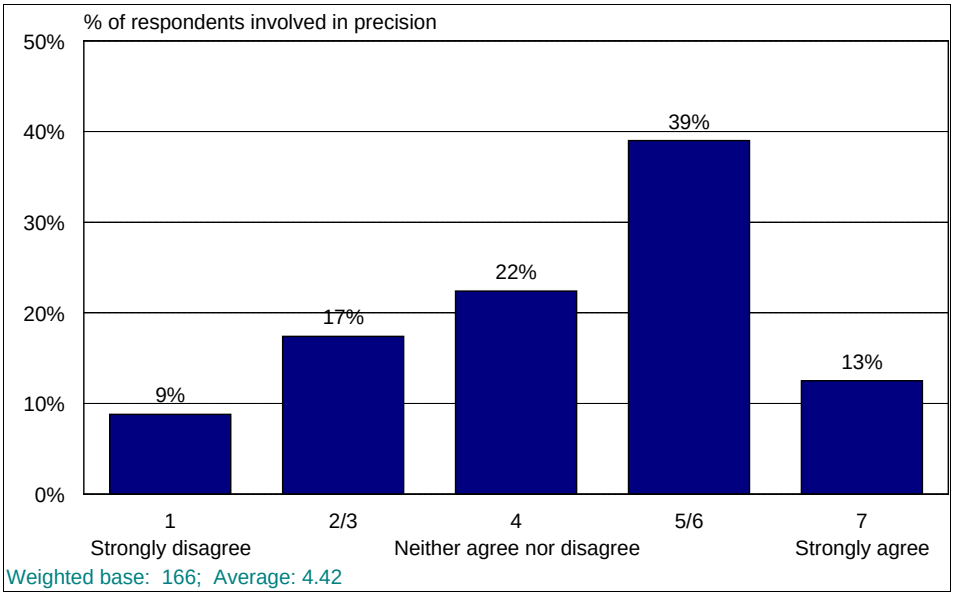
The first statement was, "It is critical that my company offers precision services in order to remain competitive in my local market." There was slightly more agreement with this statement than disagreement (Figure 29), though the difference was not great. A third (34 percent) disagreed while 46 percent agreed.

Figure 29. ***It is critical that my company offers precision services in order to remain competitive in my local market.***



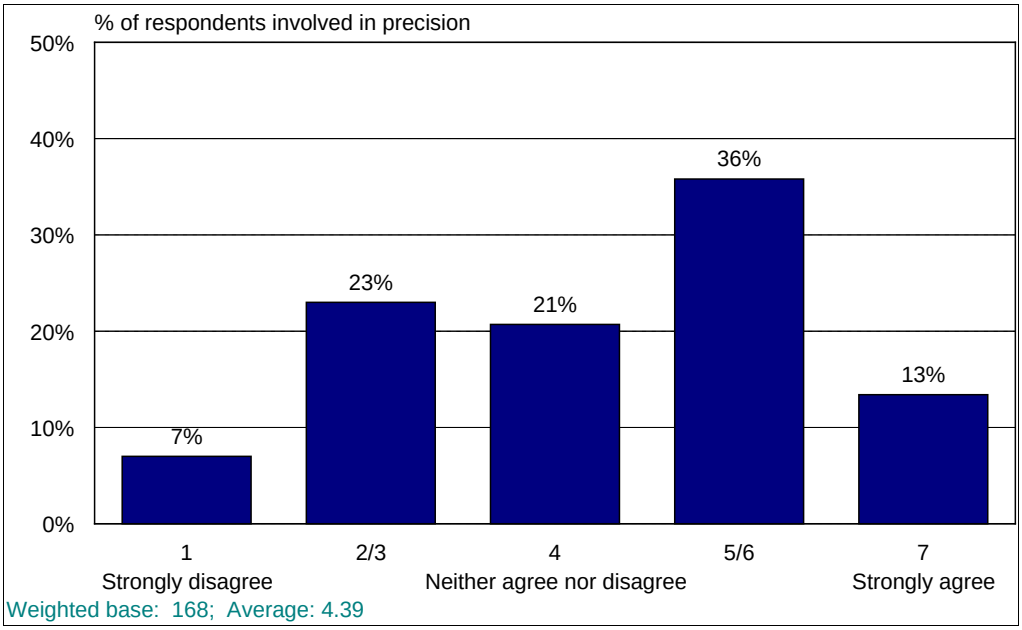
Respondents were also asked whether or not they felt that precision agriculture made their company a technological leader in their local market instead of a follower (Figure 30). Over half of the respondents agreed that it would make them a technological leader. Only a quarter of the respondents disagreed with the statement (26 percent). This disagreement suggests that in some markets, precision agriculture has been adopted by enough competitors that adopting a precision strategy is no longer a strategy undertaken only by the technological leaders.

Figure 30. ***Precision agriculture makes my company a technological leader rather than a follower in my local market.***



When asked how they felt about the long term role of precision technologies in their local market, a third of the respondents did not think that it would be a critical component of farming while almost half (49 percent) agreed that it would be a critical component in the future (Figure 31).

Figure 31. ***In the long run, precision technologies will be a critical component of farming in my local market.***



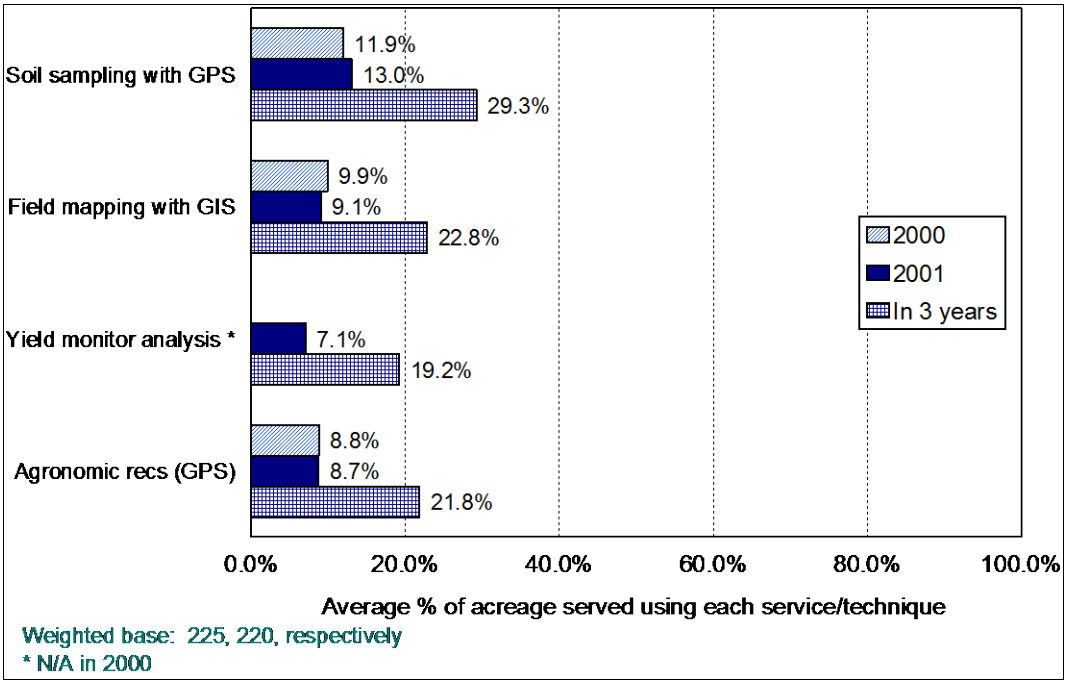
Customer Use of Site-Specific Services

To get a better understanding of how quickly growers are adopting precision services, survey participants were asked what percentage of the total acreage they served in their market area (all growers, not just current customers) was under various site-specific management techniques currently, and, in their opinion, what proportion of the local market acres will be using these techniques in 3 years. Figure 32 shows the average percentage of the current acreage respondents serve that is estimated to be under specific precision agriculture management techniques.

Currently, soil sampling with GPS was the most common precision technology, used on an average of 13 percent of the acreage (Figure 32). This was expected to more than double by 2003, with soil sampling (GPS) used on almost a third of the acreage at that time. The second most common precision service was manual variable rate application – fertilizer, lime and chemicals – with approximately 10 to 12 percent of the acreage estimated to be using manual variable rate application for each of the inputs. These services were followed by field mapping with GIS and single nutrient controller-driven application of lime (each accounting for 9 percent of the acreage).

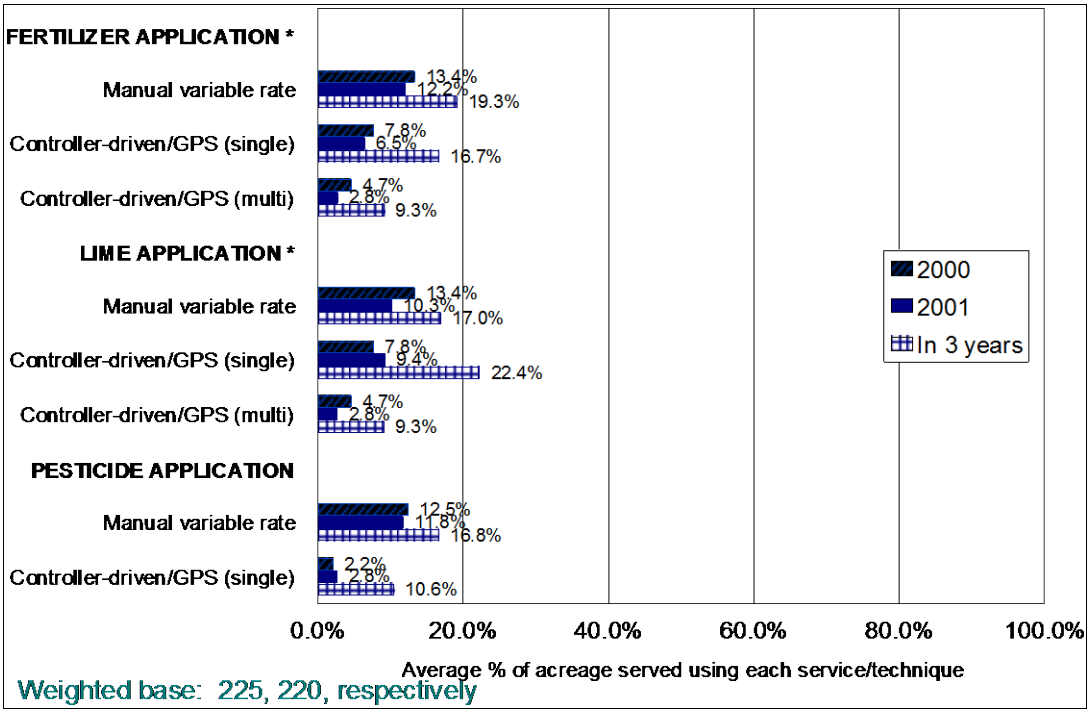
Though dealer service offerings dropped in 2001, estimated use of these services on farm acreage remained fairly constant from 2000 to 2001. Growth estimates were a bit more conservative this year compared to previous years, however farm acreage under precision technology was still expected to more than double by 2003.

Figure 32. Estimated Market Area Using Soil Sampling (GPS), Field Mapping (GIS), Yield Monitor Analysis



Estimates of acreages under variable rate application declined somewhat from 2000 to 2001 (Figure 33), though the changes were not significant and some of the changes could be due to differences in the wording of the question. Again, use of variable rate applications were expected to increase over the next 3 years with the largest growth expected in controller-driven variable rate application of lime.

Figure 33. Estimated Market Area Using Variable Rate Application



Figures 34 to 37 show estimated market areas under various precision services by region. As expected, precision use was significantly higher in the Midwest than in other states. In addition, use of precision services was estimated have declined from 2000 to 2001 to a greater extent in non-Midwestern states than in the Midwest. Again, acreages under precision services are expected to increase in the next 3 years in both regions and for all services.

Figure 34. Estimated Market Area Using Soil Sampling, Field Mapping, and Yield Monitor Analysis by Region

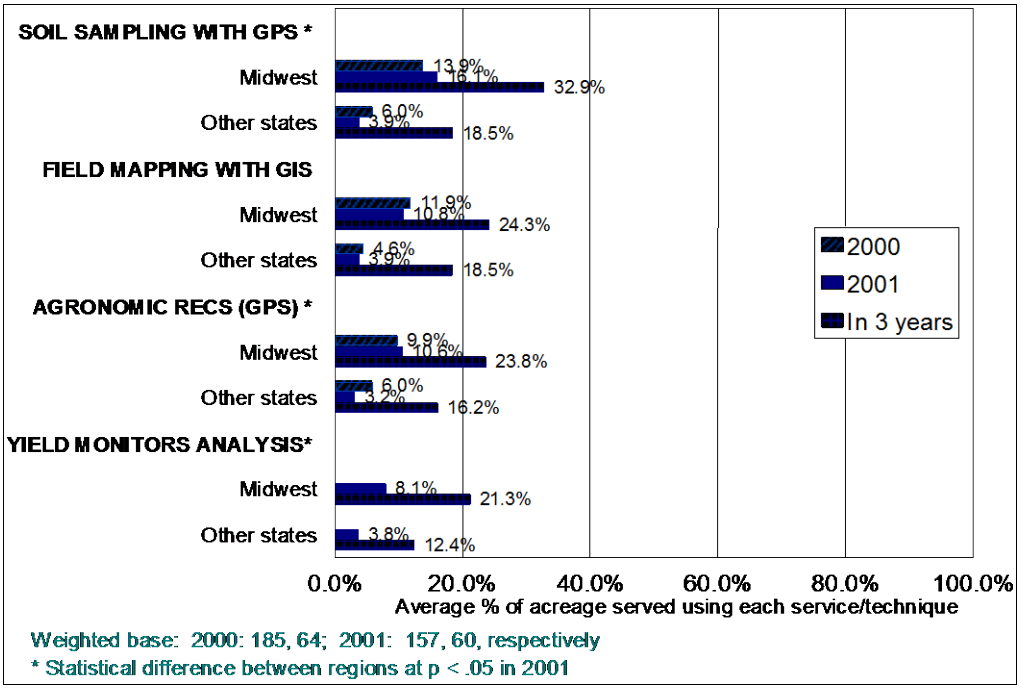


Figure 35. Estimated Market Area Using Variable Rate Application for *Fertilizer* by Region

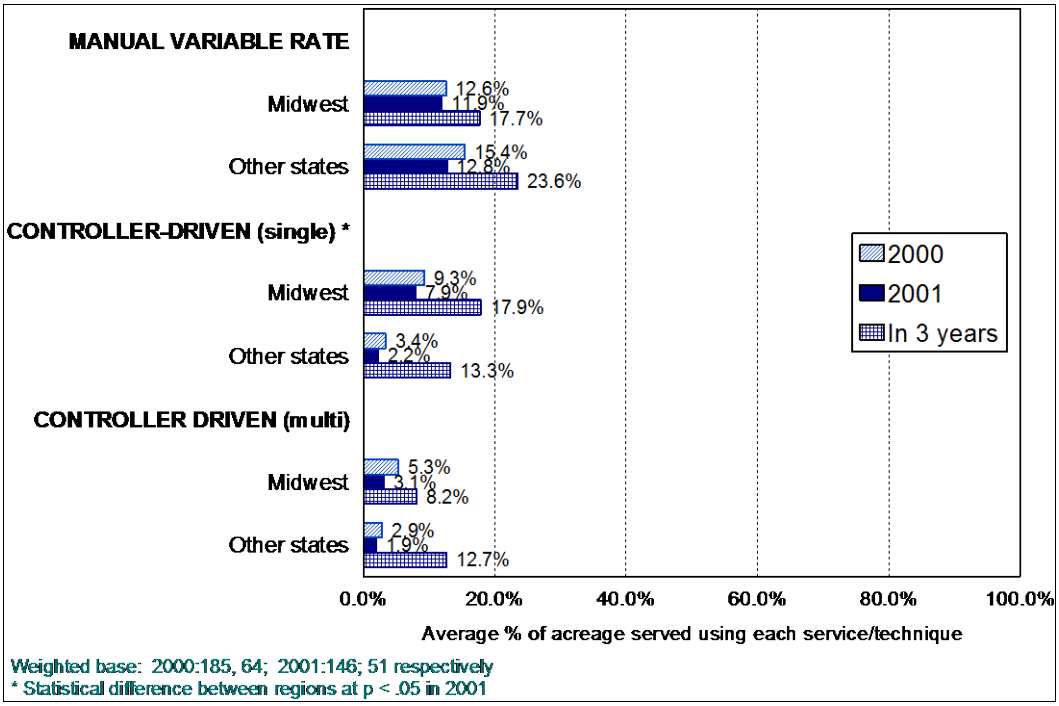


Figure 36. Estimated Market Area Using Variable Rate Application for *Lime* by Region

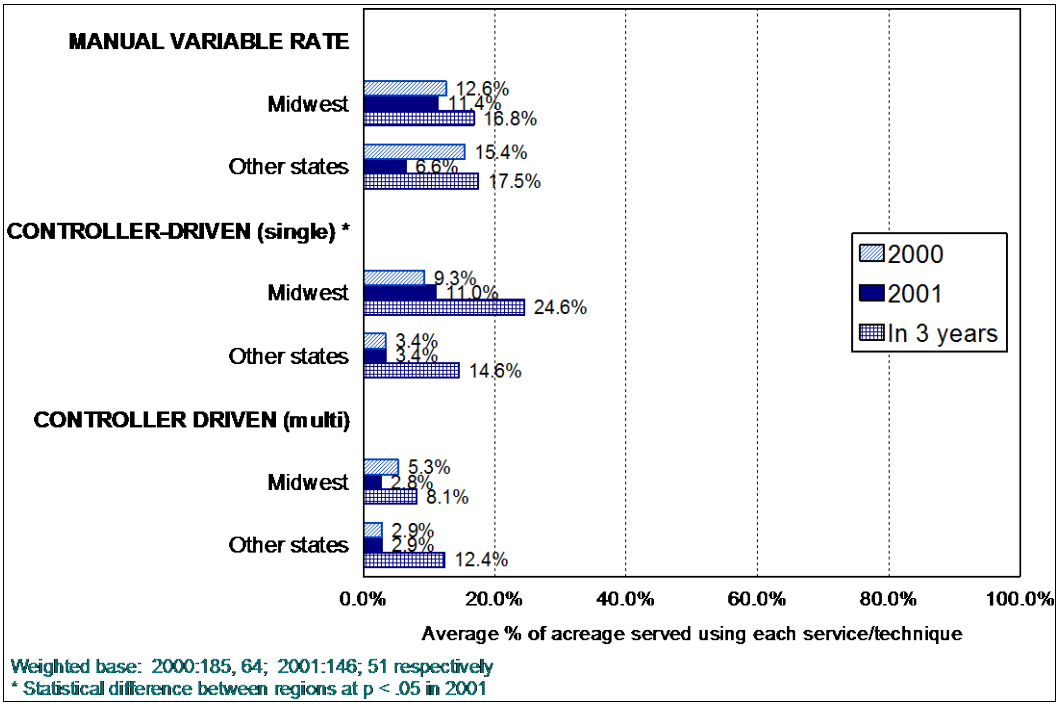
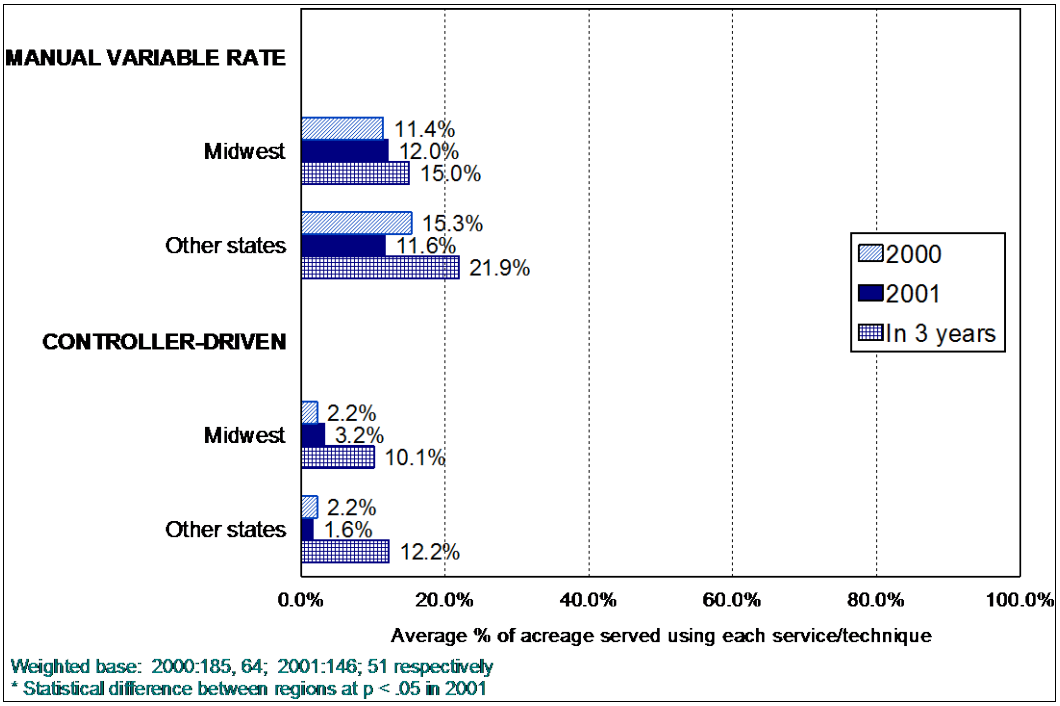


Figure 37. Estimated Market Area Using Variable Rate Application for *Pesticides* by Region

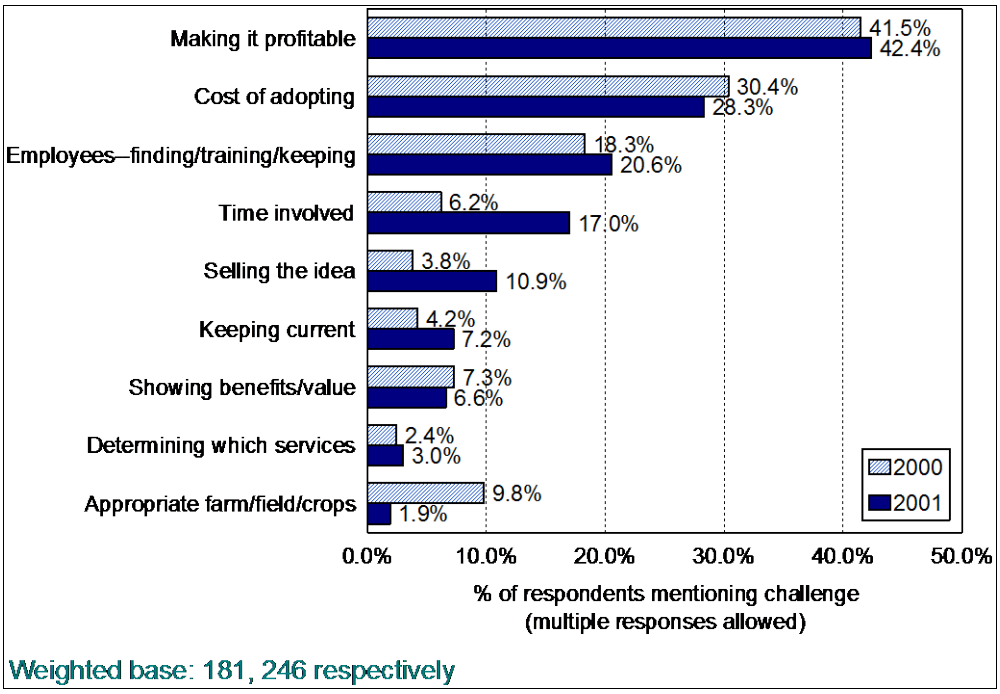


Internal Management Challenges in Implementing Precision Agriculture

To get a better understanding of some of the problems dealerships are facing when offering precision products and services, respondents were asked about their biggest internal challenges in implementing these technologies. For the second year since starting this survey, cost was not the most-often mentioned internal challenge. Perhaps reflecting low commodity prices, respondents said their biggest challenge was in determining out how to make the service profitable for both them and their customers (Figure 38). Responses here ranged from how to charge enough for the services, to generating enough profit at the farm level to be able to pay for the actual cost of the service. More than four out of ten dealerships that offered precision services said the challenge of making the services pay was their biggest challenge, compared to 28 percent who said the challenge was the cost of adopting the technology. Both of these challenges were mentioned by a similar number of respondents in 2000.

The third challenge mentioned was a day-to-day management challenge – how to find, train, and keep employees in order to offer the services (21 percent of respondents). Time involved in offering precision services was a much greater challenge this year – mentioned by 17 percent of the respondents compared to only 6 percent last year. "Selling the idea" was also much more important this year, mentioned by 11 percent of respondents compared to only 4 percent last year. Having enough farm/fields/crops that fit well with precision technology was much less of an issue this year, mentioned by only 2 percent of the respondents compared to 10 percent last year.

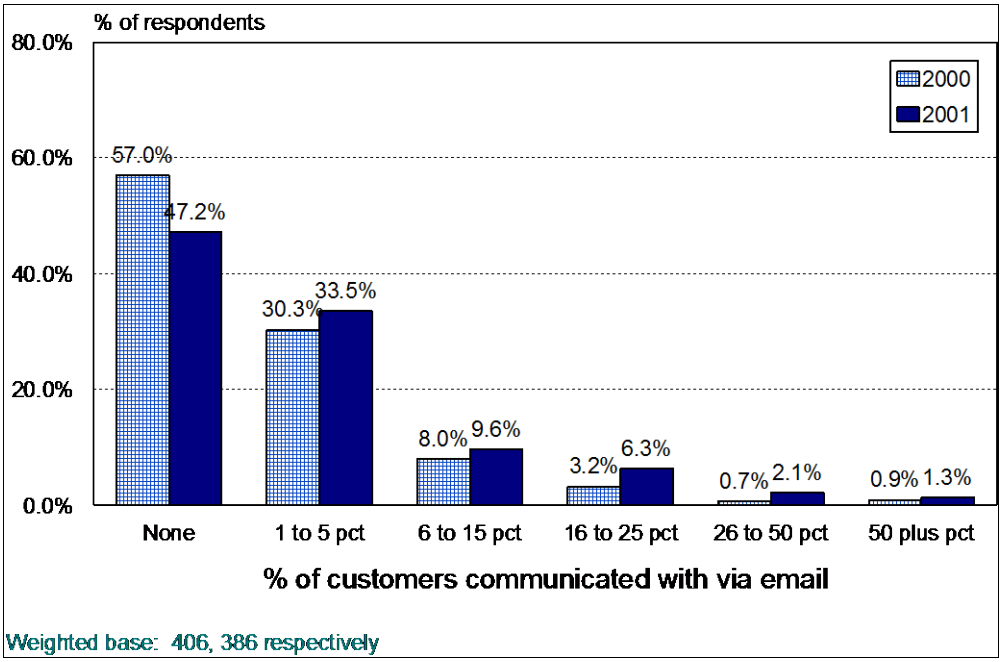
Figure 38. Most Challenging Internal Management Problems in Implementing Precision Agriculture



Use of Email and Web Sites

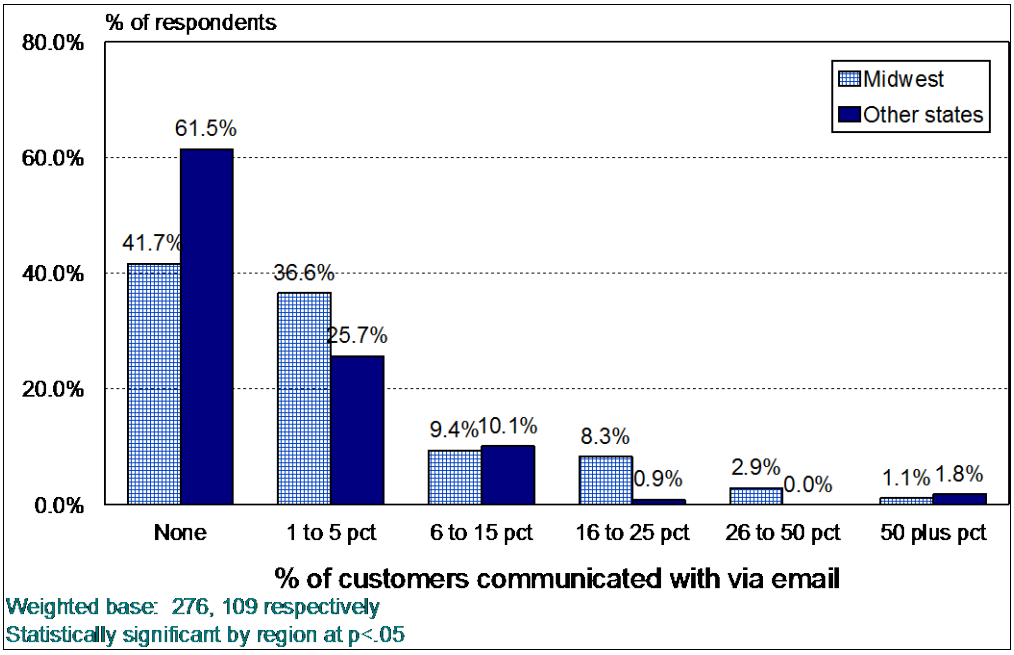
The survey also looked at another type of technology that is changing how business is conducted in today's market. Dealerships were asked how many of their customers they were communicating with through email and whether or not they, or their parent company, had a web site available for their customers. Figure 39 shows that more than half of the respondents (53 percent) used email to communicate with at least some of their customers. This was up from 43 percent last year. In 2001, almost 10 percent of the respondents communicated by email with over 15 percent of their customers within the past year, double the number last year.

Figure 39. Customers Communicated With Via Email



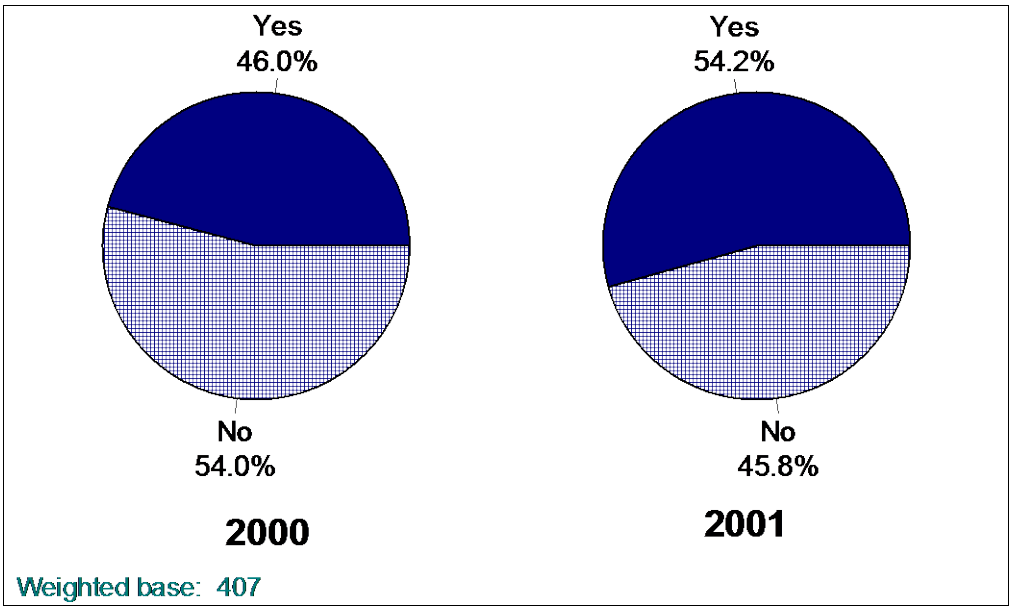
Email use varied by region with 58 percent of the respondents from the Midwest using email to communicate with their customers but only 38 percent of the respondents from other states communicating with email (Figure 40). In the Midwest, 12 percent had communicated by email with over 15 percent of their customers compared to only 2 percent of the non-Midwestern respondents.

Figure 40. Customers Communicated With Via Email by Region



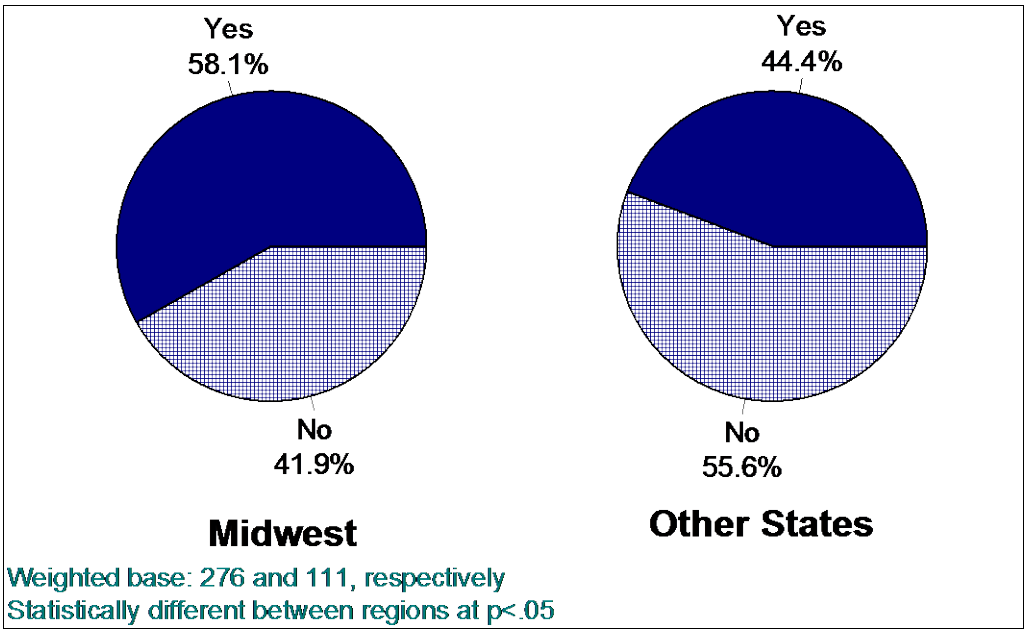
When asked if either they or their parent company had a web site available, 54 percent of the dealerships said there was a web site (Figure 41). This represents a 17 percent increase from the 2000 numbers.

Figure 41. Web Site Available



The availability of web sites was significantly different by region, as well. In the Midwest, 58 percent of the respondents said they had a web site available compared to only 44 percent of the respondents in non-Midwestern states (Figure 42).

Figure 42. Web Site Available by Region



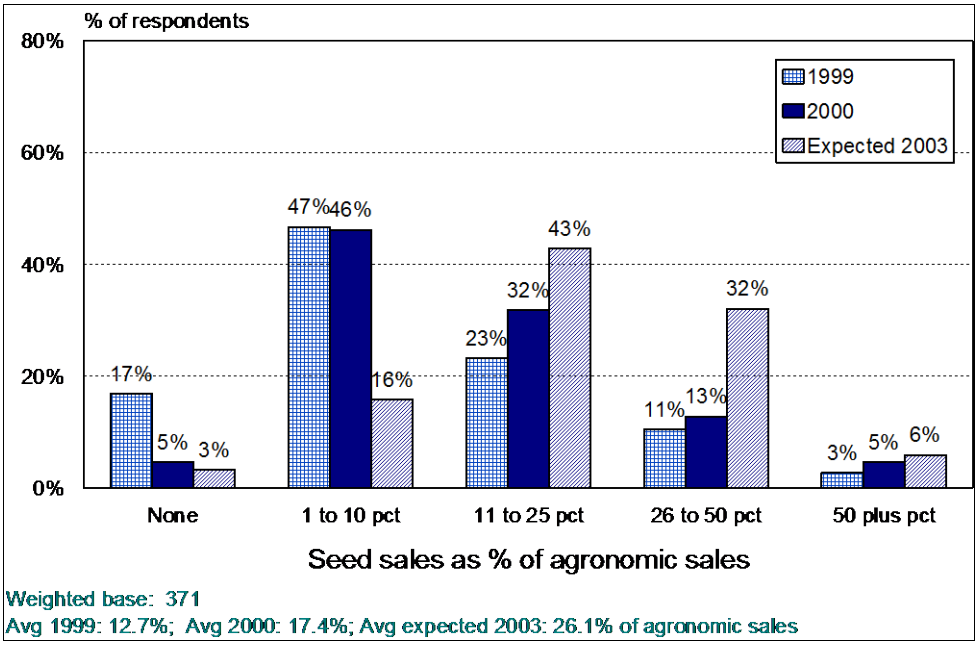
Enhanced Seed

As technology continues to evolve and as dealerships continue to look for ways of improving customer service and profitability, seed is becoming an increasingly important part of the total product line for agronomic dealerships. Seed enhanced with some input or output trait (enhanced seed) is driving much of this growth, and, despite uncertainty in the GMO arena, respondents indicate they expect enhanced seed to have an even greater impact on their businesses in the future.

Seed Sales

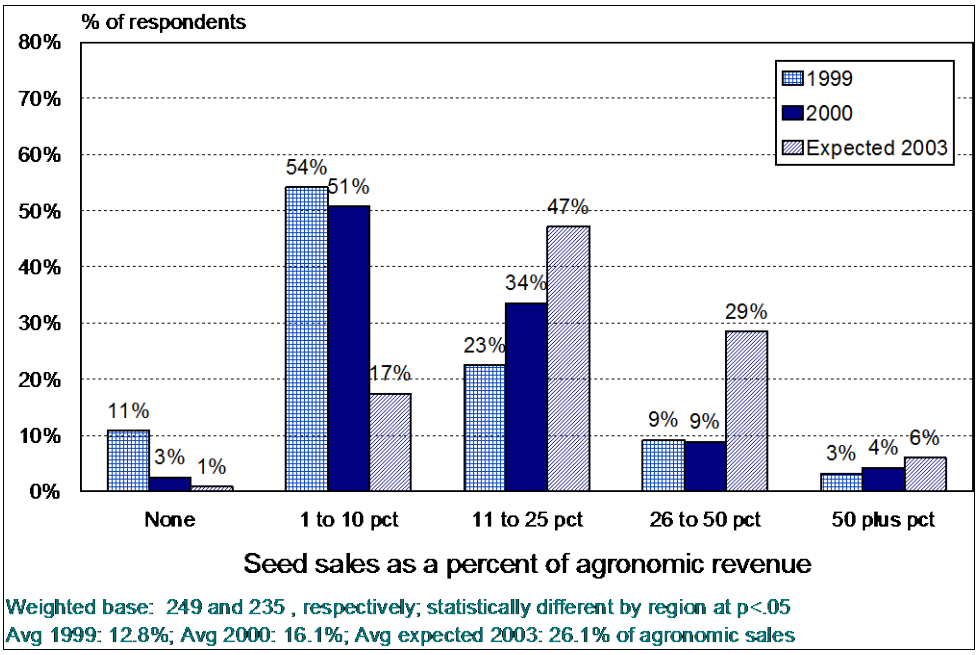
Some 95 percent of the survey respondents sold seed in 2000 – 97 percent in the Midwest and 89 percent in the non-Midwestern states. This represented a large increase from the year before. Not surprisingly, dealerships saw seed becoming an even more important contributor to their total agronomic revenue (sales of fertilizer, chemicals, and seed plus agronomic service income). In 1999, respondents reported that seed sales accounted for an average of 13 percent of their agronomic revenue (Figure 43). In 2000, seed represented 17 percent of their agronomic revenue and by 2003, it was expected to grow to 26 percent of their agronomic revenue. Only 18 percent of the responding dealerships had seed sales accounting for over a quarter of their 2000 agronomic revenue, but by 2003, this was expected to ~~grow~~ more than double to 38 percent of the dealerships.

Figure 43. Seed Sales as a Percent of Agronomic Revenue



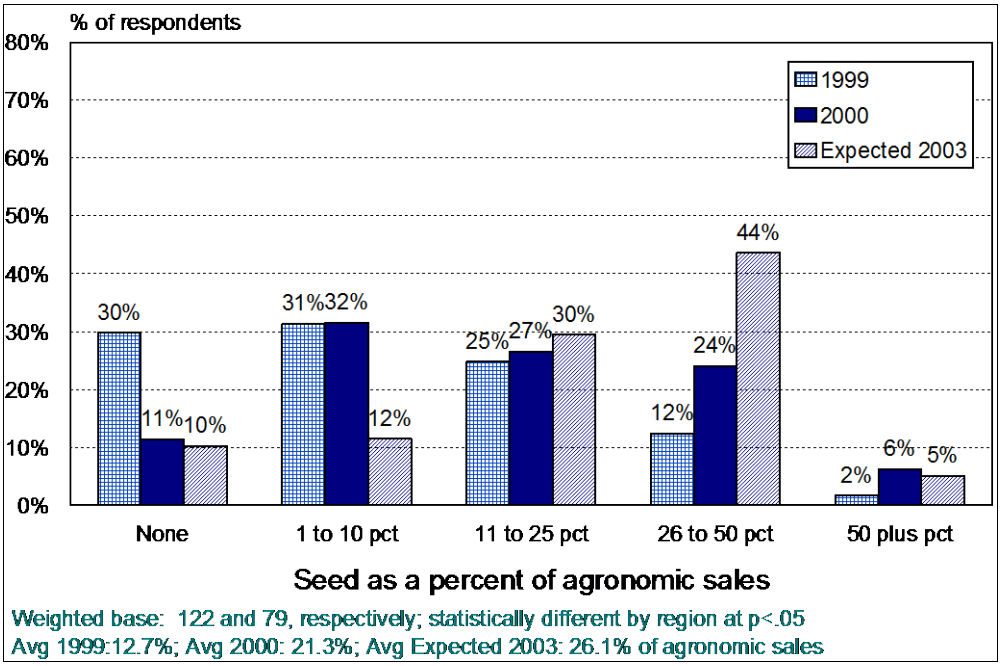
There were significant differences in the importance of seed sales by region. In the Midwest, two-thirds of the respondents said that seed accounted for less than 10 percent of their total agronomic sales in 1999 but this dropped to 54 percent in 2000 and by 2003, only 18 percent of the respondents expected seed to account for less than 10 percent of the agronomic sales (Figure 44).

Figure 44. Seed Sales as a Percent of Agronomic Revenue by Region: Midwest



Non-Midwestern states also expected growth in their seed sales but the change was not nearly as dramatic as that expected in the Midwest and appears to be driven by dealerships who are expanding current seed business rather than adding a new product line (Figure 45). Most of the non-Midwestern dealerships added seed from 1999 to 2000 instead of expecting to grow it in the next 3 years.

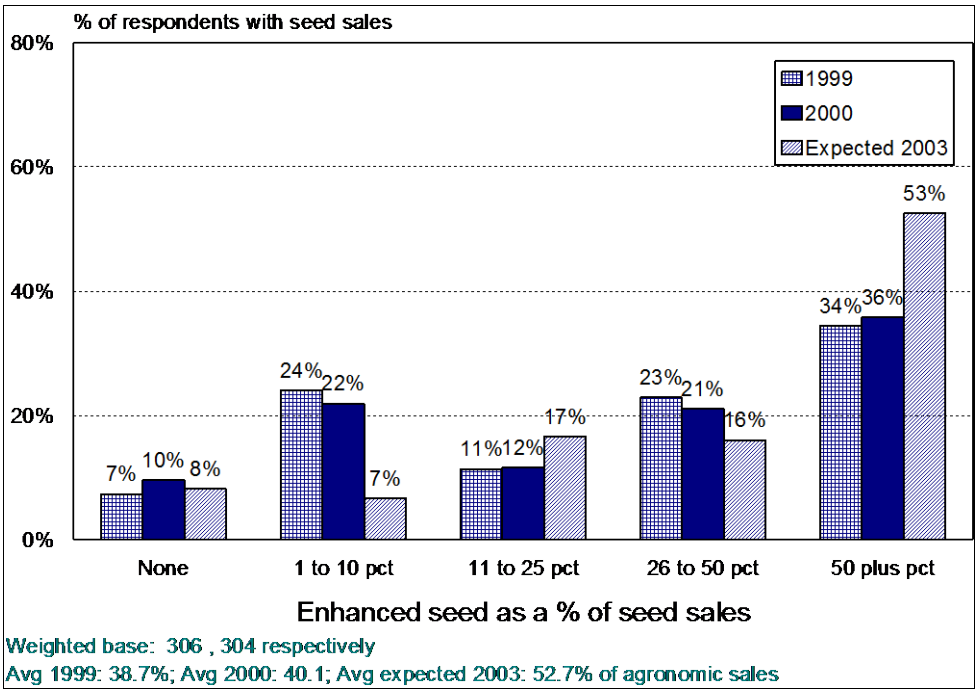
Figure 45. Seed Sales as a Percent of Agronomic Revenue by Region: Other States



Enhanced Seed Sales

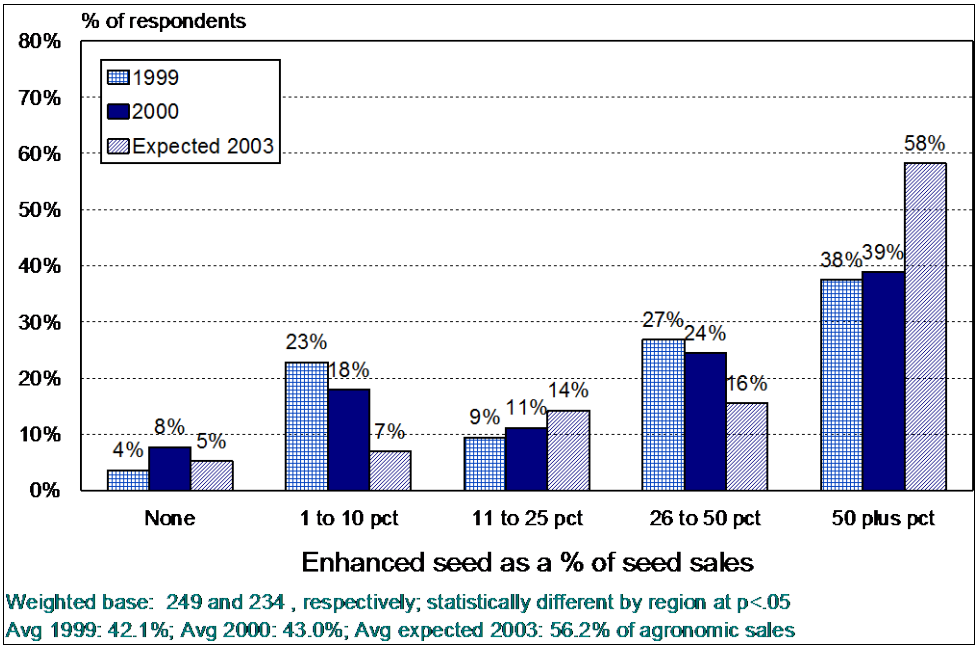
Given the rapid introduction of enhanced seed products over the past few years, it is clear that enhanced seed is no longer a specialty product in general. Nine out of 10 of the dealerships that sold seed also sold enhanced seed in 2000 (Figure 46). The difference was not much different from the amount of enhanced seed sold in 1999. However, dealers expected significant growth in the next 3 years with over half of the respondents indicating they expected enhanced seed to account for more than half of their seed sales by 2003.

Figure 46. Enhanced Seed as a Percent of Seed Sales



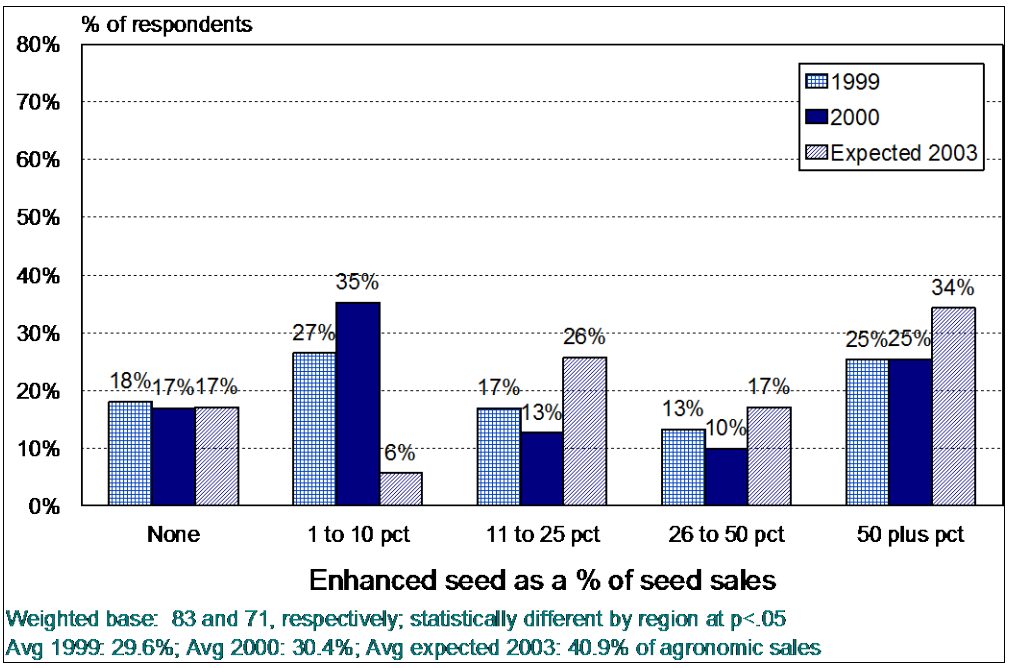
Midwestern dealerships were much more likely to sell enhanced seed relative to dealerships in other states – 92 percent of the Midwestern dealerships selling seed also sold enhanced seed in 2000 (Figure 47). There was not a large difference from 1999 to 2000 in the Midwest but these respondents expected tremendous growth in the next 3 years. On average, respondents expected 56 percent of their seed sales to be from enhanced seed by 2003.

Figure 47. Enhanced Seed as a Percent of Seed Sales by Region: Midwest



Though the proportion of enhanced seed sales was not as great in non-Midwest dealerships, growth outside the Midwest was still expected to be rapid. In the Midwest, enhanced seed accounted for an average of 43 percent of seed sales in 2000 compared to 30 percent in non-Midwestern states (Figure 48). By 2003, non-Midwestern respondents expected enhanced seed to account for 41 percent of their seed sales.

Figure 48. Enhanced Seed as a Percent of Seed Sales by Region: Other States



Summary

Precision technology continues to grow in the agricultural industry among both growers and retail agronomic dealerships. In 2001, though, the use of precision technology by dealerships appears to have shifted from grower services to internal use of the technology. As Purdue agricultural economist Jess Lowenberg-DeBoer has pointed out, one of the major technological changes in agriculture was the introduction of the tractor in the early part of the 20th century. This technology also showed starts and stops in adoption as growers figured out how to adjust the tractor to fit their businesses and how to adjust their businesses to the tractor. In the end, it was half a century before tractors were widely adopted. Precision technology may be showing this same pattern in its adoption starts and stops. As the technology continues to evolve, it can be incorporated more efficiently and economically into the agricultural industry.

Appendix I: Questionnaire

6th ANNUAL PRECISION AG AND ENHANCED SEED DEALERSHIP SURVEY

FARM CHEMICALS • **Purdue University/Center for Agricultural Business**

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:* **FARM CHEMICALS,** *37733 Euclid Ave., Willoughby, OH 44094; Fax: 440-942-0662.* ***PLEASE RETURN BY MARCH 14, 2001.***

1. Your primary responsibility: [*check one*]
   - ☐ Owner/general manager
   - ☐ Precision manager
   - ☐ Technical consultant/agronomist
   - ☐ Other: _____ (Please specify)
   - ☐ Departmental manager
   - ☐ Application manager
   - ☐ Sales/sales management

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 dealerships

4. What was the total annual sales (in dollars) of agronomic products and services (fertilizer, chemicals, seed, services) **at this location** in 2000?
   - ☐ 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

5. How many total retail outlets does ***your company*** own or manage? [*check one*]
   ☐ 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
   - ☐ 201 to 500
   - ☐ 501 to 1000
   - ☐ Over 1000

7. Do you provide custom application? ☐ No → go to Question 11 ☐ 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 11
   - ☐ Under 10,000 acres
   - ☐ 10,001 to 25,000 acres
   - ☐ 25,001 to 50,000 acres
   - ☐ over 50,000 acres

9. In 2000, approximately what proportion of your total fertilizer sales were custom applied? _____%

10. In 2000, approximately what proportion of your total herbicide/pesticide sales were custom applied? _____%

11. Please indicate other agronomic services you provide at your location. [*check all that you provide*]

☐ Seed sales ☐ Agronomic consulting ☐ Soil sampling
☐ Recordkeeping ☐ Computer-aided field mapping ☐ *None of the above*

12. Do you offer soil sampling following a grid pattern and/or by soil type?

☐ 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 ☐ Other: _____

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

☐ GPS guidance systems when applying uniform rates of fertilizer/chemicals to reduce skips and overlaps
☐ 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

14. Does your dealership offer agronomic services for customers, including services such as soil sampling with GPS, field mapping with GIS, variable-rate application and /or agronomic recommendations based on GPS/GIS data

☐ Yes ☐ No (If no, skip to question 21 on Page 4)

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

Service	Fall 2001	Offer by 2003	Never/ Don't Know	Don't offer now but did at one time
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	☐	☐	☐	☐
Agronomic recommendations based on GPS/GIS data	☐	☐	☐	☐
Soil sampling with GPS	☐	☐	☐	☐

16. How many years has your dealership been providing some type of precision service to your customers?

_____Years

17. 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.)
Field mapping (with GIS)	$_____/acre	$_____/(specify units)_____
Manual variable rate application		
Fertilizer/lime	$_____/acre	$_____/(specify units)_____
Lime	$_____/acre	$_____/(specify units)_____
Chemicals	$_____/acre	$_____/(specify units)_____
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)_____
Agronomic recommendations based on GPS/GIS data	$_____/acre	$_____/(specify units)_____
Soil sampling with GPS	$_____/acre	$_____/(specify units)_____

18. Providing precision agriculture services could impact your dealership in several different ways. As a direct result of your precision agriculture package, what changes have you seen so far?

Possible Change	Decrease more than 5%	Decrease 5% to 15%	Decrease less than 5%	No Change	Increase less than 5%	Increase 5% to 15%	Increase more than 15%
Service acres for existing customers	1	2	3	4	5	6	7
Number of customers	1	2	3	4	5	6	7
Product sales	1	2	3	4	5	6	7
Service revenue	1	2	3	4	5	6	7
Market share (in terms of acres)	1	2	3	4	5	6	7
Profit	1	2	3	4	5	6	7

19. 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
Custom application (Not-precision)	1	2	3	4	5
Manual variable rate application	1	2	3	4	5
Soil sampling with GPS	1	2	3	4	5
Data analysis for yield monitors	1	2	3	4	5
Satellite imagery	1	2	3	4	5
Variable seeding rates with GPS	1	2	3	4	5
Controller-driven (GPS) **single** nutrient variable rate application	1	2	3	4	5
Controller-driven (GPS), **multiple** nutrient variable rate application	1	2	3	4	5
Total precision program, all components	1	2	3	4	5

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.)

20. Please rate the following statements as to how strongly you agree or disagree with them. (1=strongly disagree, 7=strongly agree)

	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
It is critical that my company offers precision services in order to remain competitive in my local market.	1	2	3	4	5	6	7
Precision agriculture makes my company a technological leader rather than a follower in my local market.	1	2	3	4	5	6	7
In the long run, precision technologies will be a critical component of farming in my local market.	1	2	3	4	5	6	7

21. What are the ***most challenging internal management problem*** you face in implementing precision services?

_____

_____

_____

_____

_____

_____

22. **Please answer the following question whether or not you offer any precision services.** Approximately what percentage of the total acreage you serve in your market area **(all growers, not just your current customers)** is currently using the following site-specific agricultural techniques? Approximately what percentage of the total acreage you serve will be using these techniques in three years (the year 2003)?

	% of acres served (fill in blank with a percentage; indicate 0 if none)	
Service	**Currently**	**3 years from now (2003)**
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	_____%	_____%
Agronomic recommendations based on GPS/GIS data	_____%	_____%
Soil sampling with GPS	_____%	_____%

23. What **proportion** of your **total sales of agronomic products and services** was accounted for by **seed sales** (of any kind) in 2000? What **proportion** of your **total sales of agronomic products and services** will be accounted for by **seed sales** (of any kind) in three years (2003)? (Enter the percentages in the blanks below.)

	2000	2003(projected)
Seed as a percentage of total sales of agronomic products and services:	_____%	_____%

24. What proportion of your total seed sales was accounted for by **enhanced** seed in 2000? What proportion of your **total seed sales** will be accounted for by **enhanced** seed in 3 years (the year 2003)?

Enhanced seed sales **as a proportion of total seed sales** in 2000: _____ %

Enhanced seed sales **as a proportion of total seed sales** in 3 years (2003): _____ % (projected)

25. 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%

26. Does your location/parent company have a Web site?
☐ Yes ☐ No

27. How many issues of ***FARM CHEMICALS*** magazine do you normally read?
☐ 4 out of 4 ☐ 3 out of 4 ☐ 2 out of 4 ☐ 1 out of 4 ☐ 0 out of 4

28. Approximately how much time do you spend reading an average issue of ***FARM CHEMICALS?***
☐ 2 hours or more ☐ 1 to 2 hours ☐ 1/2 to 1 hour ☐ Less than 1/2 hour ☐ Don't read

29. How many people, other than yourself, read each copy of ***FARM CHEMICALS*** you receive?
☐ None ☐ One ☐ Two ☐ Three ☐ Four ☐ Five or more

30. What is your ZIP code? _____

31. In what state are you located? (use two-letter postal code) _____

Thank you for your cooperation! PLEASE SEND YOUR COMPLETED SURVEY TO:
FARM CHEMICALS, **37733 Euclid Ave., Willoughby, OH 44094, Fax: 440-942-0662.**
DEADLINE: Mar. 14, 2001

Appendix II: Statistical Weighting Scheme

Statistical Weighting Scheme

The breakdown by region, by sales volume, and by organization type of respondents for the 1999, 2000 and 2001 surveys is shown below. Both the 2000 and 2001 results were weighted by the 1999 numbers in order to make the year-to-year changes as comparable as possible.

	1999		2000		2001	
	Number of respondents	**Percent of respondents**	**Number of respondents**	**Percent of respondents**	**Number of respondents**	**Percent of respondents**
Regions						
Midwest	280	66.7%	321	60.7%	168	60.2%
West	48	11.4%	59	11.2%	24	8.6%
South	66	15.7%	115	21.7%	64	22.9%
Northeast	26	6.2%	34	6.4%	23	8.2%
Annual sales $/outlet						
Under $1 million	77	18.3%	116	21.9%	100	36.4%
$1 to under $2 million	67	16.0%	131	24.8%	53	19.3%
$2 to under $3 million	89	21.2%	101	19.1%	29	10.5%
$3 to under $5 million	94	22.4%	80	15.1%	34	12.4%
$5 million or more	93	22.1%	101	19.1%	59	21.5%
Organization type						
Cooperative	175	40.6%	198	37.4%	87	31.5%
Local independent	195	45.2%	257	48.5%	171	62%
Part of national/ regional chain	60	14.2%	75	14.1%	18	6.5%
Total	420		529		280	