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Report 183

# Crop Protectant Operations of Local Farm Supply and Marketing Cooperatives



## Abstract

### Crop Protectant Operations of Local Farm Supply and Marketing Cooperatives

This report analyzes the crop protectant operations of 383 local farm supply and marketing cooperatives. They were surveyed about their 1999 crop protectant sales, source of product, competitors and type of competition, and services offered or desired to offer. Questions focused on global positioning and geographic information systems in crop protectant use and application. Most questions were similar to ones in a 1996 fertilizer survey. That facilitated comparisons. Crop protectant sales trends for these cooperatives during the past 9 years were compared to the prior survey. Data from 10 standard U.S. farm production regions and 4 cooperative sizes and types were compiled.

**Key words:** Cooperatives, crop protectant sales, precision agriculture, GPS/GIS technology, services, and farm supply sales.

E. Eldon Eversull  
Rural Business-Cooperative Service  
U.S. Department of Agriculture

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## **Preface**

This report studied the 1999 crop protectant sales and services of 383 local farmer cooperatives and compared them with crop protectant sales trends during the past 9 years. Changes in operations were also compared to a 1996 fertilizer study. The current study focused on regional differences as well as cooperative size and type differences.

This information provides cooperative managers and boards of directors with a basis for comparing their cooperatives' historical crop protectant sales performance and services offered with representative cooperative data. The author thanks the cooperatives that participated in this study.

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## Highlights

Almost 400 local farm supply and marketing cooperatives provided information about their crop protectant sales, sources, competitors, type of competition, and services. These cooperatives represented 37 percent of locals that sold at least \$0.5 million of crop protectants. In 1999, crop protectant sales of those surveyed were \$830 million, or 40 percent of local agricultural cooperatives' crop protectant sales. The information gathered was combined with similar data from the past 9 years, with comparisons by region, growth in sales, and services offered in a similar 1996 fertilizer study.

Surveyed local cooperatives had crop protectant sales in excess of \$0.5 million. Their 1999 sales averaged \$2.2 million—farm supplies, \$10.6 million; and marketing, \$11.1 million. Their crop protectant sales grew almost 11 percent per year from 1991 to 1999. An analysis of those operations showed:

- Herbicides comprised 81 percent of all crop protectant sales; insecticides, 14 percent; fungicides, 3 percent; and all other crop protectant products, 2 percent.
- Most locals got their crop protectants from regional cooperatives—about 68 percent of herbicides and insecticides and almost 50 percent of fungicides and all other crop protectant products.
- Their primary competitors were private crop protectant suppliers. Other cooperatives were a close second. Most often, price was the major competitive tool.
- More than 95 percent of the cooperatives provided crop protectant application, 93 percent had crop/agronomy specialists, 83 percent offered soil testing for organic matter, and 76 percent supplied crop protectant records. Services offered varied by cooperative size. Those with higher sales volumes offered more services.
- Cooperatives used technology—global positioning system (GPS) and global information system (GIS)—to apply crop protectants. Sixty-eight percent of the cooperative volume was offered with possible field mapping technology (offered, but not necessarily used). It was also offered for record keeping by cooperatives with 48 percent of the crop protectant volume; 57 percent of the volume could be applied with equipment using GPS/GIS.

# Crop Protectant Operations of Local Farm Supply and Marketing Cooperatives

E. Eldon Eversull  
Rural Business-Cooperative Service  
U.S. Department of Agriculture

Local agricultural cooperatives sold \$2.3 billion, or 27 percent, of the \$8.6 billion farmers spent for crop protectants—herbicides, insecticides, fungicides, and all other crop protectant products—in 1999. Protectants accounted for almost 5 percent of total farm production expenditures.

The crop protection industry has had many changes during the past two decades. Increased input costs, environmental concerns, and low crop prices in the 1980s placed more emphasis on sustainable agriculture, using less fertilizers and crop protectants. Interest in technology increased during the 1990s. Technology permitted crop protectants to be applied based on pest presence and crop needs in 2.5- to 4-acre grids mapped with global positioning system (GPS) and geographic information system (GIS) technology.

GPS technology pinpoints within several yards the location of crop protectant application equipment in a farmer's field. GIS maps can then be made that combine the location within the field with soil samples, scouting reports on pest damage, and yield monitor results to crop protection application equipment.

Ground water quality exerted pressure on crop protectant usage in the 1990s. Crop protectants are expensive so farmers strive to use the minimum amount needed. Even with careful usage of crop protectants, urban areas have increasingly looked at farm operations as sources of pollutants and pressured farmers to use less crop protectants to avoid harming urban water quality.

More recently, genetically modified organisms (GMOs) have gained attention. Some GMOs allowed the farmer to use less crop protectants by planting insect-resistant varieties such as Bt corn and Bt cotton. Other GMOs are resistant to popular broad-spectrum

herbicides so they need less crop protectant treatments and because of the reduction in weed pressure on the crop, promote no- or minimum-till practices.

Scientists as well as farmers have broadly embraced the benefits of GMOs and supported their use. Some suggest GMOs may provide the opportunity for farmers to produce enough food to overcome world hunger. Some consumers and/or consumer groups will continue to object to GMOs until they can be shown to directly benefit consumers and are considered safe, for instance, people losing weight from eating foods produced from GMO crops.

Even with this new technology that uses field maps, scouting reports, and aerial photos, farmers still have many decision and interpretation problems. Farmer-owned cooperatives, recognizing the need for better information and analysis, have been on the forefront in providing crop/agronomy specialists to help with recommendations on crop protectant application, field mapping, and record keeping with GPS/GIS.

Local cooperatives were surveyed about their crop protectant sales, sources, competition, and services offered. Questions also focused on the relatively new use of agricultural technology like GPS/GIS in crop protectant application and field mapping. Information from 383 local cooperatives represented 37 percent of locals selling crop protectants. Those sales totaled \$830 million (40 percent of all local cooperative crop protectant sales). The information was combined with crop protectant sales information from the past 9 years and compared with services offered, by region, and a 1996 fertilizer study. Cooperatives again were subdivided into the four size and type categories used in prior studies [Eversull, Rotan].

## All Respondents

Each year, USDA's Rural Business-Cooperative Service (RBS) surveys all farmer cooperatives. Data from this survey and the RBS database were used in this study.

Special questions were attached to the annual surveys of local cooperatives with crop protectant sales in excess of \$0.5 million. Crop protectant sales of these cooperatives averaged \$2.2 million; farm supply sales, \$10.6 million; and marketing sales, \$11.1 million in 1999 (figure 1). Crop protectant sales increased steadily at the rate of about 11 percent per year from 1991 to 1999.

Herbicides, at 81 percent of dollar volume, comprised the bulk of all crop protectant sales; insecticides, 14 percent; fungicides, 3 percent; and all other

crop protectant products, 2 percent. Herbicides were sold by 381 respondents while 353 sold insecticides, 140 sold fungicides, and 90 sold all other crop protectant products.

Most locals got their crop protectants from regionals—about 68 percent of herbicides and insecticides, and a little over 48 percent of fungicides and all other products (table 1). Private dealers/suppliers and manufacturers provided about 30 percent of the herbicides and insecticides and about 50 percent of the fungicides and all other products.

The respondents were also asked whom they considered their top three competitors (table 2). A private supplier of crop protectants was considered the strongest for competitors number one through competitors number three. For competitor number one, a private supplier was the top competitor 51 percent of

Figure 1—Average Respondent Sales

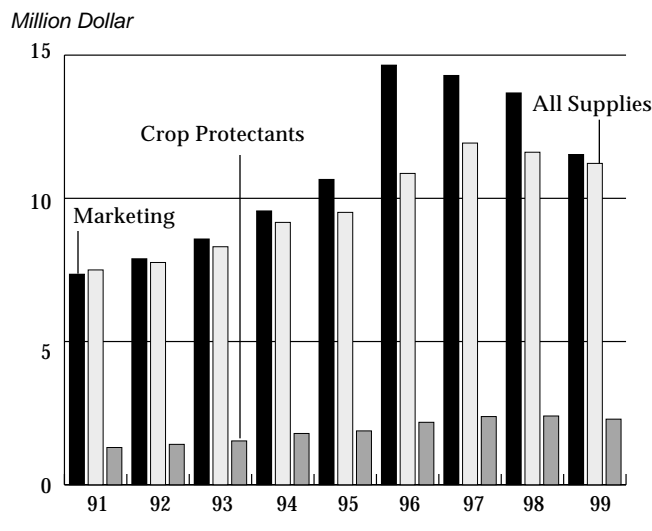


Table 2—Top three crop protectant competitors weighted by sales <sup>1</sup>

Competitor	Private supplier	Other cooperative	Private manufacturer	Dealer
	<i>Percent</i>			
Number One	50.88	36.02	2.35	10.75
Number Two <sup>2</sup>	42.86	39.99	4.57	12.58
Number Three <sup>2</sup>	37.47	32.55	7.05	22.93

<sup>1</sup> Might not add due to rounding.

<sup>2</sup> Values for competitors two and three may not add to 100 because not all cooperatives had more than one competitor.

Table 1—Sources of crop protectants, weighted by sales <sup>1</sup>

Crop protectant	Regional cooperative	Other cooperative	Private manufacturer	Private dealer/supplier	Other
	<i>Percent</i>				
All crop protectants	67.42	1.04	9.98	21.54	0.03
Herbicides	68.41	1.11	9.48	20.96	.03
Insecticides	67.46	.87	12.78	13.91	5.44
Fungicides	48.42	.11	13.91	37.56	—
All other products	50.36	.47	5.44	43.35	.38

<sup>1</sup> Might not add due to rounding.

— = Not available.



the time. An "other" cooperative was the strongest for competitors number one through three about a third of the time.

The respondents were asked how they competed with their top three competitors in three categories—price; advisory scouting and other services; and product quality and availability. Price was the competitive tool used most often (table 3). Crop protectant quality and availability did not seem to be much of an issue. For competition with private suppliers, price was always more than twice as important as providing advisory services, scouting, and other services. An "other" cooperative also competed on price, but providing advisory services, scouting, and other services was a very close second competitive tool. Private crop protectant manufacturers and dealers were very price competitive.

Services offered in conjunction with crop protectant sales ranged from application to crop protectant record keeping (table 4). Crop protectants were applied by cooperative personnel using its equipment. Crop protectants used were often a liquid spray but

Table 4—Services offered, weighted by sales

Services	Currently offer	Would like to offer
	Percent	
Crop protectant application	95.56	0.26
Crop/agronomy specialist— recommendations and scouting	93.10	1.84
Soil testing for organic matter	82.92	5.72
Record keeping of crop protectant usage	76.16	14.01
Infrared, satellite, and other aerial photography	11.74	16.82
Field mapping/recommendations using GPS/GIS	68.22	16.00
Application equipment with GPS units	56.54	21.92
Record keeping with GPS/GIS	48.12	25.10

Table 3—Type of competition by top competitors, weighted by sales <sup>1</sup>

Competitor	Competition by:		
	Price	Advisory scouting, other services	Product quality and availability
	<i>Percent of the time these tools were most important</i>		
<b>Number One</b>			
Private supplier	56.51	26.73	16.76
Another cooperative	47.64	40.42	11.95
Private manufacturer	51.58	46.31	2.11
Dealer	74.99	9.09	15.93
<b>Number Two <sup>2</sup></b>			
Private supplier	58.91	22.78	18.31
Another cooperative	43.52	37.93	18.54
Private manufacturer	68.00	15.33	16.67
Dealer	59.12	27.25	13.63
<b>Number Three <sup>2</sup></b>			
Private supplier	58.97	24.93	16.09
Another cooperative	43.46	39.68	16.86
Private manufacturer	75.08	16.74	8.18
Dealer	75.18	16.28	8.54

<sup>1</sup> May not add due to rounding.

<sup>2</sup> Values for competitors two and three may not add to 100 because not all cooperatives had more than one competitor.

could also be dry flowable. A crop/agronomy specialist could make recommendations on seed, fertilizer, and crop protectant needs. The specialist also could make on-farm visits to scout fields for pests and prescribe the appropriate remedies. Soil testing was for organic matter. Records were maintained to document when, how, and at what rate crop protectants were applied. Infrared, satellite, and other aerial photography devices were used to check crop health. Photos can show weak stands while lighter or darker colors could show crop damage. Infrared photos could also show crop damage through the analysis of different plant colors.

There were also questions on GPS/GIS services offered. The field mapping service could be provided using GPS units and information then combined in GIS maps looking at fertilizer usage, crop protectant applications and rates, and yield monitor results. Application equipment with GPS units allowed crop protectants to be applied based on GIS maps or on current infrared, satellite, or other aerial photographs. The final service asked was on the provision of crop protectant usage records to the farmer based on information generated using GPS/GIS sources.

Most respondents (96 percent) offered application services for crop protectants. Ninety-three percent of the cooperatives employed crop/agronomy specialists for recommendations and scouting. About 83 percent offered soil tests for organic matter. Seventy-six percent recorded the type and amount of crop protectants applied to farmers' fields. Infrared, satellite, and standard aerial photography of fields were offered much

less frequently (about 12 percent). In the future, 17 percent of the respondents would like to add photography analysis.

Cooperatives have embraced the use of GPS/GIS in agronomy sales. About 24 percent of the respondents in the 1996 fertilizer study had application equipment that used GPS/GIS technology. Three years later, the percentage had more than doubled—57 percent of the same respondents from 1996 had application equipment with the technology. Sixty-eight percent were able to prepare field maps with the aid of GPS and almost half could combine the maps with crop protectant application for record-keeping purposes. At least 16 percent wanted to add GPS services.

### Quintile Rankings—Sales Growth

This section ranks the respondents by crop protectant sales growth from 1991 through 1999. There were 295 (out of the 383) that replied to the RBS annual survey for 1991-99. Initially, the top 59 cooperatives in crop protectant sales growth were in quintile 1, the second 59 in quintile 2, etc. After analyzing the data, 7 cooperatives were dropped, leaving a data set of 288 cooperatives. The quintile 1 rate of growth was a rather large 26 percent per year (table 5). Thirty-two of these cooperatives participated in mergers or acquisitions with other cooperatives during the period, thus greatly increasing their growth. The quintile 5 group only had 10 mergers or acquisitions and also closed 7 branches. In terms of crop protectant sales, the top group was much larger than the other four, almost half again larger.

The top growth cooperatives were not only larger but they also relied a little less on regional coopera-

tives as their source of crop protectants, buying about 65 percent from regionals. The others purchased almost 70 percent. With their presumably bigger market territories because of their larger size, they also felt

Table 6—Top three competitors based on quintile growth, weighted by sales <sup>1</sup>

Competitor	Private supplier	Other cooperative	Private manufacturer	Dealer
<i>Percent</i>				
<b>Number One</b>				
Quintile 1	44.48	53.48	—	2.05
Quintile 2	46.38	32.60	4.26	16.75
Quintile 3	52.84	33.23	2.32	11.62
Quintile 4	61.69	31.05	—	7.25
Quintile 5	53.37	30.91	1.86	13.86
<b>Number Two <sup>2</sup></b>				
Quintile 1	47.79	36.46	2.48	13.26
Quintile 2	43.84	32.27	7.07	16.82
Quintile 3	42.08	39.93	4.64	13.34
Quintile 4	41.07	44.98	2.28	11.67
Quintile 5	41.00	46.53	1.37	11.10
<b>Number Three <sup>2</sup></b>				
Quintile 1	22.67	41.75	4.13	31.45
Quintile 2	33.43	39.81	4.03	22.73
Quintile 3	33.34	40.17	6.52	19.98
Quintile 4	49.46	23.87	16.02	10.65
Quintile 5	48.30	18.89	7.37	25.45

<sup>1</sup> Might not add due to rounding.

<sup>2</sup> Values for competitors two and three may not add to 100 because not all cooperatives had more than one competitor.

— = Not available.

Table 5—Quintile ranking of respondents based on crop protectant sales growth

Item	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
<i>Percent</i>					
Growth per year	26.41	12.58	8.74	5.90	1.24
<i>Number</i>					
Number of cooperatives	56	58	59	58	57
Mergers or acquisitions	32	26	18	20	10
Branch closures	—	—	—	1	7
<i>Dollars</i>					
Crop protectant sales	3,018,837	2,382,529	1,873,193	2,344,048	1,903,127

— = Not available.

Table 7—Type of competition by the top three quintile 1 and 5 competitors, weighted by sales <sup>1</sup>

Competitor	Type of competition					
	Price	Advisory scouting, other services	Product quality & availability	Price	Advisory scouting, other services	Product quality & availability
	<i>Percent</i>					
<b>Quintile 1 <sup>2</sup></b>	<b>Quintile 5 <sup>2</sup></b>					
<b>Number one competitor</b>						
Private supplier	53.58	35.73	10.69	62.48	27.24	10.28
Other cooperative	27.09	58.21	14.70	65.79	21.95	12.26
Dealer	—	—	—	47.99	8.29	43.72
<b>Number two competitor <sup>3</sup></b>						
Private supplier	39.22	33.60	27.19	64.07	24.43	11.50
Other cooperative	25.65	52.59	21.76	38.31	38.83	22.85
<b>Number three competitor <sup>3</sup></b>						
Private supplier	44.76	32.09	23.15	53.28	33.10	13.62
Other cooperative	33.90	52.61	13.49	55.13	29.09	15.78
Dealer	82.08	11.19	6.73	57.90	32.25	9.85

<sup>1</sup> May not add due to rounding.

<sup>2</sup> Only competitors with 6 or more responses included. Private manufacturers were considered as competitors by less than 6 respondent cooperatives so were dropped from this table as were dealers when there were less than 6 responses.

<sup>3</sup> Values for competitors two and three may not add to 100 because not all cooperatives had more than one competitor.

— = Not available.

other cooperatives were their top competition (table 6). The number two competitor was most often a private supplier except for quintile 4 and 5 cooperatives. The number three competitor shifted back to other cooperatives for quintile 1 through 3 cooperatives.

In table 7, the form of competition by the top three competitors is presented. Looking back at competition in table 3, price was always most important while in this table the quintile 1 cooperatives felt that offering advisory, scouting, and other services was their main competitive tool against another cooperative. Competition with dealers was most often on price (not shown in this table because there were fewer than 6 responses, price competition was important with private manufacturers as the competitor, as would be expected). Although competitors for quintiles 2 through 4 are not shown in this table, their responses are similar to those of quintile 5. Quintile 5 cooperatives mainly competed on price. Quintile 5 cooperatives were generally smaller and had less resources available to provide services and thus price competition was more important.

All cooperatives offered fairly similar levels of application and crop/agronomy specialists—over 90

percent for both services (table 8). Quintile 1 cooperatives offered higher levels of infrared, satellite, and other aerial photography devices; soil testing for organic matter; and record keeping—from 6 to 16 points different from the slowest growing cooperatives. The difference was even more evident in the GPS/GIS services. Many services offered more often by the quintile 1 cooperatives were expensive and beyond the basic need of application and recommendations/scouting necessary for crop protection sales. Part of the reason quintile 1 cooperatives offered the other services more often could be because of their larger size and the fact that they sold about 50 percent more dollars of crop protectants than the other cooperatives.

### GPS/GIS Technology

Cooperatives that have adopted GPS/GIS technologies tended to have larger crop protectant sales, but not necessarily those that have experienced large growth in these sales. This section focuses on the 185 cooperatives that offered field mapping, the most popular use of GPS/GIS technology, and compares them with the other 198 respondents. Although these 198

Table 8—Crop protectant services that cooperatives offer or would like to offer by growth, weighted by sales

Services	Currently offer	Would like to offer	Services	Currently offer	Would like to offer
	<i>Percent</i>			<i>Percent</i>	
<b>Crop protectant application</b>			<b>Infrared, satellite, and other aerial photography</b>		
Quintile 1	98.65	0.47	Quintile 1	17.77	9.65
Quintile 2	95.91	—	Quintile 2	15.64	17.62
Quintile 3	90.96	0.00	Quintile 3	13.77	20.53
Quintile 4	93.27	0.83	Quintile 4	8.21	13.05
Quintile 5	97.75	—	Quintile 5	1.07	12.61
<b>Crop/agronomy specialists—recommendations &amp; scouting</b>			<b>Record keeping—crop protectant usage</b>		
Quintile 1	95.59	2.65	Quintile 1	86.67	11.80
Quintile 2	98.11	—	Quintile 2	70.82	12.79
Quintile 3	91.84	0.52	Quintile 3	74.42	14.72
Quintile 4	93.42	2.33	Quintile 4	74.44	16.35
Quintile 5	93.76	1.46	Quintile 5	72.43	13.53
<b>Soil testing for organic matter</b>			<b>Application equipment with GPS units</b>		
Quintile 1	91.39	4.16	Quintile 1	75.09	13.54
Quintile 2	79.25	9.35	Quintile 2	62.05	17.63
Quintile 3	74.87	9.40	Quintile 3	44.98	22.67
Quintile 4	87.05	3.75	Quintile 4	56.40	26.40
Quintile 5	85.89	1.57	Quintile 5	57.60	13.92
<b>Field mapping/recommendations using GPS/GIS</b>			<b>Record keeping with GPS/GIS</b>		
Quintile 1	79.32	10.60	Quintile 1	69.79	17.08
Quintile 2	68.59	17.11	Quintile 2	46.50	20.99
Quintile 3	53.92	23.45	Quintile 3	33.40	33.22
Quintile 4	66.56	13.58	Quintile 4	45.62	27.77
Quintile 5	75.93	6.95	Quintile 5	52.03	18.96

— = Not available.

cooperatives did not offer GPS/GIS technology now, their responses in table 10 indicated that half of these cooperatives would like to offer the technology in the future.

The cooperatives that have adopted this technology were larger than the average respondent—crop protectant sales averaged \$3.1 million compared with \$1.3 million for the others. These cooperatives were more likely to purchase their crop protectants from a regional cooperative (table 9). About 73 percent of the herbicides and insecticides bought by GPS/GIS cooperatives were purchased from regional cooperatives while all other cooperatives purchased about 58 percent. The regionals represented most often in this survey—Cenex Harvest States/Land O’Lakes, Farmland, and Growmark—were most likely supplying both crop protectants and promoting GPS/GIS technology to many of these local cooperatives.

The competitors the GPS/GIS cooperatives faced and types of competition were very similar to that reported for all cooperatives in tables 2 and 3. A private supplier was most often the major competitor and price was the major competitive tool. Services were probably important to these cooperatives because they made crop protectant recommendations and interpreted the field maps based on the GPS/GIS technology. Almost 100 percent of the GPS/GIS cooperatives applied crop protectants while 87 percent of the others did so (table 10). These cooperatives were also more likely to use field photographs, employ crop/agronomy specialists for field scouting, soil test for organic matter, and keep records of farmers’ use of crop protectants.

Cooperatives in this section were selected because they mapped fields using GPS/GIS, so they would all offer it and the other cooperatives would

Table 9—Sources of crop protectants for cooperatives that offer GPS/GIS field mapping, and all other, weighted by sales <sup>1</sup>

Crop protectant	Regional cooperative	Other cooperative	Private manufacturer	Private dealer/supplier	Other
<i>Percent</i>					
<b>Herbicides</b>					
GPS/GIS cooperatives	73.46	1.17	7.08	18.25	0.04
All other cooperatives	57.52	0.98	14.68	26.82	—
<b>Insecticides</b>					
GPS/GIS cooperatives	73.00	1.01	9.43	16.55	0.02
All other cooperatives	54.77	0.55	20.45	24.22	—
<b>Fungicides</b>					
GPS/GIS cooperatives	52.73	0.19	12.72	34.36	0.01
All other cooperatives	43.86	0.03	15.18	40.94	—
<b>All other products</b>					
GPS/GIS cooperatives	57.78	0.58	7.14	34.11	0.39
All other cooperatives	30.13	0.16	0.83	68.52	0.37

<sup>1</sup> Might not add due to rounding.  
 — = Not available.

Table 10—Crop protectant services that GPS/GIS field mapping cooperatives and all other offer or would like to offer, weighted by sales

Services	Currently offer	Would like to offer	Services	Currently offer	Would like to offer
<i>Percent</i>			<i>Percent</i>		
<b>Crop protectant application</b>			<b>Infrared, satellite, &amp; other aerial photography</b>		
GPS/GIS cooperatives	99.80	0.20	GPS/GIS cooperatives	15.66	14.98
All other cooperatives	86.46	0.39	All other cooperatives	3.32	20.78
<b>Crop/agronomy specialists—recommendations &amp; scouting</b>			<b>Record keeping—crop protectant usage</b>		
GPS/GIS cooperatives	98.85	0.47	GPS/GIS cooperatives	83.94	10.66
All other cooperatives	80.78	4.76	All other cooperatives	59.48	21.21
<b>Soil testing for organic matter</b>			<b>Application equipment with GPS units</b>		
GPS/GIS cooperatives	95.77	1.80	GPS/GIS cooperatives	78.22	12.19
All other cooperatives	55.35	14.11	All other cooperatives	9.99	42.81
<b>Field mapping/recommendations using GPS/GIS</b>			<b>Record keeping with GPS/GIS</b>		
GPS/GIS cooperatives	100.00	—	GPS/GIS cooperatives	69.02	16.99
All other cooperatives	—	49.77	All other cooperatives	3.26	42.53

— = Not available.

not. Half of the other cooperatives would like to offer field mapping sometime in the future. Almost 80 percent of the GPS/GIS cooperatives have crop protection application equipment that can be guided by GPS units. Only 10 percent of the other cooperatives have GPS guided application equipment, but 43 percent would like to. Keeping records of farmers' fields could be done using GPS/GIS technology by 69 percent of the cooperatives while about 3 percent of the other cooperatives were capable of doing this. Again, about 43 percent of the other cooperatives would like to be able to do this.

## Regional Comparisons

More so than any prior comparisons in this study, there were regional differences in cooperative crop protectant operations. Ten standard farm production regions<sup>1</sup> were used. Because of the small number of respondents, the Northeast and Appalachian (NE&AP) regions were combined as were the Southeast and Delta States (SE&DS). The number of cooperative respondents in each region is presented in table 11. The Corn Belt (CB) had the most respondents, followed by the Lake States (LS) and Northern Plains (NP). The CB also had some large respondents, resulting in crop protectant sales averaging almost \$3.2 million. For some of the regions, especially NE&AP, SE&DS, and Pacific (PA) with their small number of respondent cooperatives, it would be impossible to say the sample populations were representative. But, the information may still be useful to these cooperatives.

NE&AP and NP cooperatives were most likely to purchase their crop protectants from regionals (table 12). SE&DS and Southern Plains (SP) cooperatives purchased almost half of their crop protectants from private manufacturers and dealer/suppliers while more than half of the Mountain (MT) and PA cooperatives did so.

Table 11—Number of cooperatives by region and their average crop protectant sales

Regions	Number of cooperatives	Average crop protectant sales
	<i>Number</i>	<i>Dollars</i>
All	383	2,167,501
Northeast and Appalachian	17	1,708,050
Southeast and Delta States	9	3,193,878
Southern Plains	9	1,599,853
Corn Belt	143	2,844,934
Lake States	89	1,722,857
Northern Plains	89	1,536,846
Mountain	18	2,027,861
Pacific	9	2,725,752

<sup>1</sup> Standard farm production regions used, Northeast: ME, NH, VT, NY, MA, RI, CT, PA, NJ, DE, MD, and DC. Lake States: MI, WI, and MN. Corn Belt: OH, IN, IL, IA, and MO. Northern Plains: ND, SD, NE, and KS. Appalachian: VA, WV, KY, TN, and NC. Southeast: SC, GA, AL, and FL. Delta States: MS, LA, and AR. Southern Plains: OK and TX. Mountain: MT, ID, WY, CO, UT, NV, AZ, and NM. Pacific: WA, OR, CA, HI, and AK.

Table 12—Sources of crop protectants by region, weighted by sales <sup>1</sup>

Regions	Regional cooperative	Other cooperative	Private manufacturer	Private dealer/supplier	Other
	<i>Percent</i>				
All	67.42	1.04	9.98	21.54	0.03
Northeast and Appalachian	88.21	—	1.13	10.66	—
Southeast and Delta States	50.88	—	36.16	12.95	—
Southern Plains	52.95	—	16.68	30.37	—
Corn Belt	68.48	1.32	6.75	23.42	0.03
Lake States	67.69	1.57	8.50	22.17	0.07
Northern Plains	78.83	0.61	8.48	12.05	0.03
Mountain	44.24	0.02	27.96	27.78	—
Pacific	22.07	—	30.13	47.80	—

<sup>1</sup> Might not add due to rounding.  
— = Not available.

Table 13—Top three competitors by region, weighted by sales <sup>1</sup>

Competitor	Private supplier	Other cooperative	Private manufacturer	Dealer
<i>Percent</i>				
<b>Number One</b>				
Northeast & Appalachian	69.43	6.45	—	24.12
Southeast & Delta States	32.39	45.68	—	21.93
Southern Plains	55.77	16.79	22.19	5.25
Corn Belt	53.41	35.15	2.56	8.88
Lake States	33.83	52.10	3.52	10.55
Northern Plains	54.76	31.92	0.38	12.94
Mountain	44.66	41.19	—	14.15
Pacific	100.00	—	—	—
<b>Number Two <sup>2</sup></b>				
Northeast & Appalachian	61.55	18.29	—	20.16
Southeast & Delta States	42.33	14.26	—	43.41
Southern Plains	74.59	8.71	7.22	9.47
Corn Belt	42.10	44.79	1.50	11.61
Lake States	38.20	47.54	3.06	11.20
Northern Plains	37.82	37.97	10.31	13.90
Mountain	35.91	31.92	30.93	1.24
Pacific	100.00	—	—	—
<b>Number Three <sup>2</sup></b>				
Northeast & Appalachian	57.37	5.32	2.66	34.65
Southeast & Delta States	56.90	11.25	20.91	10.94
Southern Plains	43.56	—	9.28	47.17
Corn Belt	33.68	32.24	7.44	26.64
Lake States	40.79	40.39	3.24	15.58
Northern Plains	31.26	41.97	9.71	17.06
Mountain	48.41	25.79	1.48	24.32
Pacific	68.31	—	5.83	25.86

<sup>1</sup> Might not add due to rounding.

<sup>2</sup> Values for competitors two and three may not add to 100 because not all cooperatives had more than one competitor.

— = Not available.

Competitors vary quite a bit among regions (table 13). The NE&AP and PA most often have private suppliers as competitors. The CB, LS, and NP, where more cooperatives are located, have an "other" cooperative as a competitor more often. Price was generally the most important form of competition (table 14). The analysis in this table was limited to those competitors and regions where there were at least six responses in the categories, so competitors were narrowed to private suppliers and other cooperatives. Due to the limited number of responses, the SE&DS and SP regions were dropped from this table. Competition in the LS focused on price even though there were at least 30 cooperatives in each category (i.e. 30 responses to number one competitor was a private supplier and 30

responses to number one competitor was an "other" cooperative). This was odd in that cooperatives in the LS offered a lot of services (table 15). The deviation from price competition comes in the CB where advisory recommendations, field scouting, and other services were most important when competing with another cooperative.

By region, services offered varied greatly, with the SP and PA regions most often offering the fewest services (table 15). Cooperatives in most regions had a high incidence of offering application and crop/agronomy specialists for recommendations and field scouting. Record keeping of crop protectant usage was offered less often, but if the cooperatives wanting to offer record keeping in the future were added to those

Table 14—Top three competitors and type of competition by region, weighted by sales <sup>1</sup>

Region	Competitor <sup>2</sup>	Type of competition		
		Price	Advisory scouting, other services	Product quality & availability
		<i>Percent</i>		
<b>Number One</b>				
Northeast & Appalachian	Private supplier	43.93	32.94	23.14
Corn Belt	Private supplier	52.76	28.43	18.81
	Other cooperative	34.94	52.50	12.56
Lake States	Private supplier	76.20	12.85	10.95
	Other cooperative	57.19	30.37	12.44
Northern Plains	Private supplier	56.24	29.17	14.59
	Other cooperative	47.07	38.79	14.14
Mountain	Private supplier	76.46	11.77	11.77
	Other cooperative	67.64	23.48	8.87
Pacific	Private supplier	46.37	41.71	11.92
<b>Number Two <sup>3</sup></b>				
Northeast & Appalachian	Private supplier	53.95	24.25	21.80
Corn Belt	Private supplier	51.85	28.79	19.36
	Other cooperative	35.78	44.08	20.15
Lake States	Private supplier	73.17	14.91	11.92
	Other cooperative	54.66	29.82	15.52
Northern Plains	Private supplier	70.30	13.68	16.01
	Other cooperative	49.45	34.56	15.99
Mountain	Private supplier	57.91	7.01	35.08
	Other cooperative	75.71	2.26	22.03
Pacific	Private supplier	40.95	34.18	24.87
<b>Number Three <sup>3</sup></b>				
Corn Belt	Private supplier	45.08	33.51	21.41
	Other cooperative	33.87	49.03	17.10
Lake States	Private supplier	76.77	16.61	6.61
	Other cooperative	53.94	27.11	18.95
Northern Plains	Private supplier	75.51	15.16	9.33
	Other cooperative	47.97	35.81	16.22
Mountain	Private supplier	75.58	15.44	8.98

<sup>1</sup> Might not add due to rounding.

<sup>2</sup> Competitors limited to those having 6 responses—private manufacturers and dealers excluded because of too few responses.

<sup>3</sup> Values for competitors two and three may not add to 100 because not all cooperatives had more than one competitor.



Table 15—Crop protectant services that cooperatives offer or would like to offer by regions, weighted by sales

Services	Currently offer	Would like to offer	Services	Currently offer	Would like to offer
	<i>Percent</i>			<i>Percent</i>	
<b>Crop protectant application</b>			<b>Crop/agronomy specialists—recommendations &amp; scouting</b>		
Northeast and Appalachian	96.33	—	Northeast and Appalachian	94.42	—
Southeast and Delta States	92.72	—	Southeast and Delta States	100.00	—
Southern Plains	79.51	1.62	Southern Plains	71.87	1.62
Corn Belt	97.56	—	Corn Belt	96.15	0.78
Lake States	97.01	—	Lake States	94.30	0.48
Northern Plains	97.41	0.83	Northern Plains	85.40	8.11
Mountain	89.64	2.19	Mountain	99.45	—
Pacific	63.68	—	Pacific	71.35	—
<b>Soil testing for organic matter</b>			<b>Record keeping—crop protectant usage</b>		
Northeast and Appalachian	86.99	—	Northeast and Appalachian	39.78	17.76
Southeast and Delta States	74.35	16.11	Southeast and Delta States	55.97	24.36
Southern Plains	81.13	—	Southern Plains	46.51	30.48
Corn Belt	91.19	2.57	Corn Belt	85.62	8.27
Lake States	80.07	7.51	Lake States	78.48	12.46
Northern Plains	75.44	7.88	Northern Plains	67.04	20.53
Mountain	67.99	14.01	Mountain	66.70	32.76
Pacific	33.79	20.21	Pacific	53.87	28.52
<b>Infrared, satellite, and other aerial photography</b>			<b>Field mapping/recommendations using GPS/GIS</b>		
Northeast and Appalachian	12.88	3.67	Northeast and Appalachian	73.83	6.75
Southeast and Delta States	—	15.69	Southeast and Delta States	46.63	—
Southern Plains	—	8.30	Southern Plains	—	36.91
Corn Belt	12.52	13.04	Corn Belt	84.94	6.38
Lake States	15.89	22.56	Lake States	65.85	18.38
Northern Plains	10.36	20.95	Northern Plains	48.11	26.06
Mountain	4.17	26.22	Mountain	40.68	54.53
Pacific	11.01	28.52	Pacific	17.52	64.86
<b>Application equipment with GPS units</b>			<b>Record keeping with GPS/GIS</b>		
Northeast and Appalachian	61.56	18.41	Northeast and Appalachian	24.46	19.23
Southeast and Delta States	76.20	—	Southeast and Delta States	30.52	—
Southern Plains	53.53	14.72	Southern Plains	—	36.91
Corn Belt	68.98	13.59	Corn Belt	65.82	15.20
Lake States	47.49	28.19	Lake States	40.72	30.65
Northern Plains	38.46	33.25	Northern Plains	31.53	40.17
Mountain	43.25	51.96	Mountain	28.06	59.65
Pacific	—	47.13	Pacific	—	48.73

— = Not available.

already offering it, there appears to be a great interest in record keeping. Infrared, satellite, and other aerial photography for field analysis was offered the least, but many cooperatives would like to offer this service in the future.

The use of GPS/GIS technology seemed to be centered in the CB where the cooperatives were some of the largest respondents and corn and soybeans were the predominant crops. Almost 69 percent of the application equipment in the CB had GPS units; field mapping could be made with GPS/GIS technology by 85 percent of the cooperatives, and record keeping with this technology by 66 percent. The use of GPS/GIS technology seems to fall with cooperative size and when the predominant crops were not corn and soybeans.

For the cooperative to apply crop protectants with GPS equipment, field maps have to be generated. These maps are generally segmented into 2.5- to 4-acre grids. Crop protectants are applied in the individual grids based on soil tests, infrared, satellite, and aerial photography, and field scouting. The analysis of the information and the maps generated are only as good as their interpretation. Many farmers rely on outside help to scout their fields for crop protection. In the CB and LS, where 85 percent and 66 percent of the respondents, respectively, provide field mapping, cooperatives also employ crop/agronomy specialists more than 94 percent of the time. While the survey did not specifically ask if the cooperative provided interpretation of the GPS/GIS information, that would be a safe assumption given the equipment and services.

## Size and Type Comparisons

Previous studies using the RBS database have found differences in cooperative operations when the cooperatives were classified by size and type. Those in this study were divided into size and type using criteria developed in previous reports.

Since sales of crop protectants in this study had to be greater than \$0.5 million, there were few small cooperative respondents. About 70 percent were large and super cooperatives, and half mostly sold farm supplies (table 16).

There were small differences by size and type for the source of their crop protectants. Although not shown, the majority received their crop protectants from regional cooperatives, with additional amounts coming from private suppliers and manufacturers. There were also small differences in the competitors that these cooperatives faced and the type of competition. As found in prior sections, private suppliers were the top competitors and price was the main competitive tool. The exception was marketing cooperatives for which the main competitor was another cooperative. Their prime competitor was another cooperative 63 percent of the time; number two, 51 percent; and number three, 53 percent.

The major difference in size and type was in services offered (table 17). Many services require expensive equipment, specially trained personnel, or both, making their offer more possible as cooperative size increases. By size and type, more than 90 percent of the respondents offered crop protectant application with the exception of small cooperatives (77 percent). Infrared, satellite, and other aerial photography showed no real size-related pattern, as both small and

Table 16—Size and type definitions, number, and average crop protectant sales

	Definition	Cooperatives	
		Number	Dollars
<b>Cooperative size</b>			
Small	up to \$5 million in total sales	33	936,991
Medium	\$5 million to \$10 million	85	1,115,988
Large	\$10 million to \$20 million	126	1,557,923
Super	\$20 million and more	139	3,655,215
<b>Cooperative type</b>			
Farm supply	total net sales from farm supplies	131	2,095,279
Mixed farm supply	from 50 to 99 percent	77	1,935,974
Mixed marketing	from 25 to 49 percent	130	2,364,875
Marketing	less than 25 percent	45	2,203,721

Table 17—Crop protectant services that cooperatives offer or would like to offer by size and type

Services	Currently offer	Would like to offer	Services	Currently offer	Would like to offer
<i>Cooperative size</i>	<i>Percent</i>		<i>Cooperative type</i>	<i>Percent</i>	
<b>Crop protectant application</b>					
Small	76.99	—	Farm supply	90.60	0.41
Medium	92.55	1.19	Mixed farm supply	99.44	0.54
Large	90.95	0.53	Mixed marketing	96.89	0.08
Super	99.04	—	Marketing	99.35	—
<b>Infrared, satellite, and other aerial photography</b>					
Small	—	13.44	Farm supply	8.03	21.18
Medium	12.53	18.79	Mixed farm supply	6.75	12.82
Large	2.26	16.93	Mixed marketing	12.80	15.54
Super	15.96	16.62	Marketing	26.18	14.74
<b>Crop/agronomy specialists for recommendations and field scouting</b>					
Small	80.13	5.98	Farm supply	91.39	1.09
Medium	83.63	4.51	Mixed farm supply	96.52	0.46
Large	93.01	2.49	Mixed marketing	92.46	2.96
Super	95.70	0.83	Marketing	94.72	2.50
<b>Record keeping—crop protectant usage</b>					
Small	62.65	18.56	Farm supply	71.70	15.83
Medium	59.42	18.35	Mixed farm supply	78.53	10.66
Large	73.30	12.01	Mixed marketing	82.57	8.43
Super	81.22	13.70	Marketing	65.08	31.32
<b>Soil testing for organic matter</b>					
Small	38.85	13.34	Farm supply	74.28	7.47
Medium	75.65	2.35	Mixed farm supply	88.19	6.35
Large	78.86	10.73	Mixed marketing	86.69	4.00
Super	88.53	3.94	Marketing	87.25	5.23
<b>Application equipment with GPS units</b>					
Small	4.98	42.56	Farm supply	58.15	19.06
Medium	32.31	21.26	Mixed farm supply	49.09	22.39
Large	50.44	26.71	Mixed marketing	57.14	24.78
Super	66.55	18.94	Marketing	61.38	20.28
<b>Field mapping/recommendations using GPS/GIS</b>					
Small	3.21	—	Farm supply	62.55	15.98
Medium	40.69	19.11	Mixed farm supply	69.34	15.93
Large	55.12	22.95	Mixed marketing	71.74	14.96
Super	82.37	11.12	Marketing	71.32	—
<b>Record keeping with GPS/GIS</b>					
Small	—	32.28	Farm supply	38.36	26.06
Medium	26.86	23.95	Mixed farm supply	47.29	24.42
Large	31.73	34.16	Mixed marketing	55.48	21.19
Super	61.35	21.38	Marketing	53.59	35.63

— = Not available.

large cooperatives seldom offer it. Photography showed variation by type, increasing from 8 percent for farm supply to 26 percent for marketing cooperatives.

Offering crop/agronomy specialists for recommendations and field scouting can be expensive and only about 80 percent of the small and medium cooperatives did so. By type, more than 90 percent offered crop/agronomy specialists.

Record keeping of crop protectant usage was lower for smaller cooperatives, increasing from about 63 percent for small cooperatives to 81 for super cooperatives. Mixed marketing (83 percent) and mixed farm supply (79 percent) cooperatives were most likely to keep track of farmers' use of crop protectants.

Soil testing for organic matter was much less likely conducted by small cooperatives (39 percent). Small cooperatives had very little application equipment with GPS units (5 percent). By contrast, more than 66 percent of the super cooperatives had such equipment.

Field mapping/recommendations using GPS/GIS and record keeping with GPS/GIS was seldom done by small cooperatives. As cooperative size increased, both services were offered more often. Mixed farm supply, mixed marketing, and marketing cooperatives all offered field mapping/recommendations about 70 percent of the time. Record keeping with GPS/GIS was done about 50 percent of the time by these same cooperatives.

### Prior Survey Comparisons

In 1996, cooperatives that sold \$ 0.5 million of fertilizer were surveyed about similar questions. They covered volume sold, product sources, competitors, and services offered with sales. The fertilizer survey had 497 respondents, 206 of which responded to this (crop protectant) survey (table 18). The CB, LS, and NP accounted for 80 percent of the 206 respondents.

Although different applicators are used to apply crop protectants and fertilizers, many personnel and services are shared by cooperatives in the agronomy departments that typically handle both products. In tables 19 and 20, changes and similarities can be seen in agronomy services from 1996 to 1999. Application remained the same with about 95 percent of the cooperatives providing application services for agronomy products (table 19). More cooperatives employed crop/agronomy specialists in 1999, averaging about 8 points higher than 1996. Cooperatives offering soil testing fell 10 points, but the question on testing changed also. In 1996, only soil testing was asked for in the response. In 1999, the question asked was for

Table 18—**Respondents to this survey and 1996 fertilizer survey, by region**

Region	Number of cooperatives
	<i>Number</i>
All	206
Northeast and Appalachian	14
Southeast and Delta States	5
Southern Plains	6
Corn Belt	66
Lake States	55
Northern Plains	44
Mountain	12
Pacific	4

soil testing for organic matter, a more involved and expensive test. Still, most cooperatives offered this soil test and quite a few would like to. Record keeping was up 5 points, but many cooperatives hope to offer this service in the future. Helping farmers keep track of what protectant and how much was applied will be even more necessary in the future as water quality issues become more important.

The three agronomy services compared in table 20 cover the GPS/GIS technology. GPS/GIS technology is still fairly new, but was especially new in 1996, which is reflected in some fairly low adoption rates by the cooperatives. The use of this technology in 1999 was almost double that in 1996. Field mapping/recommendations using GPS/GIS increased from 37 percent in 1996 to 66 percent in 1999. Most regions had dramatic increases. The CB increased from 58 percent offering to 83 percent. It looks like there will be more cooperatives offering this service as many responded that they would like to offer it.

Application equipment with GPS units also increased, going from 29 percent to 56 percent in 1999. Every region increased the number of cooperatives having this equipment and there was a strong desire by other cooperatives wanting to add this service in the future.

Record keeping with GPS/GIS for crop protectant usage showed the smallest growth (growing from 31 percent to 46 percent in 1999) and was offered less frequently than the other two services with this technology. It was offered much more often in the CB (65 percent) and LS (52 percent) than the other regions.

Table 19—**Agronomy services that cooperatives offer or would like to offer by region for this survey and 1996 fertilizer survey, weighted by sales**

Services	Crop protectants, 1999		Fertilizers, 1996	
	Currently offer	Would like to offer	Currently offer	Would like to offer
<i>Percent</i>				
<b>Crop protectant application</b>				
All	95.15	0.47	95.74	0.37
Northeast and Appalachian	95.71	—	89.59	—
Southeast and Delta States	96.03	—	100.00	—
Southern Plains	89.46	—	79.49	9.16
Corn Belt	98.27	—	98.70	—
Lake States	95.52	—	97.73	.76
Northern Plains	97.38	1.67	95.06	—
Mountain	85.61	3.20	95.90	—
Pacific	26.47	—	43.69	—
<b>Crop/agronomy specialists—recommendations &amp; scouting</b>				
All	93.98	1.46	85.18	7.18
Northeast and Appalachian	93.49	—	94.79	—
Southeast and Delta States	100.00	—	100.00	—
Southern Plains	80.26	—	88.65	—
Corn Belt	96.20	.55	87.64	7.38
Lake States	94.71	.81	95.67	2.82
Northern Plains	86.20	6.37	72.99	9.00
Mountain	100.00	—	67.02	24.96
Pacific	100.00	—	64.72	—
<b>Soil testing</b>				
All	83.82	6.92	92.56	.62
Northeast and Appalachian	95.08	—	78.42	—
Southeast and Delta States	61.81	34.22	89.73	—
Southern Plains	89.46	—	79.49	20.51
Corn Belt	92.09	1.85	95.05	—
Lake States	80.90	9.90	97.57	—
Northern Plains	77.00	8.36	88.40	.68
Mountain	71.57	20.55	100.00	—
Pacific	20.44	9.89	64.72	—
<b>Record keeping—crop protectant usage</b>				
All	72.31	14.23	67.20	16.98
Northeast and Appalachian	34.69	15.71	65.29	8.52
Southeast and Delta States	51.29	18.41	37.80	51.92
Southern Plains	56.03	34.77	79.49	11.35
Corn Belt	82.37	8.00	74.31	16.67
Lake States	80.45	9.58	72.63	11.96
Northern Plains	62.01	26.45	59.00	21.74
Mountain	70.47	29.53	60.13	13.85
Pacific	30.33	—	—	30.51

— = Not available.

Table 20—**Agronomy services that cooperatives offer or would like to offer by region for this survey and 1996 fertilizer survey, weighted by sales**

Services	Crop protectants, 1999		Fertilizers, 1996	
	Currently offer	Would like to offer	Currently offer	Would like to offer
<i>Percent</i>				
<b>Field mapping/recommendations using GPS/GIS</b>				
All	65.50	16.61	37.06	34.74
Northeast and Appalachian	75.98	7.89	15.72	29.74
Southeast and Delta States	65.73	—	—	42.36
Southern Plains	—	42.51	34.23	40.43
Corn Belt	82.82	6.95	57.85	26.14
Lake States	68.56	14.33	42.10	28.56
Northern Plains	44.38	27.93	17.47	54.69
Mountain	33.21	60.56	13.29	46.07
Pacific	—	30.33	—	—
<b>Application equipment with GPS units</b>				
All	55.81	22.68	28.73	36.61
Northeast and Appalachian	61.64	21.51	7.18	21.22
Southeast and Delta States	65.73	—	—	42.36
Southern Plains	64.48	15.78	—	74.66
Corn Belt	69.20	12.36	53.07	22.17
Lake States	53.96	24.32	28.63	35.50
Northern Plains	31.85	38.73	7.16	62.79
Mountain	36.98	56.79	10.43	46.07
Pacific	—	30.33	—	—
<b>Record keeping with GPS/GIS</b>				
All	46.03	25.89	31.43	36.62
Northeast and Appalachian	18.31	22.47	15.72	24.94
Southeast and Delta States	31.51	—	—	42.36
Southern Plains	—	42.51	—	74.66
Corn Belt	64.88	18.88	51.60	28.75
Lake States	52.16	15.29	33.19	34.47
Northern Plains	21.63	53.70	19.47	45.74
Mountain	33.21	49.57	—	59.36
Pacific	—	9.89	—	—

— = Not available.

Again, offering crop protectant application with GPS/GIS technology requires expensive equipment and well-trained operators. Soil testing in grids is labor intensive. Aerial photography requires the use of a flying service or interpretation of satellite maps. Employees need specialized training. Crop management specialists and crop protectant applicators have a skill that can command higher salaries. Their specialized skills and ability to communicate effectively with farmers makes them harder to retain, because they would be desirable employees at another cooperative or other competitor.

## Summary

Local cooperatives studied generally had strong growth in crop protectant sales—almost 11 percent per year from 1991 through 1999. These cooperatives supported the cooperative agricultural inputs system, purchasing more than 68 percent of their herbicides and insecticides, 48 percent of their fungicides, and 50 percent of all other crop protectant products from regionals.

The respondent cooperatives sold almost \$830 million worth of the total \$1.3 billion in crop protectants sold by all local agricultural cooperatives in 1999. Their primary competitors for these sales to farmers were private suppliers, followed by other cooperatives. Crop protectant price was the strongest competitive tool, but advisory scouting and other services was also important.

Most cooperatives applied crop protectants for farmers. Crop/agronomy specialists were often employed by local cooperatives to assist the farmer in making crop protection decisions. Many cooperatives also provided a record service to track the farmers' use of crop protectants.

The use of GPS/GIS technology has been championed by local agricultural cooperatives. Field mapping is available to 68 percent of the crop protectant volume.

There were large regional differences in the use of GPS/GIS technology. The Corn Belt appeared to be an early adopter of this technology, probably because of the crops grown (corn and soybeans) and the large size of respondent cooperatives. The GPS/GIS technology is expensive, so larger cooperatives were more likely to offer it. Many of the respondents not offering it want to offer GPS/GIS technology in the future.

Compared with cooperative fertilizer operations in 1996, there were many similar responses. Local cooperatives were still strongly supported by the

regional cooperative procurement and distribution system. Private suppliers and other cooperatives were strong competitors, especially on price.

Cooperative crop protectant application equipment with GPS/GIS technology, combined with the farmers' use of yield monitors on harvesting equipment, provides farmers with maps showing where crop protection worked and where pest damage lowered yields.

Local cooperatives, with long experience in fertilizer and crop protectant application and employing crop/agronomy specialists, can help interpret or make field maps for farmers. Working with regional cooperative personnel, locals have provided agronomy record-keeping programs and innovative ways to combine field maps, yield monitors, and fertilizer and crop protectant application equipment.

Use of GPS/GIS technology, crop/agronomy specialists, and record keeping is expensive. Many of the respondents that do not offer some or all of these services wanted to offer them but may be unable because of the high fixed costs and large volume of crop protectants required. Smaller cooperatives may be able to share a crop/agronomy specialist with a nearby cooperative or purchase GPS/GIS application units with another cooperative(s) and share the use and expenses. These cooperatives might also consider setting up an agronomy subsidiary or limited liability company to share the use and expenses of new technology, equipment, and personnel.

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## **U.S. Department of Agriculture**

### **Rural Business–Cooperative Service**

Stop 3250

Washington, D.C. 20250-3250

Rural Business–Cooperative Service (RBS) provides research, management, and educational assistance to cooperatives to strengthen the economic position of farmers and other rural residents. It works directly with cooperative leaders and Federal and State agencies to improve organization, leadership, and operation of cooperatives and to give guidance to further development.

The cooperative segment of RBS (1) helps farmers and other rural residents develop cooperatives to obtain supplies and services at lower cost and to get better prices for products they sell; (2) advises rural residents on developing existing resources through cooperative action to enhance rural living; (3) helps cooperatives improve services and operating efficiency; (4) informs members, directors, employees, and the public on how cooperatives work and benefit their members and their communities; and (5) encourages international cooperative programs. RBS also publishes research and educational materials and issues *Rural Cooperatives* magazine.

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