

Staff Paper P08-12

December 2008

# Staff Paper Series

Farmers' Awareness and Use of IPM for Soybean Aphid Control: Report of Survey Results for the 2004, 2005, 2006, and 2007 Crop Years

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**APPLIED  
ECONOMICS**

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College of Food, Agricultural  
and Natural Resource Sciences

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UNIVERSITY OF MINNESOTA

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Major funding for this study came from a multi-state project, "Soybean Aphid in the North Central US: Implementing IPM on a Landscape Scale", funded in USDA's CSREES' Integrated Research, Education and Extension Competitive Grants Program –Integrated Pest Management, 112.B Risk Avoidance and Mitigation Program (RAMP).

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Farmers' Awareness and Use of IPM for Soybean Aphid Control:  
Report of Survey Results for the 2004, 2005, 2006, and 2007 Crop Years<sup>1</sup>

Kent Olson, Thaddee Badibanga, and Christina DiFonzo<sup>2</sup>

December 2008

**ABSTRACT:** In response to the introduction and rapid spread of soybean aphid, farmers in the Upper Midwest were surveyed about their treatment of and knowledge about soybean aphids for crop years 2004, 2005, 2006, and 2007. Overall, the farmers showed a fairly good understanding of soybean aphids and their impact on soybeans. Over 80% said soybean aphids could be treated and repopulate in the same crop year. For 2004-2006, at least 75% of the farmers said aphids damaged their soybeans by sucking sap. However this percentage dropped to 59% for 2007 with a greater percentage pointing at a combination of damage methods. This lower percentage for 2007 may be due to a broader, randomly selected sample of farmers who received the surveys by mail versus farmers who attended meetings in the first three years. However, even though fewer seemed to have a clear understanding of how aphids damage soybeans, other measures indicate a stable or improved understanding of soybean aphid biology and control.

Over 70% said the frequency with which aphids should be treated for profitable control depends on aphid counts, weather conditions and plant growth stage. About a third of the farmers believed that aphids inflict the most damage during early flowering through pod set (R1-R3); however, about a third also thought aphids could inflict the most damage at any stage.

Over half the farmers considered the lowest aphid density for profitable aphid control to be 250 aphids per plant. Over 80% said scouting reports were very important for making a decision to treat for aphids; over half the farmers said plant growth stage was also very important.

## Introduction

The soybean aphid is a major new invasive pest of soybean in North America. In 2003, the first field season covered in this study, over 42 million acres of soybean in the North Central U.S. were infested and over 7 million acres were treated with insecticides to control soybean aphid (citation?). Producers, industry and university research/Extension personnel have identified the soybean aphid as one of the greatest threats to the US soybean industry.

The objective of this study was to measure soybean aphid IPM implementation and adoption and to track changes over time. To accomplish this objective, farmers were asked to complete brief surveys about their soybean production and soybean aphid treatments for crop

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<sup>1</sup> This study is part of a multi-state project, "Soybean Aphid in the North Central US: Implementing IPM on a Landscape Scale", funded in USDA's CSREES' Integrated Research, Education and Extension Competitive Grants Program –Integrated Pest Management, 112.B Risk Avoidance and Mitigation Program (RAMP).

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years 2004, 2005, 2006, and 2007. The survey was developed by the economists and entomologists on the project team. For the 2004, 2005, and 2006 crop years, farmers completed surveys for each crop year while attending field days and winter meetings in the early months of the next year, prior to the planting season. Completing the survey was voluntary; the surveys, recruitment statement, and consent statement are attached to this report. For the 2007 crop year, surveys were mailed to farmers using the standard process of an initial mailing, a postcard reminder, and a second mailing. Mailing lists were generated - from a random sample of farmers stratified by self-reported soybean acreage. Some differences between responses in 2004, 2005, and 2006 and in 2007 may be due to the random sample in 2007 versus the voluntary attendance at meetings in the first three years.

In the next section we report the numerical results from all surveys for Michigan, Minnesota, Iowa, and Wisconsin. Following the numerical results, we make some concluding comments regarding the results and trends seen in the numerical results. Individual results for each state are reported in appendices.

### **Results of Surveys for 2004, 2005, 2006, and 2007 Crop Years**

For the 2004 crop year, 742 farmers completed the survey in Iowa (307), Michigan (292), and Minnesota (143). For the 2005 crop year, 326 farmers completed the survey in Michigan (221) and Minnesota (105). For the 2006 crop year, 600 farmers completed the survey, Iowa (201), Michigan (220), Minnesota (132), and Wisconsin (47). For the 2007 crop year, 398 farmers completed the mail-in survey in Iowa (102), Michigan (91), Minnesota (101) and Wisconsin (104).

Across all years, growers reporting that they planted soybeans ranged from 88% (2006) to 96% (2005, Table 1). The average soybean acreage planted per farm was 520 in 2004, 532 in 2005, 546 in 2006, and 580 in 2007. The median (or middle of the range) soybean acreage was 340 acres in 2004, 300 acres in 2005, 300 acres in 2006, and 380 in 2007. For those who planted less than 10,000 acres, the average ranged from 439 (2006) to 460 (2004) in the winter surveys, and 580 in the 2007 mail-in survey. For those who planted less than 10,000 acres, the median was the same, that is, 340 acres in 2004, 300 acres in 2005, 300 acres in 2006, and 380 in 2007.

Treatment for soybean aphid infestation varied greatly from year-to-year. In 2004, generally a low aphid year in the Midwest, 13% said they treated for soybean aphid. On average, these individuals treated 50% of their soybean acreage. For 2005, an outbreak year for soybean

aphid across the Midwest, 84% said they treated, on average, 87% of their soybean acreage. For 2006, another relatively low aphid year, 35% said they treated, on average, 81% of their soybean acreage. For 2007, another year with elevated aphid populations in many areas, 89% said they treated, on average, 43% of their soybean acreage. The four most frequently used insecticides were Asana XL<sup>®</sup>, Lorsban 4E<sup>®</sup>, Mustang<sup>®</sup>, and Warrior<sup>®</sup>. (Lorsban is an organophosphate, while the other products are pyrethroids.)

A majority of farmers surveyed at winter meetings (55% in 2004, 55% in 2005, and 79% in 2006) said they treated for soybean aphid during the previous field season. Only 41% of farmers surveyed by mail in 2007 said they treated for aphids in a previous year.

Ground application was the most common method of treating for aphids. For 2004, of those who specified the application method, 80% said they used ground application, 17% said they used air application, and 3% indicated both methods. For 2005, the percentages were 87%, 8% and 5% and in 2006, 78%, 10% and 12% for ground, air and both types, respectively. For the 2007 mail-in survey, of those who specified an application method, 76% said they used ground application, 19% said they used air application, and 4% indicated both methods.

A small proportion of growers in 2004 (5%), 2005 (12%), 2006 (7%), and 2007 (4%) reported making more than one application for soybean aphid. The elevated percentage in 2005 was due to that being a widespread outbreak year.

The proportion of growers reporting tank-mixing their insecticide application with the herbicide glyphosate increased over the survey period. For 2004 and 2005, 19% of those answering the question said they tank-mixed insecticide and herbicide. The percentage increased to 22% in 2006 and 38% in 2007. For 2004, 8% of the farmers answering the question said they mixed the insecticide with a foliar fertilizer. This percentage was 21% in 2005, 10% in 2006, and 9% in 2007.

<b>Table 1: Reported soybean acres and aphid treatments in crop year 2004, 2005, and 2006</b>				
	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Number of surveys	742	326	600	398
Number of farmers who planted soybeans	672	313	528	353
Average number of soybean acres per farm reporting soybeans	521	548	551	580
Median number of soybean acres per farm reporting soybeans	340	300	300	380
% of farmers treating for soybean aphids	13%	84%	35%	89%

Most common insecticides used to treat for aphids, in order of frequency	AsanaXL <sup>®</sup> Warrior <sup>®</sup> Lorsban 4E <sup>®</sup> Mustang <sup>®</sup>	Asana XL <sup>®</sup> Warrior <sup>®</sup> Lorsban 4E <sup>®</sup> Mustang <sup>®</sup>	AsanaXL <sup>®</sup> Warrior <sup>®</sup> Lorsban 4E <sup>®</sup> Mustang <sup>®</sup>	Lorsban 4E Warrior
Of those treating for soybean aphid, % of acres treated*	50%	87%	81%	43%
% of farmers who had treated for soybean aphids before 2004, 2005, 2006, or 2007*	35%	28%	52%	41%
% of the farmers saying that once a field was treated with an insecticide, soybean aphids could repopulate and cause yield damage in the same year*	81	91	87	89
* Percentage of those farmers answering the specific question. ** Some farmers also reported using the following insecticides, but to a lesser extent: Baythroid, Cruiser, Malathion, Nufos, Pilot, Proaxis, and Silencer.				

Eighty-one percent in 2004, 91% in 2005, 87% in 2006, and 89% of farmers in 2007 said that once a field is treated with an insecticide, soybean aphids could repopulate and cause yield damage in the same year. Less than 5% of farmers in each year said this could not happen.

The majority of growers understood how soybean aphid damages soybean. Seventy-five percent in 2004, 77% in 2005, and 77% in 2006 correctly said aphids damage soybeans by sucking sap (Table 2). Only 59% of farmers in the 2007 mail-in survey connected sap-sucking with aphid damage. Eleven percent in 2004, 9% in 2005, 6% in 2006, and 11% of the farmers in 2007 said aphids damaged their soybeans by chewing holes in the leaves. Three percent in 2004 and less than 1% of the farmers in the other three years said aphids damaged their soybeans by eating seed pods. Less than 1% of the farmers in each year incorrectly associated root feeding with aphid damage.

	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
By Sucking sap	75%	77%	77%	59%
By chewing holes in leaves	11	9	6	11
By eating seed pods	3	<1	<1	<1
By feeding on roots	<1	0	<1	<1
More than one choice	<1	6	9	18
Did not answer	11	6	8	12
*Percentage of those completing survey: 742 for 2004, 326 for 2005, 600 for 2006, and 398 for 2007.				

Seventy-seven percent in 2004, 79% in 2005, 77% in 2006, and 77% of the farmers in 2007 said the frequency with which aphids should be treated for profitable control depends on aphid counts, weather conditions, and plant stage – essentially an integrated pest management approach (Table 3). Fifteen percent in 2004, 16% in 2005, 17% in 2006, and 10% of farmers in 2007 said aphids should be treated once in late July or early August. Only a small percentage of growers felt that soybean aphid should be treated multiple times in July and August.

<b>Table 3: Percentage of farmers indicating how often aphids should be treated for profitable control*</b>				
	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Depends on aphid counts, weather conditions, and plant stage	77%	79%	73%	77%
Once in late July or early August	15	16	16	10
Once in July and once in August	2	2	3	2
Twice in July and twice in August	<1	<1	<1	<1
Every week beginning in late July through August	0	0	<1	0
More than one choice	<1	<1	2	0
Did not answer	6	2	4	11
*Percentage of those completing survey: 742 for 2004, 326 for 2005, 600 for 2006, and 398 for 2007.				

Thirty-seven percent in 2004, 29% in 2005, 26% of farmers in 2006, and 35% in 2007 believed that aphids can inflict significant damage at any growth stage (Table 4). Twenty-nine percent of farmers in 2004, 33% in 2005, 33% in 2006, and 32% in 2007 believed that aphids inflict the most yield damage during early flowering through pods set (R1-R3) in their soybean fields. Fifteen percent of farmers in 2004, 23% in 2005, 17% in 2006, and 11% in 2007 believed that aphids inflict the most yield damage from early vegetative (V5) through early flowering and pod set (R3, maybe R4). Twelve percent of farmers in 2004, 5% in 2005, 11% of farmers in 2006, and 10% in 2007 believed that aphids inflict the most yield damage after pods are set and seeds are filling (R4-R6).

	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Significant damage can occur at any stage	37%	29%	26%	35%
During early flowering through pods set (R1-R3)	29	33	32	32
From early vegetative (V5) through early flowering and pod set (R3, maybe R4)	15	23	17	11
After pods are set and seeds are filling (R4-R6).	12	5	11	10
During early vegetative stages (VE-V4)	2	2	1	<1
More than one choice	<1	<1	4	0
Did not answer	6	8	8	12

\*Percentage of those completing survey: 742 for 2004, 326 for 2005, 600 for 2006, and 398 for 2007.

The majority of farmers – at least 66% - surveyed at winter meetings in 2004 through 2006 considered the lowest average aphid density for profitable insecticide spraying to be 250 aphids per plant which is the current economic threshold (Ragsdale et al. 2007; Table 5). However, only 49% of respondents to the mail-in survey for 2007 felt the same. Seventeen percent in 2004, 10% in 2005, 10% in 2006, and 17% in 2007 said the lowest average aphid density for profitable insecticide spraying depended on several factors. Nine percent of farmers in 2004, 7% in 2005, 11% in 2006, and 18% in 2007 considered the lowest average aphid density for profitable insecticide spraying to be 100 aphids per plant. Three percent or less of the farmers in each of the surveyed years considered the lowest average aphid density for profitable insecticide spraying to be greater than 1000 aphids per plant and less than 2% said this density was less than 3 aphids per plant.

	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2007</b>
250 aphids per plant	66%	73%	66%	49%
Depends on several factors	17	10	10	17
100 aphids per plant	9	7	11	18
>1000 aphids per plant	3	3	3	2
3 aphids per plant	<1	<1	1	2
More than one choice	<1	<1	4	0
Did not answer	5	2	5	11

\*Percentage of those completing survey: 742 for 2004, 326 for 2005, 600 for 2006, and 398 for 2007.



The majority of farmers said that the most important information for making a soybean aphid spray decision was scouting reports (84%, 2004; 85%, 2005; 94%, 2006; 85%, 2007; Table 6). Fifty-four of farmers in 2004, 52% in 2005, 61% in 2006, and 51% in 2007 said plant growth stage was very important in their decision. Thirty-one percent in 2004, 27% of in 2005, 28% of farmers in 2006, and 19% in 2007 said regional reports of aphid activity were very important. A consistent percentage of farmers, between 18% and 25% each year, said the availability of custom application was very important. Thirteen percent of farmers in 2004, 12% in 2005, 13% in 2006, and 8% in 2007 said a neighbor treating for aphids was very important in their own decision-making.

<b>Table 6: Percentage of farmers indicating the importance of the following information for making a decision to treat aphids*</b>				
	VERY important	somewhat important	NOT important	No answer
<b>2004</b>				
Scouting reports	84%	8%	<1%	9%
Plant growth stage	54	28	4	14
Regional reports on aphid activity	31	47	12	13
A neighbor treating for aphids	13	50	25	13
The availability of custom application (aerial or ground)	18	27	42	14
Other	3	2	3	92
<b>2005</b>				
Scouting reports	85%	5%	<1%	10%
Plant growth stage	52	26	6	15
Regional reports on aphid activity	27	46	10	17
A neighbor treating for aphids	12	49	22	17
The availability of custom application (aerial or ground)	25	27	32	16
Other	0	0	0	100
<b>2006</b>				
Scouting reports	94%	5%	<1%	0%
Plant growth stage	61	30	8	0
Regional reports on aphid activity	28	60	12	0
A neighbor treating for aphids	13	53	34	0
The availability of custom application (aerial or ground)	26	31	43	0
Other	0	0	0	100

<b>2007</b>				
Scouting reports	85%	4%	0.0%	10%
Plant growth stage	51	29	5	15
Regional reports on aphid activity	19	51	16	14
A neighbor treating for aphids	8	44	32	16
The availability of custom application (aerial or ground)	25	23	38	14
Other	0	0	0	100
*Percentage of those completing survey: 742 for 2004, 326 for 2005, 600 for 2006, and 398 for 2007.				

Fifty percent of farmers in 2005, 51% in 2006, and only 33% in 2007 said they had adopted most university IPM recommendations for soybean aphids (Table 7). Thirteen percent of farmers in 2005 and 2006, and 7% in 2007 said they had adopted all of them.

<b>Table 7: Percentage of farmers indicating their adoption level for university IPM recommendations for soybean aphids.*</b>				
	<b>2004**</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Do not understand them	-	2%	1%	6%
Not at all	-	2	2	7
Somewhat	-	23	23	36
Most of them	-	50	51	33
All of them	-	13	13	7
Did not answer	-	11	11	11
* Percentage of those completing survey: 742 for 2004, 326 for 2005, 600 for 2006, and 398 for 2007.				
**This question was not in the survey for the 2004 crop year.				

### **Concluding Comments**

To improve our understanding of farmers' understanding of the soybean aphid, farmers were surveyed about their knowledge of soybean aphid biology, management and control for four consecutive crop years: 2004-2007. Based on their responses, the surveyed farmers showed a fairly good understanding of soybean aphids and their impact on soybeans. Over 80% said soybean aphids could be treated and repopulate in the same crop year. In the early survey years, over 75% correctly knew that aphids damaged soybeans by sucking sap, although a consistent minority of farmers in each year thought that aphids chew plants or pods. The percentage of growers correctly identifying how aphids damage soybean dropped to 59% in 2007, with a greater percentage pointing at a combination of damage methods. This change may be due to a difference in the sample population. Growers surveyed in the first three years were attending an educational extension meeting or field day, while the mailed survey in 2007 reached a broader, random sample of farmers.

Over 70% said the frequency with which aphids should be treated for profitable control depends on aphid counts, weather conditions and plant growth stage (components of IPM). About a third of the farmers believed that aphids inflict the most damage during early flowering through pod set (R1-R3); in the Midwest, this is often when soybean aphid populations increase and spray application occur. However, about a third also thought aphids could inflict the most damage at any stage. This could reflect experiences growers in some areas have had with very early infestations at V2-V3, or late-onset populations at R5-R6.

Over half the farmers considered the lowest aphid density for profitable aphid control to be 250 aphids per plant. This is the current economic threshold accepted by the majority of soybean extension entomologists in the Midwest. The use of a threshold approach to soybean aphid management is further supported by the percentage of farmers (over 80%) who said scouting reports were very important for making a decision to treat for aphids. Just over half the farmers said plant growth stage was also very important, perhaps reflecting growers' past experiences with increasing aphid populations at the R1-R3 stages

The percentage of farmers who said they had adopted most university IPM recommendations for soybean aphids declined to 33% in 2007 compared to about half in the earlier years. This drop may be due to an actual decline in adoption of recommendations. The drop may also be due to the different survey method and sample in 2007. Growers sampled in the first three years were attending university-sponsored events, and thus perhaps more inclined to know and follow university guidelines. The mailed survey reached a broader group who may not be aware of university recommendations and so truthfully answered with a low adoption rate – even though they are following the recommendations heard from another source. Although they varied from year to year, other measures and responses did not show a strong trend up or down over the survey years as did the farmers' understanding of the damage method and the IPM adoption rate. Another potential reason for the reported drop in adoption of IPM recommendations is farmers' increased awareness or knowledge of these recommendations over time and thus the realization that they had not adopted as many of the recommendations as they previously thought they had.

Although the survey shows opportunity for continued education (damage methods and plant growth stage vulnerability, for example), the surveys showed farmers have a good knowledge already. This may be due to the quick coverage of the soybean aphid as a new pest in University and private sector advisors and the popular media doing a very good job of education

in the very early years of the soybean aphid infestation. Farmers' attention may have been heightened due to the soybean aphid being a new, potentially very damaging pest.

## Appendix 1: Michigan Results for Survey for 2004, 2005, and 2006 Crop Years

For the crop year 2004, 292 Michigan farmers completed the brief surveys. This number was 221 for the 2005 crop year, 220 for the 2006 crop year, and 91 for 2007. The average soybean acreage planted per farm was 360 in 2004, 422 in 2005, 373 in 2006, and 636 in 2007. The median soybean acreage was 240 in 2004, 280 in 2005, 200 in 2006, and 350 in 2007 (Table MI 1). No farm planted more than 4,500 acres of soybeans in each of the surveyed years.

For the crop year 2004, 5% of the Michigan farmers said they treated on average 48% of their soybean acreage for soybean aphids. For the crop year 2005, 91% of the Michigan farmers said they treated on average 87% of their soybean acreage for soybean aphids. For the crop year 2006, 4% of the Michigan farmers said they treated on average 81% of their soybean acreage for soybean aphids. For the crop year 2007, 87% of the Michigan farmers said they treated on average 48% of their soybean acreage for soybean aphids.

<b>Table MI 1. Reported Michigan's soybean acres and aphid treatments in crop year 2004, 2005, 2006, and 2007</b>				
	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Number of surveys	292	221	220	91
Number of farmers who planted soybeans	261	210	194	79
Mean number of soybean acres per farm reporting soybeans	360	422	373	636
Mean number of soybean acres per farm reporting soybeans	240	280	200	350
% of farmers treating for soybean aphids	5%	91%	4%	87%
Most common insecticides used to treat for aphids**	Asana L® Warrior®	Asana L® Lorsban E® Mustang® Warrior®	Asana L® Lorsban E® Mustang® Warrior®	Lorsban 4E Warrior®
% of soybean acres treated for soybean aphids by those who did treat*	48%	87%	81%	48%
% of farmers who had treated for soybean aphids before 2004, 2005, 2006, and 2007*	44%	50%	83%	38%
% of the farmers saying that once a field is treated with an insecticide, soybean aphids could repopulate and cause yield damage in the same year*	79%	93%	93%	90%
* Percentage of those completing the survey: 292 for 2004, 221 for 2005, 220 for 2006, and 91 for 2007.				
**Some farmers in either year also reported using the following insecticides but to a lesser extent: Baythroid, Cruiser, Dimethoate, and Imidan.				

Of those who specified the application method used, 26% in 2004, 19% in 2005, 95% in 2006, and 100% in 2007 said they used ground application. Of those who specified the number of applications, 8% in 2004, 15% in 2005, 8% in 2006, and 0% in 2007 said they made more than one application.

Of those who answered the question, 27% in 2004, 15% in 2005, 25% in 2006, and 43% in 2007 said the insecticide tank was mixed with a glyphosphate/Roundup. Twenty-seven percent of farmers in 2004, 26% in 2005, 27% in 2006, and 46% in 2007 said they mixed the insecticide with a foliar fertilizer application.

Seventy-two percent in 2004, 78% in 2005, 76% of farmers in 2006, and 53% in 2007 said aphids damaged their soybeans by sucking sap (Table MI 2). Eleven percent in 2004, 10% in 2005, 5% of the farmers in 2006, and 11% of the farmers in 2007 said aphids damaged their soybeans by chewing holes in the leaves.

<b>Table MI 2: Percentage of Michigan farmers saying aphids damaged their soybeans in the following ways*</b>				
	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
By Sucking sap	72%	78%	76%	53%
By chewing holes in leaves	11	10	5	11
By eating seed pods	3	0	0	1
By feeding on roots	0	0	<1	1
More than one choice	0	10	6	21
Did not answer	14	4	13	13

\*Percentage of those completing survey: 292 for 2004, 221 for 2005, 220 for 2006, and 91 for 2007.

Seventy percent of farmers in 2004, 79% in 2005, 74% of the farmers in 2006, and 76% in 2007 said the frequency with which aphids should be treated for profitable control depends on aphid counts, weather conditions, and plant stage (Table MI 3).

<b>Table MI 3: Percentage of Michigan farmers indicating how often they thought aphids should be treated for profitable control*</b>				
	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Depends on aphid counts, weather conditions, and plant stage	70%	79%	74%	76%
Once in late July or early August	18	14	12	9
Once in July and once in August	3	3	3	3

Twice in July and twice in August	1	<1	<1	2
Every week beginning in late July through August	0	0	<1	0
More than one choice	0	1	1	0
Did not answer	8	2	8	10
*Percentage of those completing survey: 292 for 2004, 221 for 2005, 220 for 2006, and 91 for 2007.				

Thirty-six percent in 2004, 31% in 2005, 28% of farmers in 2006, and 38% believed that aphids can inflict significant damage at any growth stage (Table MI 4). Twenty-five percent of farmers in 2004, 29% in 2005, 34% in 2006, and 31% in 2007 believed that aphids inflict the most yield damage during early flowering through pods set (R1-R3) in their soybean fields. Twenty-one percent of farmers in 2004, 21% in 2005, 18% in 2006, and 11% in 2007 believed that aphids inflict the most yield damage from early vegetative (V5) through early flowering and pod set (R3, maybe R4).

	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Significant damage can occur at any stage	36%	31%	28%	38%
During early flowering through pods set (R1-R3)	25	29	34	31
From early vegetative (V5) through early flowering and pod set (R3, maybe R4)	21	21	18	11
After pods are set and seeds are filling (R4-R6).	8	4	5	8
During early vegetative stages (VE-V4)	4	2	0	0
More than one choice	0	3	5	0
Did not answer	5	10	10	12
*Percentage of those completing survey: 292 for 2004, 221 for 2005, 220 for 2006, and 91 for 2007.				

Seventy-one percent of farmers in 2004, 75% in 2005, 73% in 2006, and 47% in 2007 considered the lowest average aphid density for profitable insecticide spraying to be 250 aphids per plant (Table MI 5). Eleven percent in 2004, 7% in 2005, 8% in 2006, and 16% in 2007 considered the lowest average aphid density for profitable insecticide spraying to depend on several factors. Nine percent of farmers in 2004, 5% in 2005, 6% in 2006, and 20% in 2007

considered the lowest average aphid density for profitable insecticide spraying to be 100 aphids per plant.

**Table MI 5: Percentage of Michigan farmers considering each of the following to be the lowest average aphid density for profitable insecticide spraying\***

	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
250 aphids per plant	71%	75%	73%	47%
Depends on several factors	11	7	8	16
100 aphids per plant	9	5	6	20
>1000 aphids per plant	1	8	2	2
3 aphids per plant	<1	0	<1	2
More than one choice	0	2	3	0
Did not answer	7	3	8	12

\*Percentage of those completing survey: 292 for 2004, 221 for 2005, 220 for 2006, and 91 for 2007.

The most important information for making a decision to treat soybean aphids was scouting reports with 78% of farmers in 2004, 82% in 2005, 78% in 2006, and 82% in 2007 rating this as very important (Table MI 6). Fifty-one of farmers in 2004, 50% in 2005, 45% in 2006, and 45% in 2007 said plant growth stage was very important in their decision. Thirty-seven percent in 2004, 29% of in 2005, 30% of farmers in 2006, and 20% in 2007 said regional reports of aphid activity were very important. Eighteen percent of farmers in 2004, 24% in 2005, 22% in 2006, and 27% in 2007 said the availability of custom application was very important.

**Table MI 6: Percentage of Michigan farmers indicating the importance of the following information for making a decision to treat aphids\***

	<b>VERY important</b>	<b>somewhat important</b>	<b>NOT important</b>	<b>No answer</b>
<b>2004</b>				
Scouting reports	78%	8%	<1%	13%
Plant growth stage	51	26	4	19
Regional reports on aphid activity	37	45	3	16
A neighbor treating for aphids	18	52	14	17
The availability of custom application (aerial or ground)	18	24	39	19
Other	4	3	1	92
<b>2005</b>				
Scouting reports	82%	5%	<1%	13%
Plant growth stage	50	25	7	18
Regional reports on aphid activity	29	41	10	20
A neighbor treating for aphids	11	53	16	20
The availability of custom application (aerial or ground)	24	26	31	19
Other	0	0	0	100



<b>2006</b>				
Scouting reports	78%	6%	<1%	15%
Plant growth stage	45	26	9	21
Regional reports on aphid activity	31	46	4	21
A neighbor treating for aphids	13	45	21	22
The availability of custom application (aerial or ground)	22	24	33	21
Other	0	0	0	100
<b>2007</b>				
Scouting reports	82%	7%	0%	11%
Plant growth stage	45	31	8	17
Regional reports on aphid activity	20	58	7	15
A neighbor treating for aphids	7	54	22	18
The availability of custom application (aerial or ground)	27	24	35	13
Other	3	1	0	96
*Percentage of those completing survey: 292 for 2004, 221 for 2005, 220 for 2006, and 91 for 2007.				

Forty-eight percent of farmers in 2005, 48% in 2006, and 33% in 2007 said they had adopted most university IPM recommendations for soybean aphids (Table MI 7).

<b>Table MI 7: Percentage of Michigan farmers indicating their adoption level for university IPM Recommendations for soybean aphids.*</b>				
	<b>2004**</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Do not understand them	-	<1%	<1%	7%
Not at all	-	1	3	11
Somewhat	-	24	22	33
Most of them	-	48	48	33
All of them	-	13	15	7
Did not answer	-	12	12	10
* Percentage of those completing survey: 292 for 2004, 221 for 2005, 220 for 2006, and 91 for 2007.				
**This question was not in the 2004 survey.				

## Appendix 2: Minnesota Results for Survey for 2004, 2005, 2006, and 2007 Crop Years

For the crop year 2004, 143 Minnesota farmers completed the brief surveys. This number was 105 for the 2005 crop year, 132 for the 2006 crop year, and 101 for the 2007 crop year (Table MN 1). The average soybean acreage planted per farm was 541 in 2004, 756 in 2005, 671 in 2006, and 647 in 2007. The median soybean acreage was 400 in 2004, 400 in 2005, 340 in 2006, and 490 in 2007. No farm in 2004, 2005, and 2006 planted more than 4,500 acres of soybeans in each of the surveyed years. In 2007, one farm planted 6,500 acres of soybeans.

For the crop year 2004, 10% of the Minnesota farmers said they treated on average 40% of their soybean acreage for soybean aphids. For the crop year 2005, 67% of the Minnesota farmers said they treated on average 87% of their soybean acreage for soybean aphids. For the crop year 2006, 69% of the Minnesota farmers said they treated on average 87% of their soybean acreage for soybean aphids. For the crop year 2007, 64% of the Minnesota farmers said they treated on average 90% of their soybean acreage for soybean aphids.

<b>Table MN 1. Reported Minnesota's soybean acres and aphid treatments in crop year 2004, 2005, 2006, and 2007</b>				
	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Number of surveys	143	105	132	101
Number of farmers who planted soybeans	132	103	119	64
Mean number of soybean acres per farm reporting soybeans	541	756	671	647
Median number of soybean acres per farm reporting soybeans	400	400	340	490
% of farmers treating for soybean aphids	10%	67%	69%	64%
Most common insecticides used to treat for aphids**	Asana XL <sup>®</sup> Lorsban 4E <sup>®</sup> Warrior <sup>®</sup>	Asana XL <sup>®</sup> Lorsban 4E <sup>®</sup> Warrior <sup>®</sup>	Asana XL <sup>®</sup> Lorsban 4E <sup>®</sup> Mustang <sup>®</sup> Warrior <sup>®</sup>	Lorsban 4E Warrior
% of soybean acres treated for soybean aphids by those who did treat*	40%	87%	89%	90%
% of farmers who had treated for soybean aphids before 2004, 2005, and 2006*	76%	66%	92%	77%
% of the farmers saying that once a field is treated with an insecticide, soybean aphids could repopulate and cause yield damage in the same year*	93%	87%	95%	97%
* Percentage of those completing the survey: 143 for 2004, 105 for 2005, and 132 for 2006, and 101 for 2007.				
**Some farmers in either year also reported using the following insecticides but to a lesser extent: Baythroid, Clyprophpos (similar to Lorsban), Malathion, Pilot (similar to Lorsban), and Proaxis (similar to Warrior).				

Of those who specified the application method used, 83% in 2004, 67% in 2005, 83% in 2006, and 74% in 2007 said they used ground application. Of those who specified the number of applications, 5% in 2004, 0% in 2005, 11% in 2006, and 9% in 2007 said they made more than one application.

The practice of tank mixing insecticide with glyphosphate/Roundup increased from 19% in 2004, 17% in 2005, 31% in 2006, and 48% in 2007. None of farmers in 2004, 6% in 2005, 4% in 2006, and 4% in 2007 said they mixed the insecticide with a foliar fertilizer application.

Ninety-three percent of farmers in 2004, 87% in 2005, 95% in 2006, and 97% in 2007 said that once a field is treated with an insecticide, soybean aphids could repopulate and cause yield damage in the same year.

Eighty-two percent of farmers in 2004, 75% in 2005, 82% in 2006, and 74% in 2007 said aphids damaged their soybeans by sucking sap (Table MN 2). Nine percent of farmers in 2004, 10% in 2005, 5% in 2006, and 3% in 2007 said aphids damaged their soybeans by chewing holes in the leaves.

<b>Table MN 2: Percentage of Minnesota farmers saying aphids damaged their soybeans in the following ways*</b>				
	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
By Sucking sap	82%	75%	82%	74%
By chewing holes in leaves	9	10	5	3
By eating seed pods	4	2	2	0
By feeding on roots	0	0	0	0
More than one choice	0	2	6	14
Did not answer	5	11	5	9
*Percentage of those completing survey: 143 for 2004, 105 for 2005, and 132 for 2006, and 101 for 2007.				

Eighty-seven percent in 2004, 77% in 2005, 74% of the farmers in 2006, and 79% in 2007 said the frequency with which aphids should be treated for profitable control depends on aphid counts, weather conditions, and plant stage (Table MN 3). Ten percent of farmers in 2004, 19% in 2005, 19% in 2006, and 9% in 2007 said aphids should be treated once in late July or early August.

	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Depends on aphid counts, weather conditions, and plant stage	87%	77%	74%	79%
Once in late July or early August	10	19	19	9
Once in July and once in August	0	1	2	<1
Twice in July and twice in August	0	0	0	<1
Every week beginning in late July through August	0	0	<1	0
More than one choice	0	1	3	0
Did not answer	3	2	2	10
*Percentage of those completing survey: 143 for 2004, 105 for 2005, and 132 for 2006, and 101 for 2007.				

Thirty-two percent in 2004, 24% in 2005, 24% in 2006, and 30% of farmers in 2007 believed that aphids can inflict significant damage at any growth stage (Table MN 4). Twenty-nine percent of farmers in 2004, 39% in 2005, 36% in 2006, and 31% in 2007 believed that aphids inflict the most yield damage during early flowering through pods set (R1-R3) in their soybean fields.

	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Significant damage can occur at any stage	32%	24%	24%	30%
During early flowering through pods set (R1-R3)	29	39	36	31
From early vegetative (V5) through early flowering and pod set (R3, maybe R4)	15	26	21	16
After pods are set and seeds are filling (R4-R6).	12	6	11	12
During early vegetative stages (VE-V4)	2	1	2	<1
More than one choice	0	2	3	0
Did not answer	6	3	3	11
*Percentage of those completing survey: 143 for 2004, 105 for 2005, and 132 for 2006, and 101 for 2007.				

Seventy-four percent of farmers in 2004, 68% in 2005, 58% in 2006, and 50% in 2007 considered the lowest average aphid density for profitable insecticide spraying to be 250 aphids

per plant (Table MN 5). Seventeen percent in 2004, 15% in 2005, 17% in 2006, and 11% in 2007 considered the lowest average aphid density for profitable insecticide spraying to depend on several factors. Four percent of farmers in 2004, 12% in 2005, 17% in 2006, and 27% in 2007 considered the lowest average aphid density for profitable insecticide spraying to be 100 aphids per plant.

<b>Table MN 5: Percentage of Minnesota farmers considering each of the following to be the <u>lowest</u> average aphid density for profitable insecticide spraying*</b>				
	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
250 aphids per plant	74%	68%	58%	50%
Depends on several factors	17	15	17	11
100 aphids per plant	4	12	17	27
>1000 aphids per plant	3	0	<1	<1
3 aphids per plant	0	0	<1	<1
More than one choice	0	4	3	0
Did not answer	1	1	2	11
*Percentage of those completing survey: 143 for 2004, 105 for 2005, and 132 for 2006, and 101 for 2007.				

The most important information for making a decision to treat soybean aphids was scouting reports with 87% of farmers in 2004, 91% in 2005, 91% in 2006, and 87% in 2007 rating this as very important (Table MN 6). Sixty percent of farmers in 2004, 57% in 2005, 54% in 2006, and 51% in 2007 said plant growth stage was very important in their decision. Twenty-three percent in 2004, 23% of in 2005, 14% of farmers in 2006, and 14% in 2007 said regional reports of aphid activity were very important. Twenty-four percent of farmers in 2004, 26% in 2005, 24% in 2006, and 23% in 2007 said the availability of custom application was very important.

<b>Table MN 6: Percentage of Minnesota farmers indicating the importance of the following information for making a decision to treat aphids*</b>				
	<b>VERY important</b>	<b>somewhat important</b>	<b>NOT important</b>	<b>No answer</b>
<b>2004</b>				
Scouting reports	87%	9%	0%	4%
Plant growth stage	60	27	1	13
Regional reports on aphid activity	23	57	13	7
A neighbor treating for aphids	7	51	33	9
The availability of custom application (aerial or ground)	24	31	33	11
Other	4	3	3	90

<b>2005</b>				
Scouting reports	91%	4%	0%	6%
Plant growth stage	57	27	5	11
Regional reports on aphid activity	23	55	12	10
A neighbor treating for aphids	13	43	34	10
The availability of custom application (aerial or ground)	26	30	35	10
Other	0	0	0	100
<b>2006</b>				
Scouting reports	91%	4%	0%	5%
Plant growth stage	54	27	8	11
Regional reports on aphid activity	14	58	19	9
A neighbor treating for aphids	7	45	38	11
The availability of custom application (aerial or ground)	24	25	41	10
Other	0	0	0	100
<b>2007</b>				
Scouting reports	87%	2%	0%	11%
Plant growth stage	51	29	6	15
Regional reports on aphid activity	14	53	20	14
A neighbor treating for aphids	<1	49	34	17
The availability of custom application (aerial or ground)	23	19	44	15
Other	4	3	0	93
*Percentage of those completing survey: 143 for 2004, 105 for 2005, and 132 for 2006, and 101 for 2007.				

Fifty-four percent of farmers in 2005, 58% in 2006, and 37% in 2007 said they had adopted most university IPM recommendations for soybean aphids (Table MN 7).

<b>Table MN 7: Percentage of Minnesota farmers indicating their adoption level for university IPM recommendations for soybean aphids.*</b>				
	<b>2004**</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Do not understand them	-	3%	2%	4%
Not at all	-	3	<1	5
Somewhat	-	19	24	37
Most of them	-	54	58	36
All of them	-	12	11	6
Did not answer	-	9	5	13
* Percentage of those completing survey: 143 for 2004, 105 for 2005, and 132 for 2006, and 101 for 2007.				
**This question was not in the 2004 survey.				

### Appendix 3: Iowa Results for Survey for 2004, 2006, and 2007 Crop Years

For the crop year 2004, 307 Iowa farmers completed the brief surveys (Table IA 1). This number was 201 for the 2006 crop year, and 102 for 2007. The survey was not conducted for 2005. The average soybean acreage planted per farm was 662 in 2004, 726 in 2006, and 553 in 2007. The median soybean acreage was 400 in 2004, 450 in 2006, and 400 in 2007. No farm planted more than 4,500 acres of soybeans in 2005, and 2007. In 2004, three farms planted more than 4,500 acres; one planted 70,000 acres and two planted 15,000 acres each. In 2006, one farm planted 32,000 acres of soybeans.

For the crop year 2004, 21% of the Iowa farmers said they treated on average 54% of their soybean acreage for soybean aphids. For the crop year 2006, 41% of the Iowa farmers said they treated on average 75% of their soybean acreage for soybean aphids. For the crop year 2007, 89% of the Iowa farmers said they treated on average 87% of their soybean acreage for soybean aphids.

<b>Table IA 1. Reported Iowa's soybean acres and aphid treatments in crop year 2004, 2006, and 2007</b>			
	<b>2004</b>	<b>2006</b>	<b>2007</b>
Number of surveys	307	201	102
Number of farmers who planted soybeans	279	194	91
Mean number of soybean acres per farm reporting soybeans	662	726	553
Median number of soybean acres per farm reporting soybeans	400	450	400
% of farmers treating for soybean aphids	21%	41%	89%
Most common insecticides used to treat for aphids**	Asana L <sup>®</sup> Lorsban E <sup>®</sup> Mustang <sup>®</sup> Warrior <sup>®</sup>	Asana L <sup>®</sup> Lorsban E <sup>®</sup> Mustang <sup>®</sup> Warrior <sup>®</sup>	Asana L <sup>®</sup> Lorsban 4E Mustang <sup>®</sup> Warrior <sup>®</sup>
% of soybean acres treated for soybean aphids by those who did treat*	54%	75%	87%
% of farmers who had treated for soybean aphids before 2004, 2005, 2006, and 2007*	55%	60%	27%
% of the farmers saying that once a field is treated with an insecticide, soybean aphids could repopulate and cause yield damage in the same year*	76%	93%	90%
* Percentage of those completing the survey: 307 for 2004, 201 for 2006, and 102 for 2007.			
** Some farmers in either year also reported using the following insecticides but to a lesser extent: Baythroid, Cruiser, Dimethoate, and Imidan.			

Of those who specified the application method used, 72% in 2004, 30% in 2006, and 72% in 2007 said they used ground application. Of those who specified the number of applications, 3% in 2004, 1% in 2006, and 4% in 2007 said they made more than one application.

Of those who answered the question, 15% in 2004, 5% in 2006, and 28% in 2007 said the insecticide tank was mixed with a glyphosphate/Roundup. None of farmers in 2004, 2% in 2006, and 4% in 2007 said they mixed the insecticide with a foliar fertilizer application.

Seventy-five percent of farmers in 2004, 77% of farmers in 2006, and 57% in 2007 said aphids damaged their soybeans by sucking sap (Table IA 2). Eleven percent in 2004, 6% of the farmers in 2006, and 5% of the farmers in 2007 said aphids damaged their soybeans by chewing holes in the leaves.

	<b>2004</b>	<b>2006</b>	<b>2007</b>
By Sucking sap	75%	77%	57%
By chewing holes in leaves	11	6	5
By eating seed pods	2	0	2
By feeding on roots	2	0	0
More than one choice	0	14	22
Did not answer	12	4	15

\*Percentage of those completing survey: 307 for 2004, 201 for 2006, and 102 for 2007.

Seventy-eight percent of farmers in 2004, 74% of the farmers in 2006, and 76% in 2007 said the frequency with which aphids should be treated for profitable control depends on aphid counts, weather conditions, and plant stage (Table IA 3). Fourteen percent of farmers in 2004, 18% of farmers in 2006, and 11% of farmers in 2007 said aphids should be treated once in late July or early August.

	<b>2004</b>	<b>2006</b>	<b>2007</b>
Depends on aphid counts, weather conditions, and plant stage	78%	74%	76%
Once in late July or early August	14	18	11
Once in July and once in August	3	4	<1
Twice in July and twice in August	<1	1	0
Every week beginning in late July through August	0	0	0
More than one choice	0	1	0
Did not answer	5	2	13

\*Percentage of those completing survey: 307 for 2004, 201 for 2006, and 102 for 2007.



Thirty-nine percent of farmers in 2004, 26% of farmers in 2006, and 36% in 2007 believed that aphids can inflict significant damage at any growth stage (Table IA 4). Twenty-eight percent of farmers in 2004, 26% in 2006, and 31% in 2007 believed that aphids inflict the most yield damage during early flowering through pods set (R1-R3) in their soybean fields.

	<b>2004</b>	<b>2006</b>	<b>2007</b>
Significant damage can occur at any stage	39%	26%	36%
During early flowering through pods set (R1-R3)	28	26	31
From early vegetative (V5) through early flowering and pod set (R3, maybe R4)	11	14	4
After pods are set and seeds are filling (R4-R6).	16	21	15
During early vegetative stages (VE-V4)	<1	1	0
More than one choice	0	4	0
Did not answer	7	8	14
*Percentage of those completing survey: 307 for 2004, 201 for 2006, and 102 for 2007.			

Fifty-six percent of farmers in 2004, 65% in 2006, and 51% in 2007 considered the lowest average aphid density for profitable insecticide spraying to be 250 aphids per plant (Table IA 5). Twenty-two percent of farmers in 2004, 7% in 2006, and 22% in 2007 considered the lowest average aphid density for profitable insecticide spraying to depend on several factors.

	<b>2004</b>	<b>2006</b>	<b>2007</b>
250 aphids per plant	56%	65%	51%
Depends on several factors	22	7	22
100 aphids per plant	11	14	14
>1000 aphids per plant	6	6	<1
3 aphids per plant	<1	1	2
More than one choice	0	6	0
Did not answer	4	3	11
*Percentage of those completing survey: 307 for 2004, 201 for 2006, and 102 for 2007.			

The most important information for making a decision to treat soybean aphids was scouting reports with 87% of farmers in 2004, 86% in 2006, and 85% in 2007 rating this as very important (Table IA 6). Fifty-five of farmers in 2004, 56% in 2006, and 53% in 2007 said plant

growth stage was very important in their decision. Thirty percent of farmers in 2004, 22% of farmers in 2006, and 24% in 2007 said regional reports of aphid activity were very important. Fourteen percent of farmers in 2004, 19% in 2006, and 30% in 2007 said the availability of custom application was very important.

<b>Table IA 6: Percentage of Iowa farmers indicating the importance of the following information for making a decision to treat aphids*</b>				
	VERY important	somewhat important	NOT important	No answer
<b>2004</b>				
Scouting reports	87%	7%	0%	7%
Plant growth stage	55	31	4	9
Regional reports on aphid activity	30	46	10	14
A neighbor treating for aphids	10	47	32	11
The availability of custom application (aerial or ground)	14	27	48	11
Other	3	<1	5	92
<b>2006</b>				
Scouting reports	86%	5%	4%	<1%
Plant growth stage	56	25	5	14
Regional reports on aphid activity	22	53	11	14
A neighbor treating for aphids	10	42	30	18
The availability of custom application (aerial or ground)	19	27	39	15
Other	0	0	0	100
<b>2007</b>				
Scouting reports	85%	4%	0%	11%
Plant growth stage	53	28	4	15
Regional reports on aphid activity	24	48	14	15
A neighbor treating for aphids	13	36	35	16
The availability of custom application (aerial or ground)	30	23	31	16
Other	2	0	0	98
*Percentage of those completing survey: 307 for 2004, 201 for 2006, and 102 for 2007.				

Forty-nine percent of farmers in 2006 and 38% in 2007 said they had adopted most university IPM recommendations for soybean aphids (Table IA 7).

<b>Table IA 7: Percentage of Iowa farmers indicating their adoption level for university IPM Recommendations for soybean aphids.*</b>		
	<b>2006</b>	<b>2007</b>
Do not understand them	<1%	4%
Not at all	2	3
Somewhat	22	35
Most of them	49	38
All of them	14	9
Did not answer	13	11
* Percentage of those completing survey: 201 for 2006, and 102 for 2007.		

#### Appendix 4: Wisconsin Results for Survey for 2006 and 2007 Crop Years

For the crop year 2006, 47 Wisconsin farmers completed the brief surveys (Table WI 1). This number was 104 for the crop year 2007. The survey was not conducted for 2004 and 2005. The average soybean acreage planted per farm was 296 in 2006 and 301 in 2007. The median soybean acreage was 200 in 2006 and 331 in 2007. No farm planted more than 4,500 acres of soybeans in each of the surveyed years.

For the crop year 2006, 21% of the Wisconsin farmers said they treated on average 68% of their soybean acreage for soybean aphids. For the crop year 2007, 88% of the Wisconsin farmers said they treated on average 74% of their soybean acreage for soybean aphids.

<b>Table WI 1. Reported Wisconsin's soybean acres and aphid treatments in crop year 2006 and 2007</b>		
	<b>2006</b>	<b>2007</b>
Number of surveys	47	104
Number of farmers who planted soybeans	194	92
Mean number of soybean acres per farm reporting soybeans	296	301
Median number of soybean acres per farm reporting soybeans	200	331
% of farmers treating for soybean aphids	21%	88%
Most common insecticides used to treat for aphids**	Asana L <sup>®</sup> Lorsban E <sup>®</sup> Mustang <sup>®</sup> Warrior <sup>®</sup>	Asana L <sup>®</sup> Lorsban 4E Mustang <sup>®</sup> Warrior <sup>®</sup>
% of soybean acres treated for soybean aphids by those who did treat*	68%	74%
% of farmers who had treated for soybean aphids before 2004, 2005, 2006, and 2007*	64%	23%
% of the farmers saying that once a field is treated with an insecticide, soybean aphids could repopulate and cause yield damage in the same year*	74%	78%
* Percentage of those completing the survey: 47 for 2006, and 104 for 2007.		
**Some farmers in either year also reported using the following insecticides but to a lesser extent: Baythroid, Cruiser, Dimethoate, Imidan, and Proaxix.		

Of those who specified the application method used, 32% in 2006 and 76% in 2007 said they used ground application. Of those who specified the number of applications, 2% in 2006 and 0% in 2007 said they made more than one application.

Of those who answered the question, 2% in 2006 and 39% in 2007 said the insecticide tank was mixed with a glyphosphate/Roundup. Six percent of farmers in 2006 and 12% in 2007 said they mixed the insecticide with a foliar fertilizer application.

Sixty-six percent of farmers in 2006 and 51% in 2007 said aphids damaged their soybeans by sucking sap (Table WI 2). Fifteen percent of farmers in 2006 and 24% of the farmers in 2007 said aphids damaged their soybeans by chewing holes in the leaves.

<b>Table WI 2: Percentage of Wisconsin farmers saying aphids damaged their soybeans in the following ways*</b>		
	<b>2006</b>	<b>2007</b>
By Sucking sap	66%	51%
By chewing holes in leaves	15	24
By eating seed pods	0	0
By feeding on roots	0	0
More than one choice	11	15
Did not answer	9	10

\*Percentage of those completing survey: 47 for 2006, and 104 for 2007.

Sixty-two of the farmers in 2006 and 76% of farmers in 2007 said the frequency with which aphids should be treated for profitable control depends on aphid counts, weather conditions, and plant stage (Table WI 3). Twenty-one percent of farmers in 2006 and 11% of farmers in 2007 said aphids should be treated once in late July or early August.

<b>Table WI 3: Percentage of Wisconsin farmers indicating how often they thought aphids should be treated for profitable control*</b>		
	<b>2006</b>	<b>2007</b>
Depends on aphid counts, weather conditions, and plant stage	62%	76%
Once in late July or early August	21	11
Once in July and once in August	0	2
Twice in July and twice in August	0	0
Every week beginning in late July through August	0	0
More than one choice	9	0
Did not answer	9	12

\*Percentage of those completing survey: 47 for 2006, and 104 for 2007.

Nineteen percent of farmers in 2006, and 37% in 2007 believed that aphids can inflict significant damage at any growth stage (Table WI 4). Forty-three percent of farmers in 2006 and 35% in 2007 believed that aphids inflict the most yield damage during early flowering through pods set (R1-R3) in their soybean fields. Nineteen percent of farmers in 2006 and 13% in 2007

believed that aphids inflict the most yield damage from early vegetative (V5) through early flowering and pod set (R3, maybe R4).

<b>Table WI 4: Percentage of Wisconsin farmers who believe that aphids inflict the <u>most</u> yield damage in their soybean fields at the following growth stage</b>		
	<b>2006</b>	<b>2007</b>
Significant damage can occur at any stage	19%	37%
During early flowering through pods set (R1-R3)	43	35
From early vegetative (V5) through early flowering and pod set (R3, maybe R4)	19	13
After pods are set and seeds are filling (R4-R6).	0	5
During early vegetative stages (VE-V4)	4	0
More than one choice	0	0
Did not answer	15	11
*Percentage of those completing survey: 47 for 2006, and 104 for 2007.		

Fifty-eight percent of farmers in 2006 and 48% of farmers in 2007 considered the lowest average aphid density for profitable insecticide spraying to be 250 aphids per plant (Table WI 5). Fifteen percent of farmers in 2006 and 20% in 2007 considered the lowest average aphid density for profitable insecticide spraying to depend on several factors. Eleven percent of farmers in 2006 and 14% in 2007 considered the lowest average aphid density for profitable insecticide spraying to be 100 aphids per plant.

<b>Table WI 5: Percentage of Wisconsin farmers considering each of the following to be the <u>lowest</u> average aphid density for profitable insecticide spraying*</b>		
	<b>2006</b>	<b>2007</b>
250 aphids per plant	58%	48%
Depends on several factors	15	20
100 aphids per plant	11	14
>1000 aphids per plant	0	5
3 aphids per plant	2	2
More than one choice	0	0
Did not answer	9	12
*Percentage of those completing survey: 47 for 2006, and 104 for 2007.		

The most important information for making a decision to treat soybean aphids was scouting reports with 81% of farmers in 2006 and 84% of farmers in 2007 rating this as very important (Table WI 6). Fifty-one percent of farmers in 2006 and 54% of farmers in 2007 said plant growth stage was very important in their decision. Seventeen percent of farmers in 2006 and 18% of farmers in 2007 said regional reports of aphid activity were very important. Fifteen

percent of farmers in 2006 and 18% of farmers in 2007 said the availability of custom application was very important.

<b>Table WI 6: Percentage of Wisconsin farmers indicating the importance of the following information for making a decision to treat aphids*</b>				
	VERY important	somewhat important	NOT important	No answer
<b>2006</b>				
Scouting reports	81%	4%	0%	15%
Plant growth stage	51	19	0	30
Regional reports on aphid activity	17	40	11	32
A neighbor treating for aphids	11	34	19	36
The availability of custom application (aerial or ground)	15	30	21	34
Other	0	0	0	100
<b>2007</b>				
Scouting reports	84%	5%	0%	11%
Plant growth stage	54	27	5	14
Regional reports on aphid activity	18	48	21	13
A neighbor treating for aphids	12	39	37	14
The availability of custom application (aerial or ground)	18	28	40	14
Other	5	5	0	90
*Percentage of those completing survey: 47 for 2006, and 104 for 2007.				

Fifty-one percent of farmers in 2006 and 24% of farmers in 2007 said they had adopted most university IPM recommendations for soybean aphids (Table WI 7).

<b>Table WI 7: Percentage of Wisconsin farmers indicating their adoption level for university IPM Recommendations for soybean aphids.*</b>		
	<b>2006</b>	<b>2007</b>
Do not understand them	1%	11%
Not at all	2	11
Somewhat	23	39
Most of them	51	24
All of them	13	6
Did not answer	11	11
* Percentage of those completing survey: 47 for 2006, and 104 for 2007.		