Bt Corn IRM Compliance in Canada

Canadian Corn Pest Coalition Report

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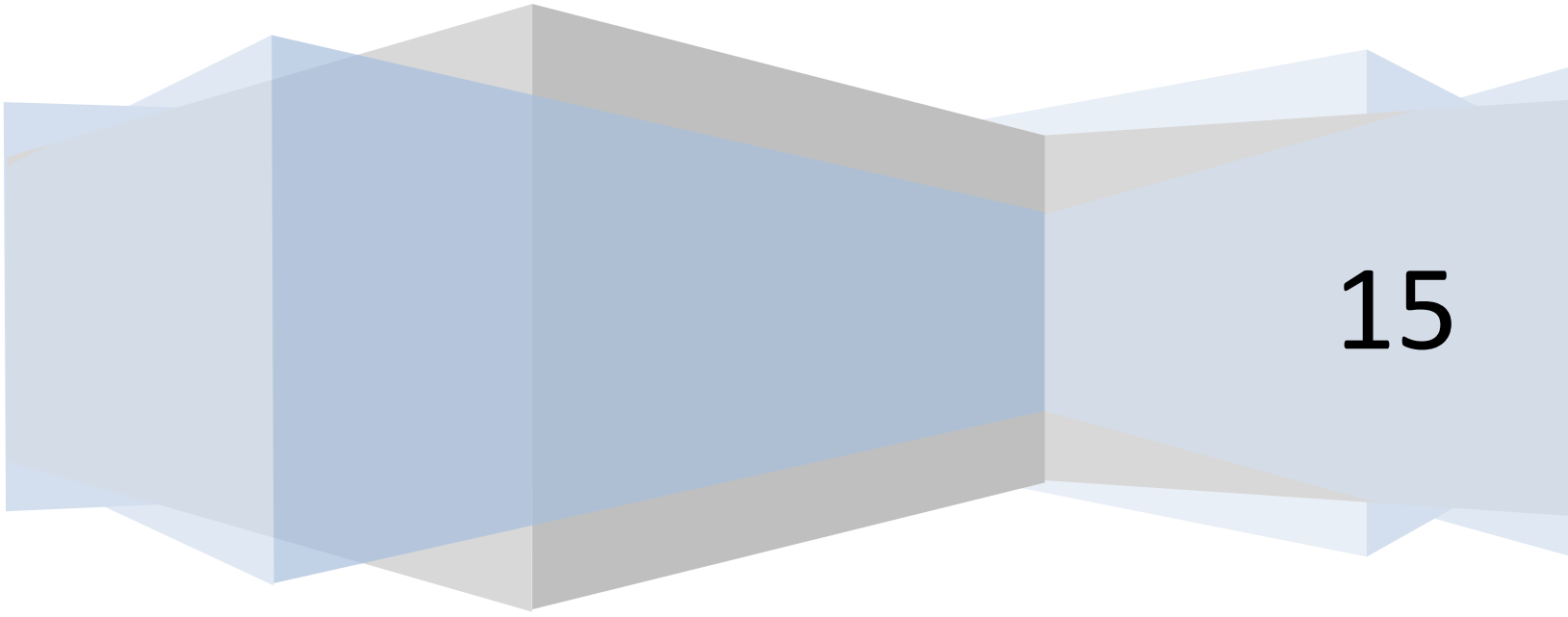


15

CONTENTS

EXECUTIVE SUMMARY

BT CORN MARKET OVERVIEW

Bt corn hybrids were planted on 3.1 million acres in 2015, no change from 2013. Bt corn as a percentage of total corn acres increased from 77.7% of planted acres in 2013 to 85.8% in 2015. Between 2013 and 2015, the percentage of corn growers planting Bt corn increased slightly from 90.0% to 93.1%.

Trend in Bt Corn Production - Total Market [1]						
	Total Market			Year-over-Year Change		
	2011	2013	2015	2011	2013	2015
Base Size	654	656	646			
% of Corn Growers:	92.9	90.0	93.1	6.1	-2.9	3.0
% of Corn Acres Planted:	72.7	77.7	85.8	7.3	5.0	8.2
Bt Corn Acres Planted (000's):	2,414	3,138	3,137	41.7%	30.0%	0.0%
Total Corn Acres Planted (000's):	3,321	4,040	3,655	21.9%	21.7%	-9.5%

[1] Total corn acres includes both grain and silage in Ontario, Quebec and Manitoba and are based on Statistics Canada, June Estimate of Principal Field Crop Areas.

BT CORN REFUGE MANAGEMENT OVERVIEW

Awareness and Compliance with Bt Refuge Requirements			
	%of Total Bt Growers		
	Aided	Compliance	
Bt Refuge Management Requirements	Awareness	Stated	Actual
Plant an adequate refuge area with non-Bt corn or plant RIB hybrids	95.9	97.0	90.9
Keep accurate records of where Bt Hybrids are planted	76.6	89.1	-
Have your Bt corn fields checked for insect damage	39.3	59.0	-
Plant the refuge in close proximity to Bt hybrids	93.8	92.5	94.6
Plant Bt and refuge hybrids of similiar maturity at the same time	85.3	93.8	-

SUMMARY OF FINDINGS

1. The greater availability of Bt corn hybrids, the development of stacked traits and the higher yields associated with Bt corn technology have driven these hybrids to a high market penetration level . Growth was most rapid between 2001 and 2009. By 2009, market share was 74% of corn acres. The 2011 market share (73%) was comparable to 2009. Growth resumed again in 2013 with market share of nearly 86% in 2015. The proportion of corn growers using the technology has remained relatively stable from 2009 – 2015, just over 90%.
2. The main change now occurring in the market is the adoption of stacked hybrids with multiple modes of action and the rapid adoption of refuge in a bag (RIB) hybrids in recent years. Stacked traits (ECB + CRW) grew in importance, from their introduction in 2009 to 71% in 2011 to 76% of total Bt corn acres in 2015. RIB hybrids, with multiple modes of action, increased significantly from 72% in 2013, and now account for 91% of total Bt corn acres.
3. The growth in popularity of RIB hybrids, with their built in compliance to the refuge requirement, has resulted in very high refuge area compliance levels in 2015 (91%), up significantly from previous years. Overall compliance levels, at first facilitated compliance with refuge area requirements with non-RIB 5% and 20% refuge hybrids in 2011 and 2013. In 2015 compliance as a percentage of growers declined with 20% refuge area compliance declining to 55% in 2015 from 76% in 2013 and 5% refuge area compliance declined to 69% from 92% in 2013. However; the number of growers not complying with the refuge area requirement declined as the use of these hybrids declined significantly and now account for a very low percentage of corn acres (1 and 9% respectively).
4. Up until 2009, the increase in Bt corn market penetration was associated with a decline in Bt corn growers planting an adequate refuge area (20%). Refuge area compliance levels declined from 85% in 2003 to 68% in 2011. However, with the introduction of RIB hybrids, refuge area compliance increased to 91% in 2015, the highest level since these measurements began in 2001.

5. The increase in compliance with refuge area requirements from 2013 to 2015 occurred in all three provinces and now stands at 91% in Ontario, 90% in Quebec and 91% in Manitoba.
6. Compliance tended to be higher among Bt corn growers in the 35-44 age category (98%). Compliance levels were lower among those who only thought the requirements were only somewhat important (84%).
7. The vast majority of Bt corn growers who planted a refuge in 2015 were in compliance (95%) with the refuge proximity requirements. This was higher than the years prior to 2013 and is a direct result of the built in compliance with RIB hybrids.
8. Planting refuge corn in complete blocks or portions of Bt corn fields continued to be the preferred grower strategy for hybrids that required a structured refuge area (non-RIB hybrids).
9. There was a significant increase in the percent of growers mixing refuge and non-refuge seed together where a structured refuge was required. This was especially evident with small corn acreage growers and in Ontario.
10. The industry continued to do an excellent job of educating corn growers on Bt corn insect resistance management (IRM) requirements. Although awareness of different requirements varied, about 96% of growers were aware of the critical refuge size requirement and 94% were aware of the critical proximity requirement. Awareness of all requirements declined slightly from 2013; this was especially evident in Ontario. Awareness decreased in Manitoba from 2013. This is most likely a result of the rapid expansion of corn acres in Manitoba since 2011 and participation of many new growers.
11. Stated compliance levels of the refuge area and record keeping requirements were higher than in previous years and scouting and refuge proximity requirements declined. Stated compliance levels have always been higher than those actually measured for the refuge area requirement, as growers are optimistic they are fully meeting the requirement and still may not fully understand the details of the requirement for the non-RIB hybrids or are becoming complacent with the introduction of RIB hybrids. Actual compliance to the refuge proximity requirement is higher than the stated compliance level.
12. The percentage of growers who said it was difficult to meet Bt corn refuge area requirement dropped significantly. The sentiment that meeting this requirement is getting easier is most likely related to the introduction of the RIB hybrids. In contrast, a higher percentage of Bt corn growers said it was more difficult to meet the scouting requirement. The top reason given for difficulty meeting Bt corn IRM requirements is now keeping track of the different requirements for different traits and just the hassle of switching seed at planting.
13. Bt corn growers continued to look to their local seed dealer and the seed companies for information on Bt corn IRM requirements. These two sources continue to be considered the most useful. The top two vehicles for getting this information was via the seed company's seed catalogue and direct from dealer or seed company personnel.
14. The vast majority of Bt corn growers say they had adequate information on Bt IRM strategies and that IRM plans are important, however, this declined from 2013. Those that did not have adequate information or thought it important enough tended to have lower compliance levels. This underlines the importance of continuing to educate and stress the importance of using refuge strategies with growers even as RIB hybrids continue to grow.
15. Providing more refuge in a bag hybrid options, standardizing how Bt hybrids are identified on the bag, simpler and easier to understand requirements, involving seed dealers more and making the requirements simpler and easier to understand, were all rated highly as effective strategies to improve compliance.
16. What does this mean for the future? As predicted, "refuge-in-a-bag" hybrids introduced in the past few years were well received by corn growers. Growers clearly want to reduce the complexity associated with switching seed at planting and the majority view RIB hybrids as a means to simplify their planting operations and still meet the refuge area and proximity requirements. As these hybrids increase in popularity, compliance with the refuge area, proximity and planting date requirements will likely improve as evidenced by the huge improvement in the overall refuge compliance in 2015 following their introduction in 2011. Other requirements such as scouting for insect damage will likely become more important as complacency with the technological solutions to other requirements becomes easy.

1. TOTAL MARKET PROFILE IN 2015

1.1. TREND IN BT CORN PRODUCTION (2011 - 2015)

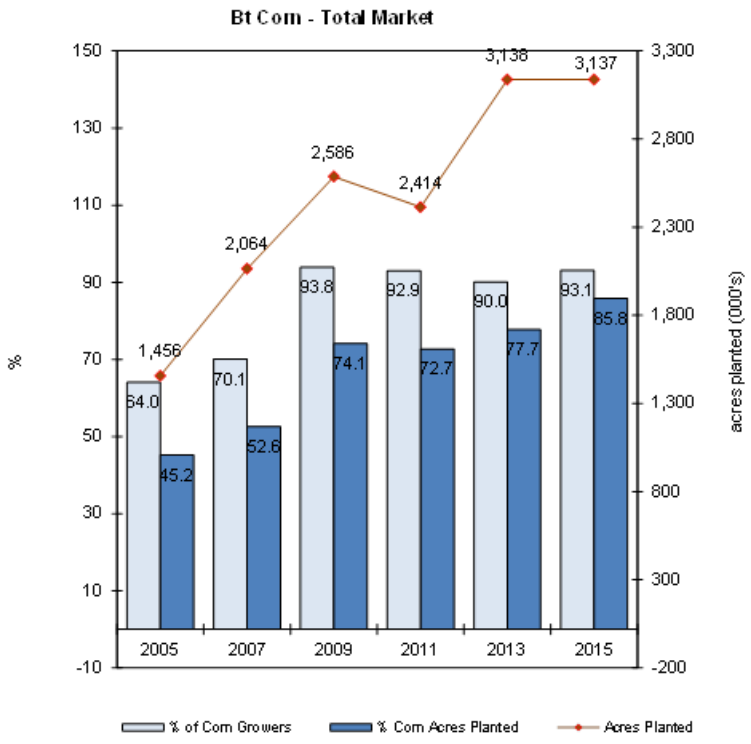
Trend in Bt Corn Production - Total Market [1]						
	Total Market			Year-over-Year Change		
	2011	2013	2015	2011	2013	2015
Base Size	654	656	646			
% of Corn Growers:	92.9	90.0	93.1	6.1	-2.9	3.0
% of Corn Acres Planted:	72.7	77.7	85.8	7.3	5.0	8.2
Bt Corn Acres Planted (000's):	2,414	3,138	3,137	41.7%	30.0%	0.0%
Total Corn Acres Planted (000's):	3,321	4,040	3,655	21.9%	21.7%	-9.5%

[1] Total corn acres includes both grain and silage in Ontario, Quebec and Manitoba and are based on Statistics Canada, June Estimate of Principal Field Crop Areas.

METHOD: Respondents were asked to indicate the area of Bt corn that they planted in each year's study. Acreage data was compiled and weighted by Census Agricultural Region up to the total grain and silage corn acreage by province reported each year by Statistics Canada in the June Estimate of Principal Field Crop Areas, Field Crop Reporting Series.

The trend in production of Bt corn is examined in the above table for 2011 - 2015 in total for Ontario, Quebec and Manitoba. Data are presented for a) % of corn farmers growing Bt hybrids, b) % of total acres planted with Bt hybrids, c) acres planted with Bt hybrids, and d) total corn acres planted.

SUMMARY OF FINDINGS:



- Bt corn was planted by 93.1% of corn growers sampled in 2015 up slightly from 90.0% in 2013, and up slightly from the 92.9% of corn growers in 2011.
- Bt corn hybrids accounted for 85.8% of total corn acres in 2015, up from 77.7% in 2013, and up from 72.7% in 2011.
- Total Bt corn acreage was 3.1 million acres in 2015, equal to 2013, which was up 30% from 2011.
- This dramatic increase, evident between 2005 and 2013, was related to the widespread availability of Bt corn hybrids, the adoption of hybrids with stacked traits and corn growers' interest in higher yielding hybrids. Although the percentage of corn growers is stable at 93%, the acreage proportion continues to grow as refuge-in-a-bag hybrids are introduced.

1.2. BT CORN PRODUCTION BY PROVINCE (2011 - 2015)

Trend in Bt Corn Production by Province												
	Ontario				Quebec				Manitoba			
	2011	2013	2015	Chg	2011	2013	2015	Chg	2011	2013	2015	Chg
Base Size	415	419	474		162	140	142		31	31	30	
% of Corn Growers	94.8	90.7	93.8	3.1	89.5	89.7	93.0	3.2	83.8	77.5	76.7	-0.8
% of Total Corn Acres	77.9	82.1	88.6	6.5	65.1	80.6	84.5	3.9	56.7	44.4	69.6	25.2
Acres Planted (000's)	1,636	2,012	2,034	1.1%	671	935	888	-5.0%	108	191	216	13.0%
Distribution of Bt Corn Acres (%)	52.1	64.1	64.8	0.7	21.4	29.8	28.3	-1.5	3.4	6.1	6.9	0.8
Total Corn Acres (000's)	2,100	2,450	2,295	-6.3%	1,031	1,160	1,050	-9.5%	190	430	310	-27.9%

METHOD: Respondents were asked to indicate the area of Bt corn that they planted in each year's study. The trend in production of Bt corn is examined in the above table for 2011, 2013 and 2015 for each province. Acreage data was compiled and weighted by Census Agricultural Region up to the total grain and silage corn acreage by province reported each year by Statistics Canada in the June Estimate of Principal Field Crop Areas, Field Crop Reporting Series. Data are presented for % of corn farmers growing Bt hybrids, % of total acres planted with Bt hybrids, acres planted with Bt hybrids, the % distribution of total Canadian Bt corn acres that each province represents, and the total corn acres planted.

SUMMARY OF FINDINGS:

- The percentage of corn growers with Bt corn increased from 2013 in Ontario and Quebec, but was flat in Manitoba.
- The percentage of corn growers planting Bt corn in 2015 ranged from 93.8% in Ontario to 76.7% in Manitoba.
- The percentage of corn acres planted to Bt corn was highest in Ontario (88.6%) followed by Quebec (84.5%) and Manitoba (69.6%).
- In Ontario, Bt corn acres increased 1.1%; Bt corn as a percentage of corn acres increased from 82.1% in 2013 to 88.6% in 2015. Overall corn acres declined by 6.3%.
- In Quebec, Bt corn acres declined by 5.0%; Bt corn as a percentage of corn acres increased from 80.6% in 2013 to 84.5% in 2015. Overall corn acres declined by 9.5%.
- In Manitoba, Bt corn acres increased by 13.0%; Bt corn as a percentage of corn acres even though Bt corn as a percentage of corn acres increased from 44.4% in 2013 to 69.6% in 2015. Overall corn acres declined by 27.9%.

1.3. BT CORN TYPE BY PROVINCE

Bt Corn Type - %of Acreage by Bt Corn Type												
	Total Market			Ontario			Quebec			Manitoba		
Bt Corn Type	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	654	656	646	415	419	474	162	140	142	31	31	30
Acres (000)												
TOTAL CORN	3,321	4,040	3,655	2,100	2,450	2,295	1,031	1,160	1,050	190	430	310
Bt CORN	2,414	3,138	3,137	1,636	2,012	2,034	671	935	888	108	191	216
20% REFUGE HYBRIDS	1,618	528	267	1,004	313	149	521	137	83	94	78	34
5% REFUGE HYBRIDS	796	366	25	632	258	17	150	77	8	14	31	
RIB HYBRIDS		2,243	2,842		1,441	1,863		721	796		81	182
Bt CORN BORER/ROOTWORM	1,702	2,433	2,376	1,235	1,577	1,556	404	755	658	62	101	163
Bt CORN BORER ONLY	714	704	761	401	435	478	267	179	230	45	90	53
NON-CORN BORER	910	902	518	467	438	261	360	225	163	82	239	94
%of Corn Acres												
TOTAL CORN	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Bt CORN	72.7	77.7	85.8	77.9	82.1	88.6	65.1	80.6	84.5	56.7	44.4	69.6
%of Bt Corn Acres												
20% REFUGE HYBRIDS	67.0	16.8	8.5	61.4	15.6	7.3	77.7	14.7	9.3	86.9	41.1	15.9
5% REFUGE HYBRIDS	33.0	11.7	0.8	38.6	12.8	0.8	22.3	8.2	0.9	13.1	16.2	
RIB HYBRIDS		71.5	90.6		71.6	91.6		77.1	89.7		42.7	84.5
Bt CORN BORER/ROOTWORM	70.5	77.6	75.7	75.5	78.4	76.5	60.3	80.8	74.1	57.9	52.7	75.4
Bt CORN BORER ONLY	29.6	22.4	24.3	24.5	21.6	23.5	39.9	19.2	25.9	42.1	47.3	24.6

METHOD: Respondents were asked to indicate the type of Bt corn that they planted in each year's study. The Bt corn type was split between Bt Corn Borer and Bt Corn Rootworm combined hybrids and Bt Corn Borer only hybrids and also between 20% refuge hybrids, 5% refuge hybrids and Refuge-In-a-Bag (RIB) hybrids. The trend in production of Bt corn is examined in the above table for 2011 to 2015 for each province. Acreage data was compiled and weighted by Census Agricultural Region up to the total grain and silage corn acreage by province reported by Statistics Canada in the June Estimate of Principal Field Crop Areas, Field Crop Reporting Series. Data are presented for a) acres planted with Bt hybrids by type and b) % of total acres planted with Bt hybrids by type.

SUMMARY OF FINDINGS:

- Of the 3.1 million acres of corn about 2.8 million acres or 90.6% were the new RIB hybrids.
- The RIB hybrid market penetration was highest in Ontario (91.6%), compared to Quebec (89.7%) and Manitoba (84.5%).
- As RIB hybrids entered the market, traditional 5% refuge area hybrids and 20% refuge area hybrids declined to 0.8% and 8.5% of Bt corn acres, respectively.
- Bt Corn Borer and Corn Rootworm combined hybrids accounted for 2.4 million acres or 75.7% of the total Bt corn acres down from 77.6%.
- Bt Corn Borer/Corn Rootworm hybrid penetration was similar in Ontario (76.5%), Quebec (74.1%) and Manitoba (75.4%).
- Bt Corn Borer/Corn Rootworm hybrids market penetration increased in Manitoba and declined slightly in Ontario and Quebec.
- Bt Corn Borer only hybrids accounted for 761,000 acres or 24.3% of the total Bt corn acres, up from 22.4% or 704,000 acres in 2013.
- Bt Corn Borer only hybrid market penetration increased in Ontario (23.5%) and Quebec (25.9%) and declined in Manitoba (24.6%).

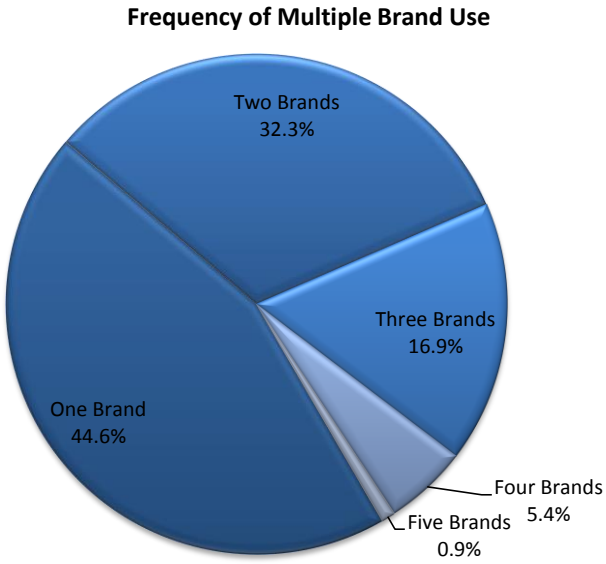
1.4. FREQUENCY OF MULTIPLE BT SEED COMPANY USE

Frequency of Multiple Seed Company Use - Bt Hybrids										
	Total Market				Province in 2015			Corn Acreage in 2015		
	2011	2013	2015	Chg	Ontario	Quebec	Manitoba	Small (< 128 acres)	Medium (128-277 acres)	Large (278 + acres)
Base Size	608	590	600		445	132	23	215	200	185
# of Bt Corn Hybrid Brands										
One	43.0	46.3	44.6	-1.7	44.0	43.2	73.9	56.2	40.8	35.5
Two	35.9	33.9	32.3	-1.7	33.4	30.3	21.7	30.9	36.2	29.6
Three	14.9	12.6	16.9	4.3	17.7	15.9	4.3	10.3	18.3	22.9
Four	6.3	5.7	5.4	-0.3	4.2	9.1	0.0	2.6	4.8	9.1
Five		1.5	0.9	-0.6	0.7	1.5	0.0	0.0	0.0	2.9
Avg. Number of Brands	1.7	1.8	1.9	0.0	1.8	2.0	1.3	1.6	1.9	2.1

METHOD: The above table examines, separately by province and by corn acreage category, the extent to which Bt corn growers planted Bt corn hybrids from one or more seed corn companies. For example, in Ontario in 2015, of the 445 Bt corn growers surveyed, 44.0% grew Bt corn hybrids from one seed corn company, 33.4% from two companies, 17.7% from three companies, 4.2% from four companies and 0.7% from five companies. The average number of Bt corn seed companies used by a Bt corn grower in Ontario in 2015 was 1.8 companies.

SUMMARY OF FINDINGS:

- Bt corn growers increased their use of multiple Bt corn brand lines in 2015 compared to 2013. The mean number of Bt corn company brands increased to 1.9 brands in 2015 up from 1.8 in 2013.
- The percentage of corn growers planting one and two brands decreased from 2013 and the percentage planting three brands increased. A few growers planted five brands in 2015 which brought the overall average up.
- There was a higher percentage of Bt corn growers with multiple brand lines in Quebec compared to Ontario and Manitoba.



- The larger the corn grower, the greater the number of different brands of Bt hybrids planted.
- These findings suggest that individual Bt corn companies cannot be held solely accountable for compliance to the Bt corn insect management requirements, especially with about 55% of Bt corn growers accessing multiple sources.

1.5. DEMOGRAPHIC PROFILE OF BT CORN GROWERS

Demographic Profile of Bt Corn Hybrid Growers												
	Total Market			Ontario			Quebec			Manitoba		
	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base Size	608	589	600	415	419	445	162	139	132	31	31	23
Corn Acreage Category												
Small Corn Acreage (<128 acres)	33.9	35.4	35.3	37.6	39.6	38.7	29.6	26.6	27.3	6.5	12.9	26.1
Medium Corn Acreage (128-277)	33.1	32.2	33.6	30.8	29.5	32.3	40.1	40.3	37.9	25.8	25.8	26.1
Large Corn Acreage (278 + acres)	33.1	32.3	31.0	31.6	31.0	29.0	30.2	33.1	34.8	67.7	61.3	47.8
Farm Type												
Mainly crop	50.6	51.6	53.5	49.6	48.0	51.7	51.4	61.2	56.8	60.0	51.6	69.6
Mixed	37.9	32.8	29.2	39.2	32.7	30.4	33.8	32.4	26.5	40.0	41.9	26.1
Mainly livestock	11.5	15.5	17.3	11.1	19.0	17.9	14.9	7.2	**16.7**		6.5	4.3
Age												
Under 35	5.1	5.0	3.5	4.8	5.5	***2.6***	3.4	2.9	4.5	16.7	12.9	18.2
35 - 44	11.8	12.1	9.5	10.9	10.8	8.8	13.7	15.1	11.4	13.3	16.1	9.1
45 - 54	38.7	30.7	31.7	35.6	27.2	27.6	45.2	39.6	43.2	46.7	35.5	27.3
55 and over	44.5	51.4	55.2	48.6	55.3	**61.0**	37.7	42.4	40.9	23.3	35.5	45.5
Education												
High School	47.5	47.4	44.7	46.2	45.7	43.4	51.0	52.5	47.0	46.7	41.9	56.5
Some college or University	17.3	16.6	13.8	15.7	12.6	9.7	21.8	25.2	25.0	16.7	35.5	***8.7***
Graduated College or University	32.7	32.9	37.5	36.0	37.7	42.3	23.8	21.6	25.0	33.3	19.4	34.8
Post-Graduate	2.5	2.2	**4.0**	2.0	2.4	**4.5**	3.4	1.4	3.0	3.3	3.2	
Livestock Type												
Base Size		276	276		206	212		55	57		15	7
Dairy		47.8	45.9		42.1	37.0		70.9	75.4		20.0	
Beef		29.0	27.3		34.9	32.6		3.6	8.8		66.7	71.4
Chicken		7.2	6.7		9.1	8.5		1.8	1.8			
Hogs		12.5	14.5		10.3	14.9		20.0	12.3		13.3	28.6
Other		3.5	5.6		3.6	7.0		3.6	1.8			

METHOD: Respondents were asked a series of demographic questions designed to establish a grower profile, and to test for differences in behavior and perceptions across segments, as relevant. The above table examines the demographic profile of Bt corn growers summarized by corn acreage, by farm type, by age category and their education level. A comparison with the 2011, 2013 and 2015 studies is provided. In 2013 and 2015, for mixed and livestock farm types, producers were asked their primary livestock. Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

SUMMARY OF FINDINGS:

Corn Acreage Category:

- There were no significant changes in the acreage profile of Bt corn growers in the sample between 2013 and 2015.

Farm Type: Relevant question was … "Which of the following statements best describes your farming operation?"

- In 2015 the percentage of Bt corn growers classifying themselves as mixed farming operations declined compared to 2013. The decline was most significant in Quebec and Manitoba.
- The percentage of corn growers classifying themselves as mainly livestock increased in 2015. The percentage increased in Quebec and declined in Ontario.

- continued

DEMOGRAPHIC PROFILE OF BT CORN GROWERS – continued …

Age: Relevant question was … "To which of the following age groups do you belong?"

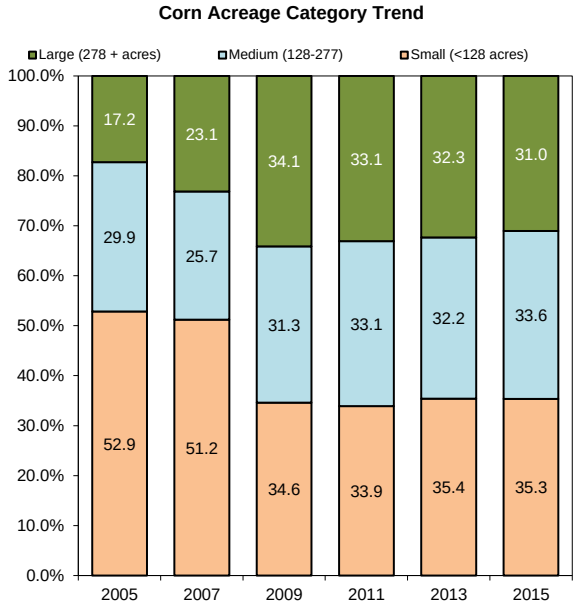
- There was a tendency for a higher overall average age of Bt corn growers in the 2015 sample, continuing the trend from 2011. The percentage of corn growers 55 years and over increased as the percentage of corn growers less than 45 years in age declined. This was driven by changes in Ontario and Manitoba.

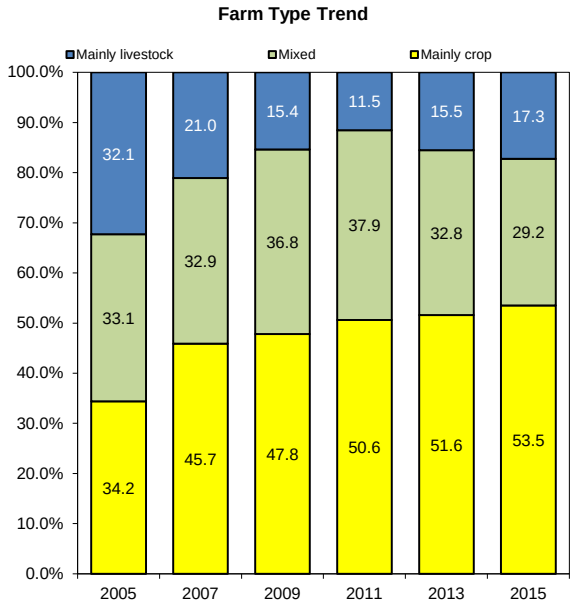
Education Level:

- 37.5% of Bt corn growers have graduated college or university with an additional 4.0% having a post-graduate degree. University education is highest in Ontario. The education profile in 2015 is similar to 2013 except for a slight increase in the percentage of growers having post-graduate education in Ontario.

Livestock Type: Relevant question with mixed farms and livestock was … "What is your primary type of livestock?"

- 45.9% of the mixed and livestock farms had dairy cows as their primary livestock. Dairy was most prevalent in Quebec where 75% of mixed and livestock farms were dairy farms. The next highest dairy farm penetration was Ontario at 37% of mixed/livestock producers.
- Beef was most prevalent in Manitoba (71.4%) followed by Ontario (32.6%).
- Hogs were most prevalent in Manitoba (28.6%).





1.6. CORN ROTATION PRACTICES

Corn Rotation among Bt Corn Growers - Length of Time Corn Under Production in Same Fields								
	Total Market		Province			Corn Acreage		
	2013	2015	Ontario	Quebec	Manitoba	Small	Medium	Large
Base	587	600	23	445	132	215	200	185
%of Bt Growers with:								
First Year Corn	94.5	**97.9**	95.7	98.3	97.0	99.2	95.7	98.8
Second Year Corn	54.3	***39.8***	26.1	34.0	56.5	27.9	41.9	51.1
Third Year Corn	17.9	***13.6***	13.0	12.5	16.8	10.6	13.7	17.0
Four or More Years in Corn	13.3	12.2	4.3	7.9	24.2	8.9	10.8	17.4
%of Bt Growers where:								
All Corn Rotated	40.0	**54.2**	69.6	61.8	32.6	67.3	51.9	41.9
Some Corn Rotated	54.4	***43.7***	26.1	36.5	64.4	32.0	43.8	57.0
No Corn Rotated	5.5	***2.1***	4.3	1.7	3.0	0.8	4.3	1.2
%of Corn Acres	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
First Year Corn	68.4	**76.6**	80.7	64.4	88.1	85.0	77.6	74.8
Second Year Corn	18.4	***13.0***	11.3	18.4	7.4	8.9	13.2	13.7
Third Year Corn	5.3	3.7	3.7	3.8	3.9	3.6	3.9	3.7
Four or More Years in Corn	7.9	6.6	4.3	13.4	0.7	2.6	5.3	7.8
Corn Acres (000)	3,668	3,490	2,201	1,012	276	386	806	2,298
First Year Corn	2,508	2,672	1,777	652	244	328	625	1,720
Second Year Corn	675	455	249	186	20	34	106	314
Third Year Corn	194	131	81	39	11	14	31	85
Four or More Years in Corn	291	232	95	135	2	10	43	179

METHOD: Bt Corn growers were asked to indicate the number of acres of corn that was planted on the same acres two years in a row, three years in a row and four years in a row. Acreage data was compiled and weighted by Census Agricultural Region up to the total grain and silage corn acreage by province reported by Statistics Canada in the June Estimate of Principal Field Crop Areas, Field Crop Reporting Series. Data are presented for 2013 and 2015 with a % of Bt corn growers growing any amount of corn on first, second, third and four or more years corn ground, the total acres of corn for first, second, third and four or more years and the % by each type. In addition, the net % of Bt corn growers that rotated all of their corn, some of their corn and none of their corn is provided.

SUMMARY OF FINDINGS:

- The majority of corn acres with Bt Corn growers were first year corn. Of the total 3.5 million acres of corn 76.6% of those areas were grown on land that was not in corn the previous year up from 68.4% in 2013. First year corn was grown by 97.9% of Bt corn growers.
- Second year corn was grown on 13.0% of acres followed by 3.7% of acres for third year corn and 6.6% of acres on ground that had four or more years in a row of corn. Second year corn as a % of corn acres declined from 2013.
- Ontario had the highest proportion of first year corn at 79.2% followed by Manitoba at 69.5%.
- Quebec had the highest proportion of second, third and four or more years of corn at 17.3%, 3.6% and 12.6% respectively.
- Smaller corn acreage growers tended to have a higher proportion of first year corn compared to larger corn acreage growers.
- On a net basis 54.2% of Bt corn growers rotated all of their corn, 43.7% rotated some of their corn and only 2.1% did not rotate any of their corn.
- Ontario had the highest percentage of Bt corn growers with all their corn being rotated followed next by Quebec and then Manitoba.
- The smaller the corn acreage category the greater the percentage of growers rotating all of their corn.

2. ACTUAL COMPLIANCE WITH REFUGE AREA AND PROXIMITY REQUIREMENTS

2.1. REFUGE AREA COMPLIANCE

Refuge Area Compliance - by Province												
	% of Bt Growers											
	Total Market			Ontario			Quebec			Manitoba		
	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base (Total All Hybrids)	608	590	600	415	419	445	162	140	132	31	31	23
Base (20% Refuge Hybrids)	490	185	132	318	120	92	145	52	33	27	13	7
Base (5% Refuge Hybrids)	318	540	15	258	388	9	54	132	6	6	20	0
Base (RIB Hybrids)	-	507	518	-	363	391	-	128	109	-	16	18
Total All Hybrids	67.7	87.5	**90.9**	68.5	87.7	91.1	64.2	86.4	90.2	87.1	93.5	91.3
20% Refuge Hybrids	63.2	75.6	***55.1***	62.9	76.8	***54.5***	62.1	71.2	***54.5***	85.2	92.3	***71.4***
5% Refuge Hybrids	89.7	92.0	***68.7***	90.1	92.4	***70.4***	87.0	90.9	***66.7***	100.0	95.0	***0.0***
RIB Hybrids	-	100.0	100.0	-	100.0	100.0	-	100.0	100.0	-	100.0	100.0

Refuge Area Compliance - by Acreage Category												
	% of Bt Growers											
	Total Market			Small			Medium			Large		
	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base (Total All Hybrids)	608	590	600	206	205	215	201	190	200	201	194	185
Base (20% Refuge Hybrids)	490	185	132	152	51	51	165	62	43	173	71	38
Base (5% Refuge Hybrids)	318	540	15	111	184	6	96	173	4	111	182	5
Base (RIB Hybrids)	-	507	518	-	165	177	-	166	176	-	175	165
Total All Hybrids	67.7	87.5	**90.9**	71.2	87.2	91.0	65.8	89.1	**93.8**	65.9	86.2	87.5
20% Refuge Hybrids	63.2	75.6	***55.1***	65.8	76.5	***59.4***	62.3	76.3	***63.7***	61.7	73.9	***39.5***
5% Refuge Hybrids	89.7	92.0	***68.7***	87.8	90.6	**100.0**	86.9	93.1	***75.7***	93.9	92.4	***23.8***
RIB Hybrids	-	100.0	100.0	-	100.0	100.0	-	100.0	100.0	-	100.0	100.0

METHOD: The above tables examine the percentage of Bt corn growers that comply with the refuge area requirements. Bt corn growers were asked for their acreage of non-Bt corn, their stacked and non-stacked trait hybrids and their RIB hybrids. Each grower was categorized as having met either a) the 20% refuge area requirement for applicable stacked traits (20% Refuge Hybrids) or b) 5% refuge requirement for applicable hybrids (5% Refuge Hybrids) or c) the Refuge-In-a-Bag (RIB) hybrids and d) if they met requirements for all three categories of hybrids (Total All Hybrids).

Since RIB hybrids, introduced for the first time in the 2013 study, contain the correct refuge amount all of this acreage automatically complies with the refuge area requirement.

In addition to the total market, splits by a) Province (Ontario, Quebec, Manitoba) and b) Corn acreage category (small, medium, large) are provided.

As an example in the first table, in Quebec in 2015, the compliance level for 20% refuge hybrids was 54.5%; the compliance level for 5% refuge hybrids was 66.7%. These combined with 100% compliant RIB hybrids resulted in an overall compliance level of 90.2%.

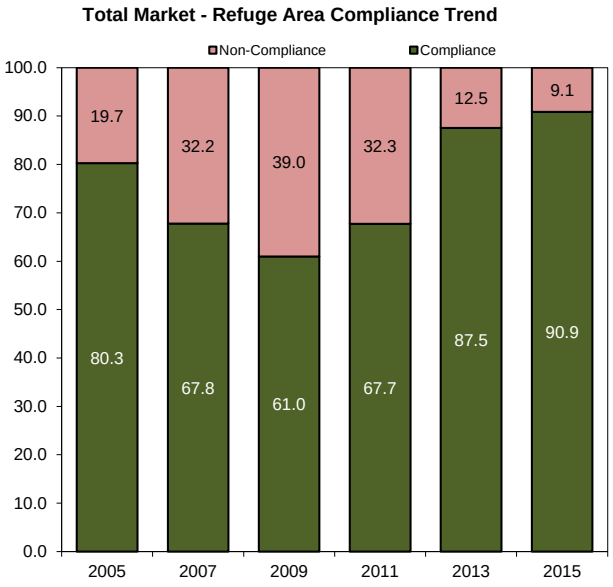
Statistical analysis was performed on the compliance levels. Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

- continued

REFUGE AREA COMPLIANCE – continued….

SUMMARY OF FINDINGS:

- Total Market
  - There was a statistically significant increase in compliance overall with all hybrids in 2015 compared to 2013. 90.9% of Bt corn growers complied with all area refuge requirements in 2015 compared with 87.5% in 2013 which was up from 67.7% in 2011.
  - The compliance with the 20% refuge hybrids was 55.1%, down from 75.6% in 2013 and the compliance with the 5% refuge hybrids was 68.7% down from 92.0% in 2013. However, in absolute terms the number of growers not complying has likely gone down as the use of these hybrids has declined significantly.
  - The reason for the increase in the overall compliance was due to the significant penetration into the market with the RIB hybrids.



- By Province
  - The compliance level increased in both Ontario and Quebec in 2015 compared to 2013, although not significantly. Compliance declined slightly in Manitoba although not significantly.
  - In Ontario and Quebec the compliance level with all hybrids was higher due to the heavy use of RIB hybrids (91 and 90% respectively).

- By Corn Acreage Category
  - Overall compliance levels increased among all size categories of corn grower, although it was only significant for medium corn acreage growers.
  - The overall compliance levels were higher with small (91%) and medium (94%) size corn acreage growers compared to large corn acreage growers (88%).

- Profile of Bt Corn Growers Compliance/Non-Compliance
  - Compliance and non-compliance with the refuge area requirement was examined for significant differences across all regional and demographic variables as well as how respondents answered other questions in the survey.
  - Only two variables had significant differences in compliance compared to the overall market.
  - One variable was based on having adequate information on Bt IRM. Overall non-compliance was significantly higher (21.4%) with those growers who said they did not have adequate information, compared to overall market compliance of 9.1%.
  - Another variable was the age category of the grower. Growers who were in the 35-44 year age category had a significantly higher compliance level (97.6%) than the market as a whole.
  - The fact that compliance levels are now so high results in insignificant differences across variables that in the past were important such as farm type, corn acreage etc. With technological advances in hybrid offerings compliance comes easier to more growers.

2.2. PROXIMITY OF BT CORN BORER TO NON-BT CORN BORER

Proximity of Bt Corn Borer to Refuge Corn by Province												
	%of Bt Corn Borer Growers											
	Total Market			Ontario			Quebec			Manitoba		
Proximity of Bt Corn to Refuge Corn	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base (excluding RIB Hybrids)	207	80	31	131	54	19	62	19	11	14	7	1
Base (including RIB Hybrids)	207	159	183	131	109	130	62	38	47	14	12	6
Non RIB Hybrids												
In Same Field	79.1	62.4	69.1	82.6	60.6	71.8	71.0	63.2	63.6	92.9	85.7	100.0
400 m (1/4 Mile) or Less	29.5	33.4	28.4	30.9	35.3	17.5	29.0	31.6	45.5	7.1	14.3	
Greater than 400 m (1/4 Mile)	6.2	5.9	**20.6**	4.7	6.5	16.7	9.7	5.3	27.3			
Don't Know	0.4		2.6	0.7		4.4						
Compliance Level (excluding RIB Hybrids)	93.8	94.1	***79.4***	95.3	93.5	83.3	90.3	94.7	72.7	100.0	100.0	100.0
Compliance Level (including RIB Hybrids)	93.8	97.0	96.5	95.3	96.7	97.6	90.3	97.4	93.6	100.0	100.0	100.0

Proximity of Bt Corn Borer to Refuge Corn by Corn Acreage												
	%of Bt Corn Borer Growers											
	Total Market			Small			Medium			Large		
Proximity of Bt Corn to Refuge Corn	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base (excluding RIB Hybrids)	207	80	31	49	17	15	74	30	11	84	32	5
Base (including RIB Hybrids)	207	159	183	49	39	47	74	54	60	84	65	76
Non RIB Hybrids												
In Same Field	79.1	62.4	69.1	74.0	68.0	70.0	79.6	50.9	61.2	82.0	72.9	83.9
400 m (1/4 Mile) or Less	29.5	33.4	28.4	26.2	32.0	36.3	28.4	38.0	20.4	32.6	27.1	23.1
Greater than 400 m (1/4 Mile)	6.2	5.9	**20.6**	5.9	7.2	13.9	5.1	11.1	**38.8**	7.3		
Don't Know	0.4		2.6				1.1					16.1
Compliance Level (excluding RIB Hybrids)	93.8	94.1	***79.4***	94.1	92.8	86.1	94.9	88.9	***61.2***	92.7	100.0	100.0
Compliance Level (including RIB Hybrids)	93.8	97.0	96.5	94.1	96.8	95.6	94.9	93.7	92.9	92.7	100.0	100.0

METHOD: The above tables examine the planting practices of Bt corn borer growers with respect to the proximity of their hybrids containing only the Bt corn borer trait to their non-Bt (i.e. refuge) corn hybrids in 2015, compared to the 2011 and 2013 studies. The tables show the proportion of Bt corn growers with non-RIB hybrids that a) planted non-Bt corn in the same field as Bt corn borer hybrids, b) planted their non-Bt corn within a 400 m (¼ mile) of their Bt corn borer hybrids and c) planted their non-Bt corn greater than 400 m (¼ mile) from their Bt corn borer hybrids. Growers could indicate more than one practice. The compliance level on the proximity requirement is also examined. Compliance with the proximity requirement only occurred when the Bt corn grower always planted non-Bt corn in the same field or within 400 m (¼ mile) of their Bt corn borer hybrids. Overall compliance levels were calculated both excluding and including Bt corn borer RIB hybrids. Note that the calculation for compliance does not include growers who had no refuge at all. In this regard compliance as measured among growers with a refuge will be higher than if growers who have no refuge at all are included in the calculations.

In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided.

Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

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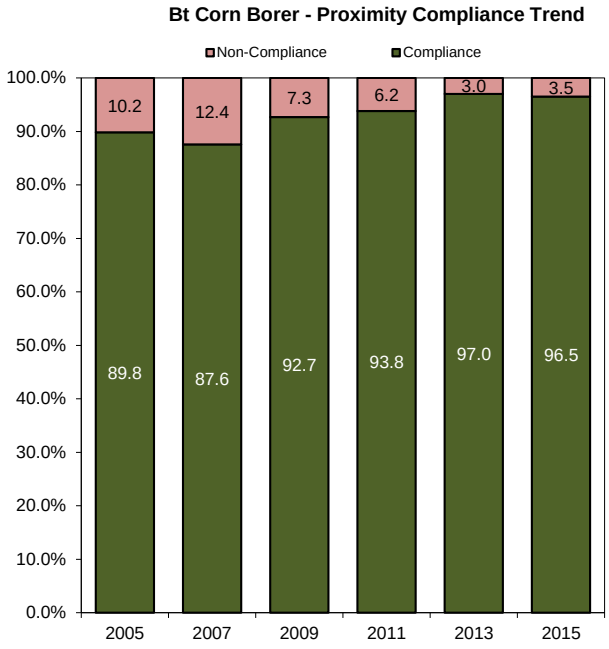
PROXIMITY OF BT CORN BORER TO NON-BT CORN BORER– continued …

SUMMARY OF FINDINGS:

- Total Market
  - Compliance levels were very high in 2015, when RIB hybrids are included in the calculation; however, excluding RIB hybrids resulted in significantly lower compliance (79.4%). There was no significant change in compliance levels between 2013 and 2015.
  - The majority of Bt corn growers in 2015 that planted a non-Bt refuge planted the refuge in the same field as Bt corn borer non-RIB hybrids (69.1%).
  - In 2015, 28.4% of Bt growers planted non-Bt corn in fields within 400 m of their Bt corn borer fields.
  - 20.6% of Bt corn growers planted their non-Bt corn more than 400 m from their non-RIB Bt corn borer fields.
  - 79.4% of Bt corn growers that planted a refuge fully complied with the proximity requirement. When RIB hybrids are included in the calculation compliance moved up to 96.5%.



- By Province
  - Compliance levels tended to be higher in Ontario compared to Quebec in 2015.

- By Corn Acreage Category
  - Compliance levels at 100% were higher with large corn acreage growers in 2015.
  - A higher proportion of large growers tended to plant refuge corn in the same field.

2.3. PROXIMITY OF BT CORN ROOTWORM TO REFUGE CORN

Proximity of Bt Corn Rootworm to Refuge Corn by Province												
	%of Bt Corn Rootworm Growers											
	Total Market			Ontario			Quebec			Manitoba		
Proximity of Bt Corn to Refuge Corn	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base (excluding RIB Hybrids)	437	174	67	319	125	48	102	40	15	16	9	4
Base (including RIB Hybrids)	437	470	546	319	341	410	102	111	117	16	18	19
Non RIB Hybrids												
In Same Field	73.5	70.9	***58.5***	78.1	76.2	***59.7***	57.8	55.0	53.3	81.3	77.8	75.0
Adjacent Field	29.3	33.2	30.5	27.0	35.2	32.3	37.3	27.5	26.7	25.0	33.3	25.0
Further Away	6.6	10.8	17.2	6.0	7.2	11.7	8.8	20.0	33.3	6.3	22.2	
Don't Know	0.7		1.3			1.9						
Compliance Level (excluding RIB Hybrids)	93.4	89.2	82.8	94.0	92.8	88.3	91.2	80.0	66.7	93.8	77.8	100.0
Compliance Level (including RIB Hybrids)	93.4	95.9	**97.9**	94.0	97.3	98.6	91.2	92.8	95.7	93.8	88.9	100.0

Proximity of Bt Corn Rootworm to Refuge Corn by Corn Acreage												
	%of Bt Rootworm Growers											
	Total Market			Small			Medium			Large		
Proximity of Bt Corn to Refuge Corn	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base (excluding RIB Hybrids)	437	174	67	155	55	30	135	56	22	146	63	15
Base (including RIB Hybrids)	437	470	546	155	160	193	135	151	184	146	158	169
Non RIB Hybrids												
In Same Field	73.5	70.9	***58.5***	72.3	75.9	***57.2***	67.6	68.2	60.2	80.1	68.8	59.0
Adjacent Field	29.3	33.2	30.5	24.5	14.1	**36.5**	32.4	47.2	29.4	31.5	37.9	20.2
Further Away	6.6	10.8	17.2	8.4	18.2	14.8	6.6	7.9	10.4	4.8	6.5	**31.2**
Don't Know	0.7		1.3	0.6			1.5					5.5
Compliance Level (excluding RIB Hybrids)	93.4	89.2	82.8	91.6	81.8	85.2	93.4	92.1	89.6	95.2	93.5	***68.8***
Compliance Level (including RIB Hybrids)	93.4	95.9	**97.9**	91.6	93.5	**97.7**	93.4	97.0	98.8	95.2	97.4	93.9

METHOD: The above tables examine the planting practices of Bt corn growers with respect to the proximity of their Bt corn rootworm hybrids to their refuge hybrids in 2015, compared to 2013 and 2011. The tables show the proportion of Bt corn growers with non-RIB hybrids that a) planted refuge hybrids in the same field as Bt corn rootworm hybrids, b) planted their refuge hybrids in an adjacent field to their Bt corn rootworm hybrids, and c) planted their refuge hybrids further away from their Bt corn rootworm hybrids. Growers could indicate more than one practice. The compliance level on the proximity requirement is also examined. Compliance with the proximity requirement only occurred when the refuge hybrids were planted in the same field as, or in a field adjacent to Bt corn rootworm hybrids. Overall compliance levels were calculated both excluding and including Bt corn rootworm RIB hybrids. Don't know respondents were removed from the base when calculating the compliance level.

In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided.

Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

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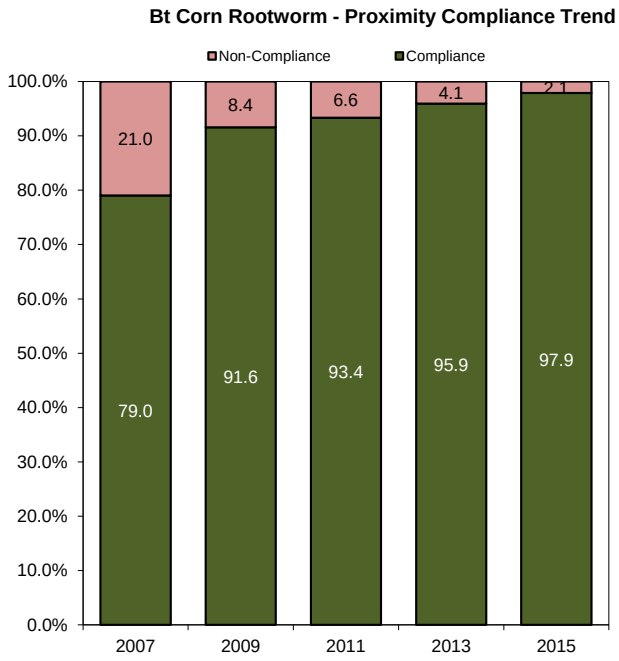
PROXIMITY OF BT CORN ROOTWORM TO REFUGE CORN – continued …

SUMMARY OF FINDINGS:

- Total Market
  - There was no significant change in compliance levels between 2013 and 2015 when RIB hybrids are excluded from the calculation, however, when RIB hybrids are included then compliance was significantly higher in 2015 compared to 2013 and 2011.
  - In 2015, the majority of Bt corn rootworm growers planted non-RIB refuge hybrids in the same field as Bt corn rootworm hybrids (58.5%), as was the case in previous years.
  - In 2015, 30.5% of growers planted Bt corn rootworm non-RIB hybrids in an adjacent field.
  - Overall compliance with the proximity requirement among growers, who planted refuge for Bt corn rootworm hybrids, including RIB hybrids, was high (97.9%).



- By Province
  - Compliance to the proximity requirement on Bt corn rootworm hybrids was higher in Ontario and Manitoba, compared to Quebec.

- By Corn Acreage Category
  - There was a significant increase in compliance levels with small corn acreage growers (97.7%).
  - In 2015, compliance levels were higher with small (97.7%) and medium (98.8%) corn acreage categories compared with large corn acreage growers (93.9%).

2.4. BT CORN BORER REFUGE PLANTING PRACTICES IN THE SAME FIELD

Bt Corn Refuge Planting Practices in Same Field by Province												
	%of Bt Corn Growers with Bt and non-Bt in Same Field											
	Total Market			Ontario			Quebec			Manitoba		
Planting Practice	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	407	165	60	301	122	42	82	30	14	24	13	4
Seed Mixed Together	4.9	7.1	**22.8**	4.9	4.5	**28.1**	4.9	13.3	14.3	4.2	23.1	
Alternating strips of less than 2 rows	6.0	3.8	9.7	5.9	2.4	2.2	7.3	10.0	28.6			
Alternating strips of 2 to 4 rows	20.4	13.4	11.6	22.7	12.3	11.2	14.6	20.0	14.3	4.2		
Alternating Strips of 4 or More rows	22.1	22.8	29.1	20.6	22.9	26.5	28.0	26.7	35.7	16.7		25.0
Complete Blocks or Portions of Fields	33.3	31.6	37.6	32.1	32.3	33.0	35.4	23.3	**50.0**	50.0	61.5	25.0
Headlands or Perimeter of Fields	29.3	29.0	27.9	33.4	35.4	26.1	14.6	6.7	**28.6**	33.3	23.1	50.0
Met or Exceeded Recommended Guidelines	81.6	75.7	73.4	81.1	80.9	69.4	81.7	56.7	78.6	91.7	76.9	**100.0**
Less than Recommended Guidelines	18.4	24.3	26.6	18.9	19.1	30.6	18.3	43.3	21.4	8.3	23.1	

Bt Corn Refuge Planting Practices in Same Field by Corn Acreage												
	%of Bt Corn Growers with Bt and non-Bt in Same Field											
	Total Market			Small			Medium			Large		
Planting Practice	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	407	165	60	131	53	28	128	52	20	148	60	12
Seed Mixed Together	4.9	7.1	**22.8**	7.9	7.5	**32.1**	3.7	5.1	8.8	3.0	8.5	23.8
Alternating strips of less than 2 rows	6.0	3.8	9.7	4.6	8.1	7.5	8.1	3.6	6.4	5.6		**19.9**
Alternating strips of 2 to 4 rows	20.4	13.4	11.6	22.6	13.1	10.6	13.4	15.8	***4.4***	24.6	11.4	25.0
Alternating Strips of 4 or More rows	22.1	22.8	29.1	12.1	16.0	21.5	19.1	13.0	23.6	34.6	38.2	54.9
Complete Blocks or Portions of Fields	33.3	31.6	37.6	31.8	27.2	32.7	36.4	44.8	41.9	32.0	23.5	41.9
Headlands or Perimeter of Fields	29.3	29.0	27.9	33.0	32.3	17.9	29.1	28.3	37.8	25.9	26.4	34.9
Met or Exceeded Recommended Guidelines	81.6	75.7	73.4	78.8	71.3	67.9	80.5	75.5	80.4	85.1	80.1	75.0
Less than Recommended Guidelines	18.4	24.3	26.6	21.2	28.7	32.1	19.5	24.5	19.6	14.9	19.9	25.0

METHOD: The above tables examine the planting practices of Bt corn growers with respect to planting refuge corn in the same field as their Bt corn hybrids in 2015, compared to the 2011 and 2013 studies. Growers were asked how they typically planted non-RIB, Bt and non Bt hybrids in the same field. Did they a) mix their refuge and Bt corn seed together, b) plant in alternating strips of less than 2 rows, c) plant in alternating strips of 2 to 4 rows, d) plant in alternating strips of 4 or more rows, e) plant complete blocks or portions of their field to refuge corn, or e) plant headlands or the perimeter of fields to refuge corn. Growers could indicate more than one practice. Although not a requirement, these are only recommended guidelines for planting refuge and Bt corn in the same field.

An estimate of whether growers met or exceeded these guidelines was also examined. To estimate whether a grower met or exceeded the guidelines the grower had to plant refuge corn in alternating strips of 2 or more rows, or in complete blocks or portions of fields or as headlands or perimeter of fields for 5% refuge hybrids and in alternating strips of 4 or more rows, complete blocks or portions of fields or as headlands or perimeter of fields for 20% refuge hybrids. If refuge was planted as a seed mixture with Bt corn, or if it was planted in alternating strips of less than 2 rows, growers would be out of compliance no matter what the hybrid.

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BT CORN BORER REFUGE PLANTING PRACTICES IN THE SAME FIELD– continued …

Due to overlapping choices and the potential for confusion with strips of alternating rows of refuge corn for different hybrids, caution needs to be taken with regard to the estimation of meeting the guidelines and especially comparisons to past studies.

In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided. Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

SUMMARY OF FINDINGS:

- Overall Market
  - In 2015, in the strictest of interpretations, 73.4% of Bt corn growers that planted non-RIB Bt corn hybrids and refuge corn in the same field met the planting guidelines for refuge. The most popular method was to plant refuge corn in complete blocks or portions of the field (37.6%) followed by alternating strips of 4 or more rows (29.1%) and planting of headlands or perimeters of the field (27.9%).
  - Although not statistically significant, it appears non-compliance to the guidelines is up slightly.
  - In 2015, 26.6% of Bt corn growers planted non-RIB Bt corn and refuge corn in the same field in a way that did not appear to meet all of the planting guidelines for Bt corn refuge across all hybrids. The most common form of non-compliance among these growers was to mix Bt corn seed with non-Bt corn seed. This increased significantly in 2015 compared to 2013.

- By Province
  - Quebec growers tended to meet the guidelines more than Bt corn growers in Ontario.
  - The mixing of seed together was highest in Ontario (28.1%), a significant increase from 2013.
  - Meeting the planting guidelines increased in Ontario and Manitoba in 2015 compared to 2013.

- By Corn Acreage Category
  - Small corn acreage growers tended to plant refuge corn in the same field in a way that does not meet the guidelines more frequently than medium and large corn acreage growers.

2.5. OVERALL ACTUAL COMPLIANCE WITH BT REFUGE REQUIREMENTS

Overall Actual Compliance with Bt Refuge Requirements by Province												
	%of Bt Growers											
	Total Market			Ontario			Quebec			Manitoba		
Actual Bt Refuge Compliance	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base - Refuge Area	607	590	600	415	419	445	162	140	132	31	31	23
Base - Proximity & Both (excludes DK)	522	530	600	366	378	445	128	125	132	28	27	23
Complied with Refuge Area Requirement	67.7	87.5	**90.9**	68.5	87.7	91.1	64.2	86.4	90.2	87.1	93.5	91.3
Complied with Proximity Requirement	91.9	95.5	94.6	92.7	96.6	95.5	89.1	92.8	91.7	96.4	92.6	100.0
Complied with Both Requirements	69.0	92.3	***87.8***	68.7	93.9	***89.1***	68.0	88.0	84.1	89.3	92.6	91.3
Non- Compliance with Refuge Area Requirement	32.3	12.5	***9.1***	31.5	12.3	8.9	35.8	13.6	9.8	12.9	6.5	8.7
Non-Compliance with Proximity Requirement	8.1	4.5	5.4	7.3	3.4	4.5	10.9	7.2	8.3	3.6	7.4	0.0
Non-Compliance with Either Requirement	31.0	7.7	**12.2**	31.3	6.1	**10.9**	32.0	12.0	15.9	10.7	7.4	8.7

Overall Actual Compliance with Bt Refuge Requirements by Corn Acreage												
	%of Bt Growers											
	Total Market			Small			Medium			Large		
Actual Bt Refuge Compliance	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base - Refuge Area	607	590	600	205	205	215	201	190	200	201	194	185
Base - Proximity & Both (excludes DK)	522	530	600	172	180	215	173	174	200	177	175	185
Complied with Refuge Area Requirement	67.7	87.5	**90.9**	71.2	87.2	91.0	65.8	89.1	**93.8**	65.9	86.2	87.5
Complied with Proximity Requirement	91.9	95.5	94.6	90.2	93.5	92.7	92.4	95.4	95.6	93.2	97.6	95.7
Complied with Both Requirements	69.0	92.3	***87.8***	74.4	92.4	87.9	67.1	92.0	90.4	65.2	92.3	***85.0***
Non- Compliance with Refuge Area Requirement	32.3	12.5	***9.1***	28.8	12.8	9.0	34.2	10.9	***6.2***	34.1	13.8	12.5
Non-Compliance with Proximity Requirement	8.1	4.5	5.4	9.8	6.5	7.3	7.6	4.6	4.4	6.8	2.4	4.3
Non-Compliance with Either Requirement	31.0	7.7	**12.2**	25.6	7.6	12.1	32.9	8.0	9.6	34.8	7.7	**15.0**

METHOD: The above tables examine the overall compliance levels to the refuge area requirement and the proximity requirement. To comply with the refuge area requirement, the proportion of refuge corn to Bt corn as determined by the acreages that farmers reported had to be 20% or more for 20% refuge hybrids and 5% or more for 5% refuge hybrids. RIB hybrids automatically comply. These data are the same as compliance levels reported in Section 2.1. To comply with the proximity requirement for Bt corn borer hybrids, refuge corn had to be planted in the same field or within 400 m (¼ mile) of Bt corn borer fields. To comply with the proximity requirement for Bt corn rootworm hybrids, non-Bt corn rootworm had to be planted in the same field or in a field adjacent to Bt corn rootworm fields. The data shown in this table are the net compliance/non-compliance with requirements for both Bt corn borer and Bt corn rootworm traits that are shown in Sections 2.2 and 2.3. Growers who complied with both requirements were those growers who answered the proximity questions and met the refuge area requirement.

Non-compliance with the refuge area requirement, the proximity requirement and with either requirement is also provided; however, they are the opposite of the compliance numbers and therefore separate commentary is not necessary.

In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided. Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

Direct comparisons between 2015 and all previous years for the measure on both requirements combined cannot be made. In 2013 and all previous years, compliance to the both requirements did not include growers who had no refuge at all. In this regard compliance as measured among growers with a refuge will have been higher than if growers who have no refuge at all are included in the calculations. In 2015 growers with no refuge were seen as non-compliant to the proximity requirement which would lower the compliance to the proximity and both requirements combined, compared to previous year's measurement.

- continued

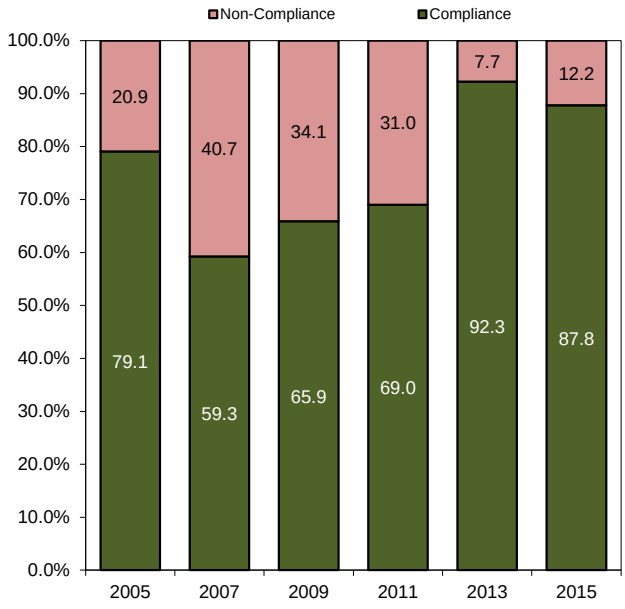
SUMMARY OF FINDINGS:

- Total Market
  - In 2015, 90.9% of Bt corn growers complied with the refuge area requirement, 94.6% with the proximity requirement and 87.8% with both requirements.
  - Compliance with the refuge area requirement was higher in 2015 as discussed in Section 2.1.

- By Province
  - Compliance to both requirements was slightly higher in Ontario and Manitoba compared to Quebec.

- By Corn Acreage Category
  - There was a significant increase in compliance with the refuge area requirement with medium corn acreage growers.
  - Overall compliance to both requirements in 2015 was higher with medium corn acreage growers compared to small and large corn acreage growers.

Trend in Compliance to Both Requirements



3. AWARENESS AND STATED COMPLIANCE

3.1. AIDED AWARENESS OF BT CORN REFUGE REQUIREMENTS

Aided Awarness of Bt Refuge Requirements by Province												
	%of Bt Growers											
	Total Market			Ontario			Quebec			Manitoba		
Bt Refuge Management Requirements	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	580	590	600	398	419	445	152	140	132	30	31	23
Refuge Area	95.7	97.7	***95.9***	96.7	98.6	***96.7***	92.8	95.7	94.7	100.0	93.5	87.0
Record Keeping	70.2	78.3	76.6	73.5	80.3	81.9	62.5	75.0	***65.2***	66.7	58.1	47.8
Scouting	32.3	42.9	39.3	28.3	37.2	33.9	42.4	59.3	54.5	30.0	29.0	30.4
Refuge Proximity	94.2	96.0	***93.8***	96.6	97.4	***94.8***	88.0	93.6	91.7	96.7	83.9	87.0
Planting Date	78.9	85.2	85.3	79.4	87.5	88.2	78.5	81.4	80.3	70.0	61.3	56.5

Aided Awareness of Bt Refuge Requirments by Corn Acreage Size												
	%of Bt Growers											
	Total Market			Small			Medium			Large		
Bt Refuge Management Requirements	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	580	590	600	198	205	215	191	190	200	191	194	185
Refuge Area	95.7	97.7	***95.9***	93.5	97.9	96.1	96.7	95.7	95.5	97.1	99.4	***96.3***
Record Keeping	70.2	78.3	76.6	70.8	77.1	70.4	61.7	75.4	**82.3**	78.6	82.3	77.4
Scouting	32.3	42.9	39.3	27.6	37.6	34.4	36.7	49.0	41.9	33.0	42.1	42.3
Refuge Proximity	94.2	96.0	***93.8***	92.1	94.3	92.4	96.3	95.6	94.4	94.2	98.2	***94.6***
Planting Date	78.9	85.2	85.3	75.6	83.2	86.7	76.5	80.5	82.3	85.3	92.0	86.8

METHOD: The above tables examine the aided awareness of the Bt refuge management requirements among Bt corn growers for 2015 compared to 2013 and 2011. Bt corn growers were read each requirement and asked if they were aware of each requirement.

The requirements listed in the above tables and in the tables in sections 3.2 and 3.2 are in short form. The following statements are how each requirement was read to Bt corn growers:

Refuge Area – Plant an adequate refuge area with non-Bt corn or plant refuge in a bag hybrids. “Plant an adequate refuge area with non-Bt corn” was asked in 2011.

Record Keeping – Keep accurate records of where Bt hybrids are planted.

Scouting – Have your Bt corn fields checked for insect damage.

Refuge Proximity – Plant the refuge in close proximity to Bt hybrids. In 2011 “Plant Bt corn in the same field or within close proximity to non-Bt corn fields” was asked.

Planting Date – Plant Bt and refuge hybrids of similar maturity at the same time.

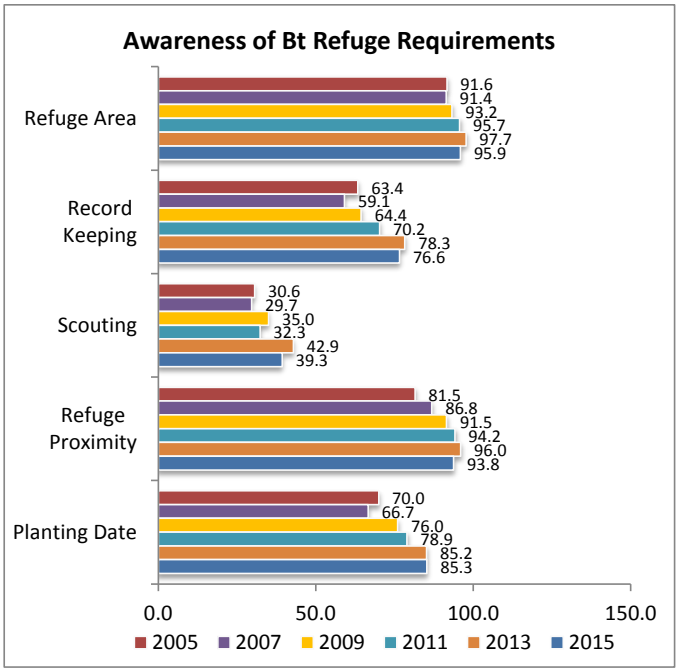
In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided. Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

- continued

AIDED AWARENESS OF BT CORN REFUGE REQUIREMENTS – continued …

SUMMARY OF FINDINGS:

- Overall Market
  - On an aided basis there was very high awareness of the refuge area requirement (95.9%) and the proximity requirement (93.8%) in 2015, as in previous years. Awareness of these two requirements has steadily increased over the years.
  - Awareness of the requirement to scout for insect damage was the lowest at 39.3%.
  - There was a significant decrease in the awareness of the refuge area and refuge proximity requirements in 2015 compared to 2013.



- By Province
  - Awareness levels of the refuge and proximity requirements declined in Ontario and awareness of the record keeping requirement declined in Quebec.
  - As in the past, awareness levels of all the requirements tended to be higher in Ontario compared to Quebec with the exception of the scouting requirement where awareness was higher in Quebec. The awareness was higher in Quebec because scouting fields is routinely practiced much more widely there.

- By Corn Acreage Category
  - Awareness levels of the refuge and proximity requirements declined with large corn acreage growers.
  - Awareness of the record keeping requirement increased with medium corn acreage growers.

3.2. STATED COMPLIANCE LEVELS

Stated Compliance with Bt Refuge Requirements by Province												
	%of Bt Growers Meeting Requirement											
	Total Market			Ontario			Quebec			Manitoba		
Bt Refuge Management Requirements	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	580	590	600	398	419	445	152	140	132	30	31	23
Refuge Area	92.7	96.0	97.0	92.1	96.8	97.4	94.1	95.0	96.2	93.3	83.9	91.3
Record Keeping	81.2	87.3	89.1	78.8	88.0	89.2	86.8	86.4	90.2	86.7	77.4	73.9
Scouting	63.4	65.9	***59.0***	57.9	62.0	***54.0***	77.5	77.1	72.7	56.7	58.1	52.2
Refuge Proximity	92.8	94.7	92.5	92.4	95.3	92.7	93.3	94.3	93.2	96.7	83.9	82.6
Planting Date	91.2	93.4	93.8	90.6	93.7	94.8	92.6	94.3	91.7	93.3	77.4	87.0

Stated Compliance with Bt Refuge Requirements by Corn Acreage Size												
	%of Bt Growers Meeting Requirement											
	Total Market			Small			Medium			Large		
Bt Refuge Management Requirements	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	580	590	600	165	205	215	148	190	200	160	194	185
Refuge Area	92.7	96.0	97.0	89.7	95.7	95.9	95.7	93.9	95.9	93.0	98.3	99.3
Record Keeping	81.2	87.3	89.1	82.4	84.5	84.7	77.9	85.9	94.0	83.5	91.7	88.8
Scouting	63.4	65.9	***59.0***	63.2	64.2	***55.6***	65.9	64.1	63.3	60.9	69.4	***58.1***
Refuge Proximity	92.8	94.7	92.5	90.4	91.8	93.7	93.7	95.1	91.1	94.5	97.5	***92.8***
Planting Date	91.2	93.4	93.8	92.0	92.7	94.4	90.9	91.7	94.0	90.7	95.9	92.8

METHOD: The above tables examine compliance to the Bt corn insect management requirements as stated by growers planting Bt corn in 2015 compared to 2013 and 2011. Each requirement was read to growers and they were asked whether they met this requirement in 2015. Refer to Section 3.1 for the requirement statements that were used.

In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided.

Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

SUMMARY OF FINDINGS:

- Overall Market
  - The percentage of Bt corn growers saying they were complying with the Bt Refuge requirements in 2015 ranged from a low of 59.0% for scouting fields for insect damage to a high of 97.0% for the refuge area requirement.
  - Stated compliance declined for the scouting requirement declined whereas stated compliance with all other requirements was similar to 2013.

- By Province
  - The stated compliance for the scouting requirement declined in Ontario.
  - As with the total market stated compliance with the refuge area requirement was highest in all three provinces and the requirement for scouting was the lowest.

- By Corn Acreage Category
  - Stated compliance with the scouting and refuge proximity requirements declined with large corn growers, while record keeping increased for medium corn acreage growers and the scouting requirement declined with small corn acreage growers.
  - The stated compliance for all requirements tended to be similar across corn acreage categories.

4. BARRIERS TO COMPLIANCE

4.1. DIFFICULTY IN MEETING BT CORN REFUGE REQUIREMENTS

Difficulty in Meeting Bt Refuge Requirements - Total Market												
	%of Bt Growers saying it was:											
	Very Difficult			Somewhat Difficult			Easy			Don't Know		
Requirements	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	580	590	600	580	590	600	580	590	600	580	590	600
Refuge Area	7.8	2.0	3.3	33.0	14.7	***9.4***	58.0	83.1	**86.6**	1.2	0.1	0.6
Record Keeping	6.7	2.8	3.8	27.7	18.1	17.7	64.8	78.1	77.8	0.8	1.0	0.8
Scouting	10.4	7.3	9.7	38.2	29.1	**40.9**	48.1	58.7	***44.7***	3.3	4.9	4.7
Refuge Proximity	6.3	1.6	**3.7**	30.5	19.2	18.3	62.4	77.9	76.9	0.8	1.3	1.1
Planting Date	4.9	1.5	**2.9**	26.9	14.3	15.3	67.8	83.0	81.1	0.4	1.2	0.7

Difficulty in Meeting Bt Refuge Requirements - by Province												
	%of Bt Growers saying "Very or Somewhat Difficult" to Meet Requirement											
	Total Market			Ontario			Quebec			Manitoba		
Requirements	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	580	590	600	398	419	445	152	140	132	30	31	23
Refuge Area	40.8	16.8	***12.8***	39.5	16.7	***12.3***	45.4	16.4	14.4	23.3	22.6	8.7
Record Keeping	34.4	20.9	21.5	30.9	18.3	19.5	45.4	26.4	25.0	6.7	35.5	39.1
Scouting	48.6	36.4	**50.6**	44.5	31.7	**49.3**	59.6	47.1	53.0	40.0	54.8	60.9
Refuge Proximity	36.8	20.8	22.0	34.7	20.3	20.9	43.3	21.4	25.0	23.3	25.8	21.7
Planting Date	31.8	15.8	18.2	28.5	14.5	15.8	40.9	20.0	24.2	23.3	9.7	21.7

Difficulty in Meeting Bt Refuge Requirements - by Corn Acreage												
	%of Bt Growers saying "Very or Somewhat Difficult" to Meet Requirement											
	Total Market			Small			Medium			Large		
Requirements	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	580	590	600	165	205	215	148	190	200	160	194	185
Refuge Area	40.8	16.8	***12.8***	37.3	14.2	12.1	37.5	15.7	12.5	48.3	20.2	***13.8***
Record Keeping	34.4	20.9	21.5	27.4	12.7	**22.1**	39.6	26.7	20.0	36.8	23.8	22.3
Scouting	48.6	36.4	**50.6**	43.9	28.9	**47.0**	37.2	43.4	51.3	56.2	37.2	**53.9**
Refuge Proximity	36.8	20.8	22.0	27.3	16.6	21.6	40.3	21.1	22.7	44.0	24.5	21.8
Planting Date	31.8	15.8	18.2	25.6	10.6	**17.8**	29.3	18.9	17.2	41.4	18.5	19.7

METHOD: The above tables examine the level of difficulty Bt corn growers have in meeting each Bt corn refuge requirement in 2015 compared to 2013 and 2011. Each requirement was read to growers and they were asked whether they found it “very difficult”, “somewhat difficult” or “easy” to meet the requirement. Refer to Section 3.1 for the requirement statements that were used.

The first table examines the breakdown of responses for each category for the total market. In addition, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided for Bt corn growers indicating it was “very difficult” or “somewhat difficult” to meet the requirement.

Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

- continued

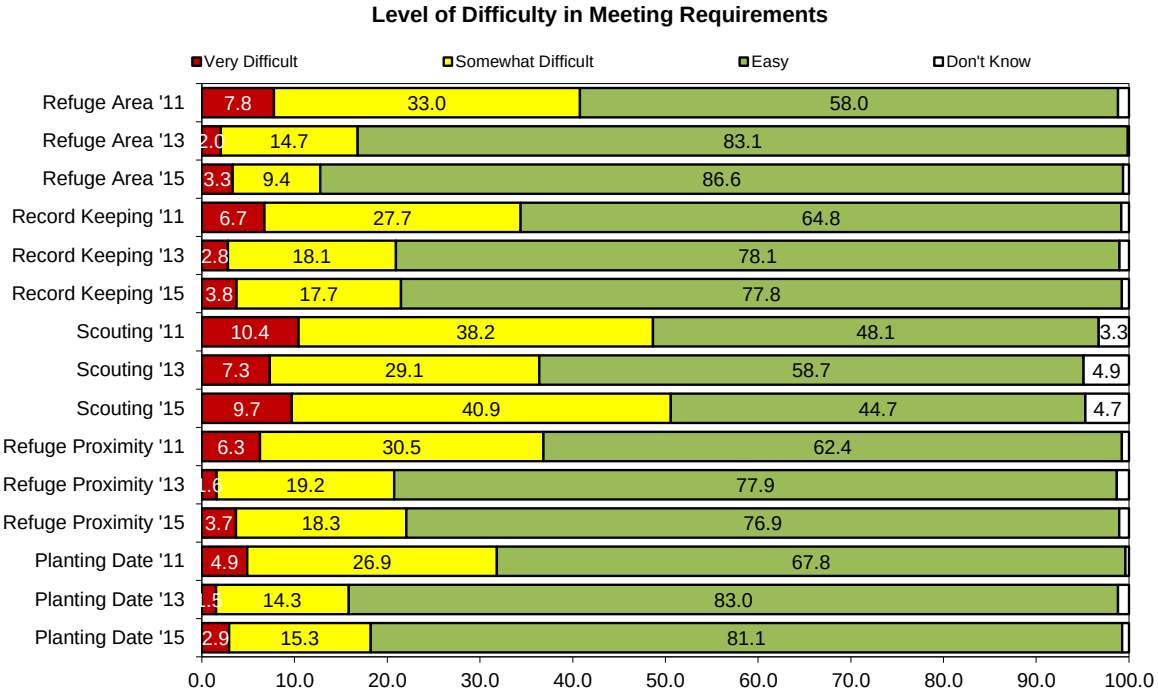
DIFFICULTY IN MEETING BT CORN REFUGE REQUIREMENTS – continued …

SUMMARY OF FINDINGS:

- Overall Market
  - Only between 3 to 10% of Bt corn growers said it was "very difficult" to meet each of the Bt IRM requirements.
  - The level of difficulty in meeting each of the five requirements was higher in 2015, however, lower than in 2013. Despite this, the vast majority said it was "easy" to meet the requirements with the exception of the scouting requirement, as the scouting requirement remains the most difficult requirement to meet.
  - The ease of meeting the refuge area requirement is significantly higher in 2015 following a large increase in 2013. The introduction and adoption of the RIB hybrids have made it much easier for growers.

- By Province
  - Ontario and Manitoba growers found it a lot less difficult in meeting the refuge area requirement in 2015 compared to 2013
  - Bt corn growers in all three provinces found it more difficult to meet the scouting requirement in 2015 versus 2013, although this was significantly more difficult in Ontario.

- By Corn Acreage Category
  - Small acreage corn growers found it more difficult to meet the record keeping, scouting and planting date requirements in 2015 compared to 2013.
  - Large corn growers found it significantly less difficult to comply with the refuge area requirement.
  - All corn acreage categories found it more difficult to meet the scouting requirement in 2015 versus 2013.



4.2. REASONS FOR DIFFICULTY IN MEETING BT CORN REFUGE REQUIREMENTS

Reasons for Difficulty with Refuge Area Requirement - by Province												
	%Finding it Very or Somewhat Difficult to Meet Refuge Requirement											
	Total Market			Ontario			Quebec			Manitoba		
Reasons	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	264	101	75	186	71	54	71	23	19	7	7	2
Its difficult to keep track of where refuge was planted	30.7	30.2	**42.8**	25.1	34.1	**49.9**	45.1	21.7	26.3	14.3	14.3	50.0
My field size and shape makes leaving refuge difficult	37.1	30.6	**53.5**	36.0	33.4	**62.2**	40.8	17.4	36.8	14.3	71.4	***0.0***
It is a hassle switching seed during planting	65.2	63.9	63.7	63.4	68.9	68.9	69.0	47.8	52.6	71.4	85.7	50.0
I feel I am sacrificing yield by leaving a refuge	50.6	37.9	46.6	53.3	36.4	**54.4**	43.7	43.5	31.6	57.1	28.6	***0.0***
Its difficult to get non-Bt corn with the proper maturity	26.4	18.9	28.4	22.1	18.9	30.1	36.6	21.7	26.3	28.6	0.0	0.0
The extra time and effort required to plant and treat refuge corn	47.5	40.4	**57.8**	46.7	40.9	54.4	50.7	34.8	**63.2**	14.3	71.4	**100.0**
Its difficult to keep track of different requirements for different traits	47.6	41.7	**63.9**	44.1	50.5	**67.9**	57.7	21.7	**52.6**	14.3	14.3	**100.0**

Reasons for Difficulty with Refuge Area Requirement - by Corn Acreage												
	%Finding it Very or Somewhat Difficult to Meet Refuge Requirement											
	Total Market			Small			Medium			Large		
Reasons	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	264	101	75	86	29	27	81	30	24	97	41	24
Its difficult to keep track of where refuge was planted	30.7	30.2	**42.8**	27.1	23.4	**50.2**	33.3	39.1	37.7	42.3	29.4	40.6
My field size and shape makes leaving refuge difficult	37.1	30.6	**53.5**	36.7	24.9	**60.2**	31.3	35.7	50.6	42.3	31.9	49.6
It is a hassle switching seed during planting	65.2	63.9	63.7	60.6	60.8	77.2	61.9	65.9	62.7	72.0	66.6	51.1
I feel I am sacrificing yield by leaving a refuge	50.6	37.9	46.6	43.1	46.4	50.4	47.1	35.2	26.2	60.2	34.7	**62.9**
Its difficult to get non-Bt corn with the proper maturity	26.4	18.9	28.4	22.1	11.3	28.1	22.6	17.8	22.2	33.3	26.2	34.8
The extra time and effort required to plant and treat refuge corn	47.5	40.4	**57.8**	45.1	34.1	**60.7**	46.6	41.7	59.5	50.3	42.5	53.3
Its difficult to keep track of different requirements for different traits	47.6	41.7	**63.9**	44.4	34.1	**58.2**	55.5	45.2	63.9	44.2	46.0	**69.6**

METHOD: The above tables examine the reasons growers chose why they find it very or somewhat difficult to meet the refuge area requirement. Growers were given a list of possible reasons why it is difficult to meet the refuge area requirement and asked which reasons apply to their situation.

In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided.

SUMMARY OF FINDINGS:

- Overall Market
  - The most frequently cited reasons for difficulty in meeting the refuge area requirement continues to be that it was a hassle switching seed during planting (63.7%) the difficulty in keeping track of different requirements for different traits (63.9%) which the later was significantly higher in 2015 compared to 2013.
  - The extra time and effort required to plant and treat refuge corn (57.8%) and the field size and shape making leaving refuge difficult (53.5%) were the next most mentioned reasons with both requirements with a significant increase from 2013.
  - The belief that they were sacrificing yield increased in 2015 compared to 2013, although not significantly.
  - Of lessor importance was the difficulty in getting refuge corn with the proper maturity.

- By Province
  - In Ontario the most important reason making it difficult to leave an adequate refuge area was the hassle switching seed during planting, followed closely by the difficulty in keeping track of different requirements for different traits.
  - In Quebec and Manitoba, the extra time and effort required to plant and treat refuge and keeping track of different requirements for different traits were the top reasons with significant increases from 2013.

- By Corn Acreage Category
  - For large acreage corn growers the top two reasons, which also increased significantly from 2013, for difficulty in meeting requirements were sacrificing yield and keeping track of the different requirements for the different traits.
  - All the reasons were cited with more frequency among small acreage corn growers.

5. SOURCES OF INFORMATION AND THEIR USEFULNESS

5.1. SOURCES OF INFORMATION ON BT INSECT MANAGEMENT REQUIREMENTS

Source of Information on Bt Insect Resistance Management Requirements - by Province												
	%of Bt Growers Obtaining Information from:											
	Total Market			Ontario			Quebec			Manitoba		
Information Source	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	575	590	600	396	419	445	149	140	132	30	31	23
Their local seed dealer	85.7	84.7	83.2	89.4	85.6	88.1	76.5	82.9	***70.5***	86.7	77.4	78.3
The seed company	78.0	75.0	**83.2**	76.5	77.4	**86.3**	81.2	71.4	75.0	86.7	48.4	**82.6**
The government	16.9	14.2	**17.9**	16.2	11.5	**18.0**	19.5	22.1	18.9	10.0	6.5	4.3
Another farmer	27.0	26.6	24.7	28.3	28.3	***22.6***	21.5	22.1	29.5	50.0	25.8	34.8
The internet	17.9	19.1	19.6	15.6	17.1	16.7	22.8	25.0	28.0	26.7	12.9	13.0
Farm mags and publications	68.3	63.2	64.6	67.1	64.2	65.0	71.8	62.9	64.4	60.0	38.7	56.5
CCPC	13.1	10.0	**14.8**	11.3	8.6	**13.6**	17.4	14.3	18.9	16.7	3.2	4.3

Source of Information on Bt Insect Resistance Management Requirements - By Corn Acreage												
	%of Bt Growers Obtaining Information from:											
	Total Market			Small			Medium			Large		
Information Source	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	575	590	600	196	205	215	189	190	200	190	194	185
Their local seed dealer	85.7	84.7	83.2	81.5	83.3	82.1	85.7	83.0	84.2	90.5	87.7	83.2
The seed company	78.0	75.0	**83.2**	73.5	76.2	79.1	78.6	72.1	**84.8**	82.6	76.5	**86.2**
The government	16.9	14.2	**17.9**	18.8	13.5	**20.4**	15.7	18.2	15.9	16.2	10.9	**17.2**
Another farmer	27.0	26.6	24.7	29.7	32.2	***21.8***	28.4	24.1	**34.2**	22.3	23.2	17.8
The internet	17.9	19.1	19.6	12.4	17.7	16.2	18.5	15.7	22.0	23.5	24.1	20.9
Farm mags and publications	68.3	63.2	64.6	67.3	68.4	66.5	71.2	60.9	67.0	66.2	59.5	59.9
CCPC	13.1	10.0	**14.8**	13.6	9.5	14.7	10.1	11.8	14.0	15.7	8.7	**15.7**

METHOD: The above tables examine where Bt corn growers obtained information on the Bt IRM requirements in 2015 compared to 2013 and 2011. Bt corn growers were asked if they received information from: a) their local seed dealer: b) the seed company: c) the government: d) another farmer, e) the internet, f) farm magazines and publications and g) the Canadian Corn Pest Coalition (CCPC).

In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided.

Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

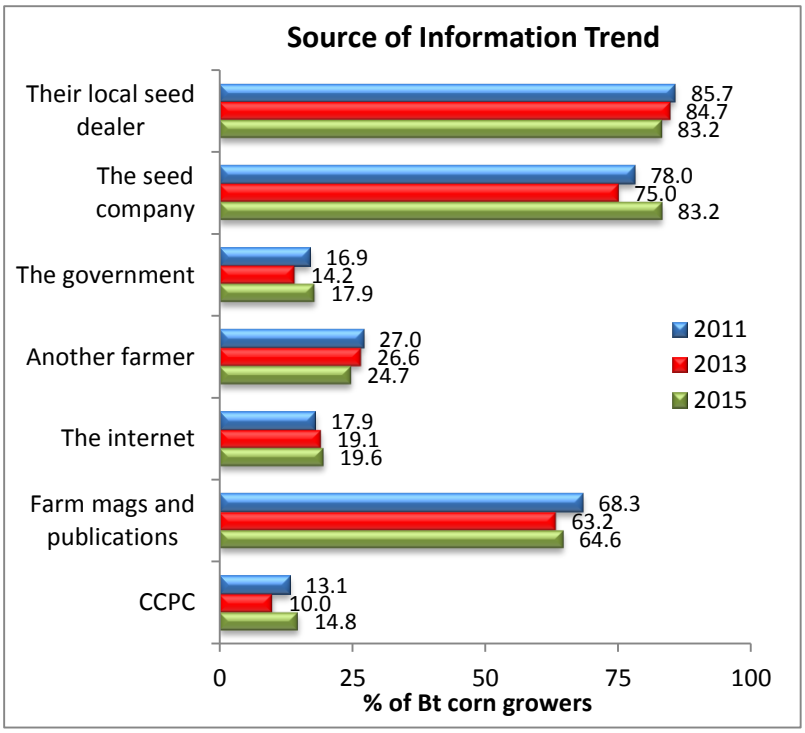
SUMMARY OF FINDINGS:

- Overall Market
  - A high percentage of Bt corn growers receive information on IRM requirements from their local seed dealer (83.2%), seed companies (83.2%) and farm magazines and publications (64.6%).
  - A smaller percentage of Bt corn growers receive information from the CCPC (14.8%), the government (17.9%) and the internet (19.6%).
  - The seed company, the government and the CCPC were more important sources of information in 2015 compared to 2013.
- By Province
  - The seed company was the most frequently cited source of information in Quebec and Manitoba and the local seed dealer was the most cited source of information in Ontario.
  - In Quebec and Manitoba, the local seed dealer and farm magazines and publications were also important sources of information, although seed dealers as a source declined in Quebec.

- continued

SOURCES OF INFORMATION ON BT INSECT MANAGEMENT REQUIREMENTS – continued …

- By Corn Acreage Category
  - Seed dealers, the seed company and farm publications were the greatest source of information across all three acreage categories
  - The seed company, the government and the CCPC increased in importance with large corn acreage growers and the seed company and other farmers increased in importance with medium corn acreage growers.
  - The government increased in importance and other farmers declined in importance with small corn acreage growers.



5.2. USEFULNESS OF INFORMATION SOURCES

Usefulness of Information on Bt Insect Resistance Management Requirements - Total Market															
				%of Bt Growers Saying Information was:											
	Base			Very Useful			Somewhat Useful			Not Useful			Don't Know		
Information Source	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Their local seed dealer	492	501	394	62.3	67.3	62.4	34.5	30.6	**35.9**	2.8	1.5	1.0	0.3	0.5	0.7
The seed company	447	435	383	54.6	58.1	55.0	41.3	39.4	40.2	3.4	1.6	**4.0**	0.7	0.8	0.9
The government	96	83	82	24.3	34.4	28.7	60.3	52.6	57.9	14.0	11.6	10.9	1.4	1.3	2.5
Another farmer	157	157	102	32.9	35.3	36.8	54.2	53.4	52.0	13.0	11.3	11.2	0.0	0.0	0.0
The internet	104	111	78	33.2	38.3	37.5	59.5	55.4	54.0	5.5	6.3	6.9	1.9	0.0	1.6
Farm mags & pubs	390	370	291	31.2	30.4	30.6	64.2	63.1	61.3	4.4	6.1	7.5	0.3	0.4	0.6
CCPC	77	58	59	28.6	37.9	34.8	60.5	52.1	49.6	7.7	8.1	14.5	3.2	1.9	1.1

Usefulness of Information on Bt Insect Resistance Management Requirements - by Province															
				%of Bt Growers Saying Information was "Very Useful"											
	Base			Total Market			Ontario			Quebec			Manitoba		
Information Source	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Their local seed dealer	492	501	394	62.3	67.3	62.4	63.7	68.9	***63.7***	58.4	62.1	59.1	61.5	75.0	***55.6***
The seed company	447	435	383	54.6	58.1	55.0	56.3	59.3	54.1	50.8	55.0	59.6	53.8	53.3	***36.8***
The government	96	83	82	24.3	34.4	28.7	25.8	32.0	22.8	20.7	38.7	44.0	33.3	0.0	0.0
Another farmer	157	157	102	32.9	35.3	36.8	34.4	33.7	38.5	29.0	41.9	35.9	26.7	25.0	***12.5***
The internet	104	111	78	33.2	38.3	37.5	34.1	28.5	32.2	32.4	54.3	45.9	25.0	75.0	***33.3***
Farm mags & pubs	390	370	291	31.2	30.4	30.6	30.5	26.3	28.7	33.0	40.9	37.6	27.8	41.7	***7.7***
CCPC	77	58	59	28.6	37.9	34.8	35.9	35.8	32.5	19.2	40.0	40.0	0.0	100.0	***0.0***

Source of Information on Bt Insect Resistance Management Requirements - By Corn Acreage															
				%of Bt Growers Saying Information was "Very Useful"											
	Base			Total Market			Small			Medium			Large		
Information Source	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Their local seed dealer	492	501	394	62.3	67.3	62.4	60.1	69.8	***59.2***	65.4	67.3	62.5	61.6	64.4	66.1
The seed company	447	435	383	54.6	58.1	55.0	56.4	58.0	***46.7***	53.1	55.6	56.8	54.5	60.3	61.7
The government	96	83	82	24.3	34.4	28.7	19.5	32.7	24.5	29.9	39.4	***25.9***	24.7	28.4	36.9
Another farmer	157	157	102	32.9	35.3	36.8	31.8	29.9	37.8	38.1	46.8	***31.6***	27.4	31.7	**46.2**
The internet	104	111	78	33.2	38.3	37.5	33.9	28.6	**40.7**	36.3	62.2	***33.0***	30.1	30.6	39.7
Farm mags & pubs	390	370	291	31.2	30.4	30.6	34.6	24.6	27.5	33.1	36.4	33.5	25.0	30.9	31.1
CCPC	77	58	59	28.6	37.9	34.8	28.5	26.9	38.6	28.9	47.6	***30.4***	28.4	38.1	35.0

METHOD: The above tables examine the usefulness of information Bt corn growers received on the Bt insect management requirements. Bt corn growers were asked what information sources they used (Section 5.1) and whether the information they received from that source were “very useful”, “somewhat useful” or “not useful”.

The first table examines the detailed response for the total market ranked in order of the most useful. In addition, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided for Bt corn growers indicating that the information source was “very useful”.

Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

- continued

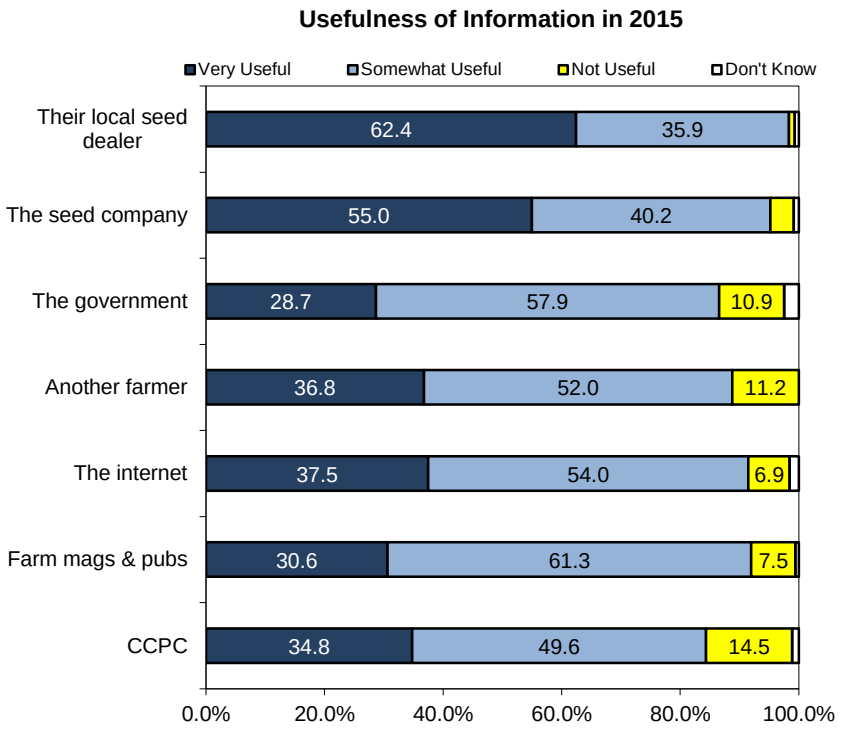
USEFULNESS OF INFORMATION SOURCES – continued …

SUMMARY OF FINDINGS:

- Overall Market
  - The vast majority rated their information sources as “very useful” or “somewhat useful” in all three years.
  - The rating of the local seed dealer and the seed company as very useful sources of information were, by far, the highest rated sources of information.
  - The other sources of information received moderate ratings and were similar in their utility in 2015 compared to 2013.

- By Province
  - In Ontario, Bt corn growers’ ratings of the usefulness of their local seed dealer declined significantly in 2015 compared to 2013, however, it was back to the 2011 level.
  - In Manitoba, sample sizes are too small to draw any conclusions.

- By Corn Acreage Category
  - Across corn acreage categories, the local seed dealer and the seed company received high ratings.
  - With small corn acreage grower’s information from the local seed dealer and from the seed company declined in utility as the internet grew in usefulness.
  - The utility of most of the sources of information declined for medium acreage corn growers.
  - Other farmers improved as source for large acreage corn growers.



5.3. INFORMATION VEHICLES FOR BT CORN IRM REQUIREMENTS

		Province			Corn Acreage		
	Total Market	Ontario	Quebec	Manitoba	Small	Medium	Large
Base	600	445	132	23	215	200	185
Mobile phone application	3.8	2.3	8.3	0.0	1.0	3.4	7.5
Website	12.2	7.6	25.0	4.3	8.1	12.5	16.4
Pocket sized brochure	31.0	22.6	54.5	17.4	29.7	30.1	33.3
Seed catalogue	59.3	55.1	72.0	43.5	56.1	62.5	59.4
Direct from a person.	56.2	57.2	51.5	78.3	52.1	58.9	58.0
Another way	6.6	6.5	7.6	0.0	7.3	6.3	6.3

METHOD The above table examines the proportion of Bt corn growers who choose certain vehicles of information on the Bt corn IRM requirements. Bt corn growers were asked, from a pre-defined list, the ways in which they got information on Bt corn insect management requirements. Growers could choose more than one answer. This is the first time this question has been asked in this survey.

In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided.

SUMMARY OF FINDINGS:

- Overall Market
  - The most frequent vehicle for information on Bt corn IRM requirements was seed catalogues (59.3%), direct from a person (56.2%) and pocket sized brochures (31%).
  - Websites (12.2%) and mobile phone applications (3.8%) were the least used methods.

- By Province
  - Seed catalogues were most popular in Quebec and direct from a person the most popular in Ontario and Manitoba.

- By Corn Acreage Category
  - Seed catalogues were the most popular method across corn acreage categories followed closely by direct from a person.

5.4. OVERALL AMOUNT OF INFORMATION ON BT CORN IRM

Overall Amount of Information is Enough - by Province												
	%of Bt Growers											
	Total Market			Ontario			Quebec			Manitoba		
Method	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	574	590	600	396	419	445	148	140	132	30	31	23
Yes	92.6	96.7	***93.5***	93.7	96.9	96.6	89.2	96.4	***85.6***	100.0	93.5	87.0
No	6.5	3.1	**5.8**	5.2	2.7	2.5	10.1	3.6	**13.6**	0.0	6.5	13.0
Don't Know	1.0	0.2	0.8	1.1	0.3	0.8	0.7	0.0	0.8	0.0	0.0	0.0

Overall Amount of Information is Enough - by Corn Acreage												
	%of Bt Growers											
	Total Market			Small			Medium			Large		
Method	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	574	590	600	196	205	215	189	190	200	189	194	185
Yes	92.6	96.7	***93.5***	90.7	95.6	91.8	94.9	95.5	95.7	92.3	99.2	***93.0***
No	6.5	3.1	**5.8**	8.3	3.8	6.4	4.7	4.5	4.3	6.3	0.8	**6.6**
Don't Know	1.0	0.2	0.8	1.1	0.6	1.8	0.4	0.0	0.0	1.4	0.0	0.5

METHOD The above tables examine the acreage of Bt corn growers who stated that overall level of information on Bt IRM was sufficient. Bt corn growers were asked if at the time of planting, they had enough information on how to establish and manage a refuge area for Bt corn.

In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided.

Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

SUMMARY OF FINDINGS:

- Overall Market
  - 93.5% of Bt corn growers said they had enough information to establish and manage a refuge area in their Bt corn. This was significantly lower than in 2013, however, similar to 2011.

- By Province
  - The percentage of growers with enough information was highest in Ontario (96.6%).
  - The percentage of growers in Quebec (85.6%) with enough information declined from 2013.

- By Corn Acreage Category
  - A higher percentage of medium (95.7%) and large (93.0%) acreage corn growers said they had enough information compared to small corn acreage growers (91.8%).
  - The percentage of large acreage corn growers in 2015 with enough information declined from 2013.

5.5. IMPORTANCE OF RESISTANCE MANAGEMENT PLANS FOR BT CORN

Importance of Resistance Management Plans for Bt Corn - by Province												
	%of Bt Growers Responding to Question											
	Total Market			Ontario			Quebec			Manitoba		
Importance	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	574	590	600	396	419	445	148	140	132	30	31	23
Very Important	62.0	72.9	71.3	62.6	72.8	70.8	60.8	73.6	73.5	60.0	67.7	60.9
Somewhat Important	32.6	23.0	25.9	32.2	22.8	26.4	33.1	24.3	23.5	40.0	16.1	**39.1**
Net "Important"	94.7	95.9	97.2	94.8	95.6	97.2	93.9	97.9	97.0	100.0	83.9	**100.0**
Not Too Important	4.5	3.4	***1.8***	4.3	3.5	2.3	5.4	2.1	0.8	0.0	12.9	***0.0***
Not At All Important	0.9	0.7	1.0	1.0	0.9	0.6	0.7	0.0	**2.3**	0.0	3.2	0.0

Importance of Resistance Management Plans for Bt Corn - by Acreage Category												
	%of Bt Growers Responding to Question											
	Total Market			Small			Medium			Large		
Importance	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	574	590	600	196	205	215	189	190	200	189	194	185
Very Important	62.0	72.9	71.3	57.1	71.5	69.4	63.3	71.9	69.8	66.3	75.3	75.0
Somewhat Important	32.6	23.0	25.9	37.1	25.1	26.9	32.4	23.2	26.9	27.8	20.6	23.7
Net "Important"	94.7	95.9	97.2	94.1	96.6	96.3	95.7	95.1	96.7	94.1	95.8	**98.7**
Not Too Important	4.5	3.4	***1.8***	4.9	2.7	2.1	2.7	4.1	2.0	5.9	3.5	1.3
Not At All Important	0.9	0.7	1.0	0.9	0.7	1.6	1.6	0.8	1.3	0.0	0.7	0.0

METHOD: The above tables examine the importance Bt corn growers place on Bt IRM plans in 2015 compared to 2013 and 2011. Growers were asked how important they considered insect resistance management plans for Bt corn to be; "very important", "somewhat important", "not too important" or "not at all important".

In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided.

Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

SUMMARY OF FINDINGS:

- Overall Market
  - In 2015, 71.3% of growers said IRM plans for Bt corn were "very important", similar to 2013.
  - On a combined basis (Very Important + Somewhat Important) 97.2% of Bt corn growers in 2015 said Bt IRM plans were important. This level was slightly higher compared to 2013 and 2011 but is not significant.

- By Province
  - A higher percentage of Ontario and Quebec growers said Bt IRM plans were "very important" compared to Manitoba. On a combined basis, net importance in Ontario and Quebec was similar.
  - The importance placed on Bt Corn insect resistance management went up in Manitoba.

- By Corn Acreage Category
  - The importance of Bt IRM plans increased significantly with large corn acreage growers.
  - The importance of Bt IRM plans did not vary by corn acreage category as all size growers rated the net importance around 96 to 100%.

5.6. EFFECTIVENESS OF STRATEGIES FOR IMPROVING COMPLIANCE

Strategies	%of Bt Corn Growers Rating Effectiveness											
	Very Effective			Somewhat Effective			Not Effective			Don't Know		
	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	573	588	600	573	588	600	573	588	600	573	588	600
Provide better education on the need to leave a refuge	39.6	43.7	42.1	44.0	43.3	47.5	15.6	11.4	9.7	0.8	1.6	0.7
Make the requirements simpler and easier to understand	48.4	53.4	56.1	34.5	33.8	35.1	16.1	12.7	***8.4***	1.0	0.2	0.5
Allow more flexibility in meeting the requirements	34.9	33.5	35.7	45.9	43.5	46.7	17.7	20.8	***16.6***	1.5	2.2	1.0
Involve the seed dealers more in assisting corn growers	46.3	47.2	**52.7**	42.4	42.3	41.5	9.5	9.8	***5.8***	1.7	0.7	***0.0***
Have someone conduct on-farm assessments	21.8	26.6	23.9	47.0	44.8	47.9	30.0	27.2	27.1	1.2	1.4	1.1
Provide incentives to purchase non-Bt hybrids with the matching Bt corn hybrids	55.1	46.1	42.6	35.2	37.7	42.0	7.7	14.8	14.5	2.0	1.4	0.9
Standardize how Bt hybrids are identified on the bag or in related materials	55.9	62.9	58.6	34.5	31.2	35.7	8.5	5.9	5.1	1.1	0.0	**0.6**
Provide more refuge in a bag hybrid options	76.0	74.7	72.3	13.4	18.8	21.6	8.2	4.6	5.2	2.3	1.8	0.8

Effectiveness of Strategies for Improving Compliance - by Province												
Strategies	%of Bt Corn Growers Rating as "Very Effective"											
	Total Market			Ontario			Quebec			Manitoba		
	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	573	588	600	395	417	445	148	140	132	30	31	23
Provide better education on the need to leave a refuge	39.6	43.7	42.1	32.8	36.5	35.4	56.8	63.6	60.6	36.7	35.5	34.8
Make the requirements simpler and easier to understand	48.4	53.4	56.1	42.1	47.7	52.5	64.9	68.6	65.9	40.0	51.6	52.2
Allow more flexibility in meeting the requirements	34.9	33.5	35.7	31.6	27.1	31.1	43.9	50.0	48.5	26.7	38.7	30.4
Involve the seed dealers more in assisting corn growers	46.3	47.2	**52.7**	43.8	41.7	**49.8**	52.7	60.0	61.4	43.3	64.5	43.5
Have someone conduct on-farm assessments	21.8	26.6	23.9	17.1	19.2	19.4	33.8	47.1	***35.6***	20.0	19.4	26.1
Provide incentives to purchase non-Bt hybrids with the matching Bt corn hybrids	55.1	46.1	42.6	52.3	41.7	37.1	61.5	57.1	56.1	63.3	51.6	56.5
Standardize how Bt hybrids are identified on the bag or in related materials	55.9	62.9	58.6	51.2	57.5	55.7	67.6	77.9	***67.4***	56.7	54.8	47.8
Provide more refuge in a bag hybrid options	76.0	74.7	72.3	77.2	70.7	69.4	74.3	86.4	80.3	63.3	64.5	69.6

Effectiveness of Strategies for Improving Compliance - by Corn Acreage												
Strategies	%of Bt Corn Growers Rating as "Very Effective"											
	Total Market			Small			Medium			Large		
	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	573	588	600	195	205	215	189	189	200	189	193	185
Provide better education on the need to leave a refuge	39.6	43.7	42.1	42.9	45.2	39.6	39.4	48.7	44.5	36.0	37.5	42.3
Make the requirements simpler and easier to understand	48.4	53.4	56.1	48.2	52.3	57.2	48.9	59.3	52.5	48.1	48.9	**58.7**
Allow more flexibility in meeting the requirements	34.9	33.5	35.7	35.6	32.6	28.8	34.5	35.9	34.7	34.6	31.9	**44.8**
Involve the seed dealers more in assisting corn growers	46.3	47.2	**52.7**	50.4	46.7	50.1	50.5	51.2	53.0	37.2	43.3	**55.4**
Have someone conduct on-farm assessments	21.8	26.6	23.9	24.1	25.4	21.6	23.8	31.3	26.2	17.1	23.5	24.0
Provide incentives to purchase non-Bt hybrids with the matching Bt corn hybrids	55.1	46.1	42.6	54.3	45.2	44.4	58.5	48.0	44.3	52.5	44.8	38.8
Standardize how Bt hybrids are identified on the bag or in related materials	55.9	62.9	58.6	60.9	60.9	54.3	56.0	66.9	***58.4***	50.1	60.8	63.7
Provide more refuge in a bag hybrid options	76.0	74.7	72.3	71.9	68.3	65.8	77.6	80.7	***72.5***	79.1	75.7	79.5

METHOD: The above tables examine the effectiveness of strategy ideas for improving compliance to the Bt corn IRM requirements comparing 2001 with 2013 and 2011. Growers were given a list of some ideas that seed suppliers have to improve corn growers' compliance with the Bt refuge requirements and were asked to rate the effectiveness of these strategies as very effective, somewhat effective or not effective.

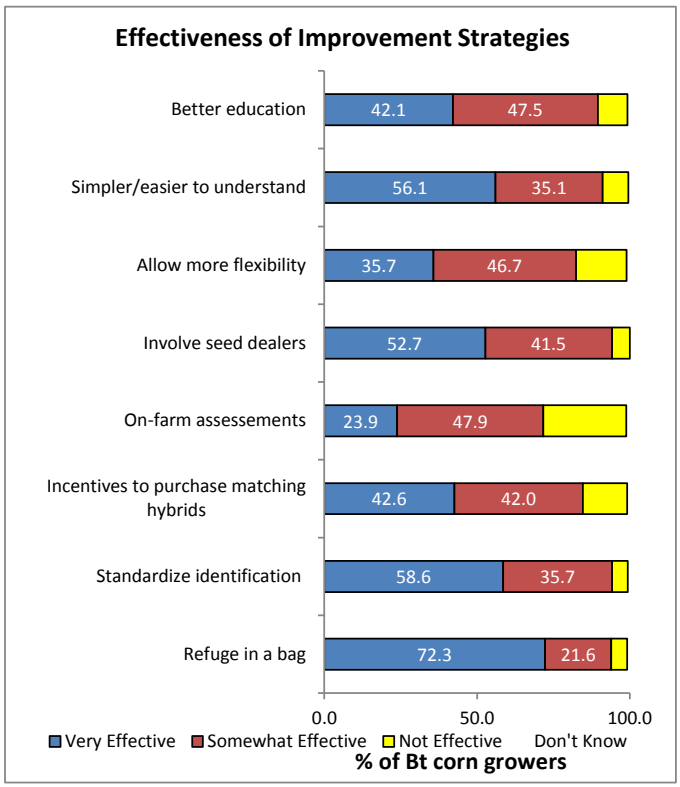
In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided.

Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

- continued

EFFECTIVENESS OF STRATEGIES FOR IMPROVING COMPLIANCE – continued …

SUMMARY OF FINDINGS:



- Overall Market
  - The percentage of Bt corn growers rating each idea as very effective varied from 24% to 72%.
  - The most effective strategy to improve Bt corn IRM compliance according to Bt corn growers is to provide more refuge in a bag options. 72% rated this as very effective.
  - Standardizing how Bt hybrids are identified on the bag or in related materials and making the requirements simpler and easier to understand were rated by the majority of Bt corn growers as very effective. (59 and 56% respectively)
  - Involving the seed dealers more in assisting corn growers, providing incentives to purchase non-Bt hybrids with matching Bt corn hybrids, and providing better education on the need to leave a refuge were also considered by many to be very effective strategies. (53, 43 and 42% respectively).
  - 36% of growers thought that allowing more flexibility in meeting the requirements was very effective.
  - Having someone conduct on-farm assessments was considered the least effective strategy with 27% of growers considering this strategy as "not effective".

- By Province
  - Quebec corn growers were more "enthusiastic" about the effectiveness of all the strategies compared to Ontario and Manitoba Bt corn growers.
  - Having someone conduct an on-farm assessment was considered the least effective strategy in all three provinces; however, it was rated as more effective in Quebec compared to the other two provinces.

- By Corn Acreage Category
  - Large corn acreage growers were more interested making the requirements simpler and easier to understand, allowing more flexibility in meeting the requirements and involving the seed dealers more in assisting corn growers compared to 2013.
  - Providing more refuge in a bag hybrid options was the most popular strategy across corn acreage categories.

6. SCOUTING AND RECORD KEEPING PRACTICES

6.1. SCOUTING OF RIB AND NON-RIB CORN FIELDS

Scouting RIB Corn Fields							
		Province			Corn Acreage		
	Total Market	Ontario	Quebec	Manitoba	Small	Medium	Large
Base	564	421	123	20	194	191	179
Yes	42.0	48.3	24.4	50.0	41.0	40.4	44.7
No	56.4	49.8	74.8	50.0	56.4	58.1	54.7
Don't know	1.6	1.9	0.8	0.0	2.6	1.6	0.5

Scouting Non-RIB Corn Fields							
		Province			Corn Acreage		
	Total Market	Ontario	Quebec	Manitoba	Small	Medium	Large
Base	141	97	37	7	55	45	41
Yes	35.8	44.1	16.2	57.1	27.6	36.6	45.7
No	61.5	51.8	83.8	42.9	70.9	60.5	50.2
Don't know	2.7	4.1	0.0	0.0	1.5	2.9	4.1

Scouting All Bt Corn Fields							
		Province			Corn Acreage		
	Total Market	Ontario	Quebec	Manitoba	Small	Medium	Large
Base	592	438	132	22	209	200	183
Yes	40.4	47.0	22.0	54.5	39.0	39.1	43.5
No	57.6	50.6	77.3	45.5	58.2	59.4	55.1
Don't know	1.9	2.4	0.8	0.0	2.8	1.5	1.4

METHOD: The above tables examine the use of scouting practices. Bt corn growers were asked if their RIB corn fields and their non-RIB corn fields were scouted.

In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided.

SUMMARY OF FINDINGS:

- Overall Market
  - 42% of Bt corn growers with RIB hybrids scouted their RIB fields for insect damage compared to 36% for non-RIB corn fields.
  - On a net basis, 40% of Bt corn growers scouted their fields for insect damage. This was lower than the stated compliance to scouting in Section 3.2.

- By Province
  - Ontario and Manitoba Bt corn growers were more likely to have scouted their corn fields.
  - Quebec Bt corn growers were much less likely to scout either their RIB or non-RIB corn fields.

- By Corn Acreage Category
  - Large corn acreage growers were more likely to have both their RIB and non-RIB corn fields scouted compared to small and medium corn acreage growers.

6.2. SOURCE OF BT CORN FIELD SCOUTING

Source of Bt Corn Scouting - by Province												
	%of Bt Growers Who Have Fields Scouted											
	Total Market			Ontario			Quebec			Manitoba		
Scouting Person	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	417	447	256	274	308	214	125	118	29	18	21	13
Self/Employee	52.9	55.2	58.9	58.0	60.2	59.4	41.6	43.2	55.2	66.7	61.9	61.5
Dealer	28.9	30.8	**39.0**	28.2	29.5	**37.5**	30.4	33.9	**51.7**	27.8	28.6	23.1
Seed company	26.6	19.1	19.0	20.1	16.5	18.2	40.8	25.4	24.1	11.1	14.3	15.4
Private consultant	20.0	15.9	**24.0**	17.7	11.4	**18.6**	24.8	26.3	**55.2**	16.7	19.0	23.1

Source of Bt Corn Scouting - by Corn Acreage Category												
	%of Bt Growers Who Have Fields Scouted											
	Total Market			Small			Medium			Large		
Scouting Person	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	417	447	256	143	156	90	141	134	82	133	156	84
Self/Employee	52.9	55.2	58.9	53.6	58.6	57.5	50.4	53.9	62.7	54.9	53.3	56.7
Dealer	28.9	30.8	**39.0**	31.2	30.7	37.0	26.0	31.2	37.2	29.5	29.9	**42.8**
Seed company	26.6	19.1	19.0	24.2	16.9	13.5	33.3	18.2	20.3	21.9	21.5	23.3
Private consultant	20.0	15.9	**24.0**	18.0	12.5	20.3	20.2	20.7	25.4	21.9	15.4	**26.5**

METHOD: The above tables examine who normally scouts Bt corn growers' fields for insect damage. Bt corn growers who had their Bt corn fields scouted were asked who normally scouts their Bt corn fields for damage: a) a dealer representative: b) a representative from the seed company: c) a private consultant: or d) themselves or someone employed by them. Since growers could use more than one person for scouting totals down the column can exceed 100%.

In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided.

Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

- continued

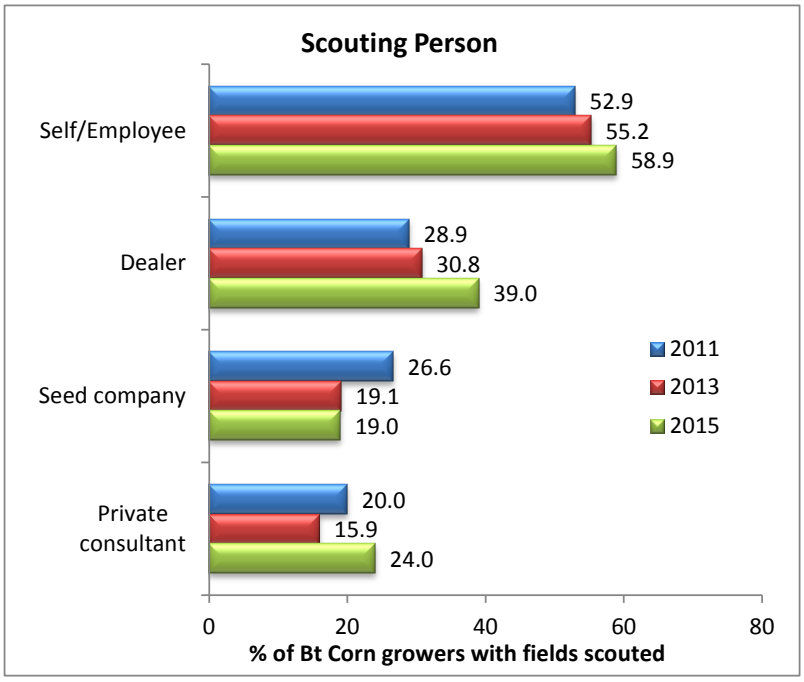
SOURCE OF BT CORN FIELD SCOUTING – continued …

SUMMARY OF FINDINGS:

- Overall Market
  - 58.9% of Bt corn growers scouted their own fields or had employees do it. This was similar to 2013.
  - Dealer representatives scouted for 39% of Bt corn growers in 2015.
  - Seed companies scouted for 19% of growers and private consultants scouted for 24% of growers in 2015.
  - The use of dealer representatives and private consultants increased significantly from 2013.

- By Province
  - In Ontario and Quebec the use of dealer representatives and private consultants increased significantly from 2013.
  - In Quebec, the use of private consultants was high (55%) comparted to the other two provinces.
  - In Manitoba in 2015, the majority of Bt corn growers scouted their own fields as they did in previous years.

- By Corn Acreage Category
  - There was a significant increase in the use of dealer representatives and private consultants in 2015 compared to 2013 among large corn acreage growers.



6.3. FREQUENCY OF BT CORN FIELD SCOUTING

Frequency of Scouting - by Province												
	%of Bt Growers Who Have Fields Scouted											
	Total Market			Ontario			Quebec			Manitoba		
Scouting Frequency	2011	2013	2015	2011	2013	2015	2011	2013	2015	2009	2011	2015
Base	406	437	256	265	301	214	123	116	29	18	20	13
1 time	16.2	8.4	10.8	14.5	8.1	10.2	20.3	9.5	17.2	5.6	5.0	0.0
2 times	30.4	25.3	24.2	30.2	22.6	23.9	32.5	31.9	27.6	5.6	20.0	15.4
3 times	20.1	16.1	19.1	18.8	16.8	19.5	23.6	14.7	13.8	5.6	15.0	30.8
4 times	12.6	10.5	11.2	12.1	11.4	12.1	12.2	8.6	6.9	33.3	10.0	7.7
5 - 9 times	12.6	17.4	***7.7***	15.2	17.6	***8.1***	5.7	17.2	***3.4***	38.9	15.0	15.4
10+ times	7.7	21.3	***13.0***	8.5	22.6	***12.2***	5.7	17.2	17.2	11.1	35.0	15.4
Don't know	0.4	0.9	0.4	0.7	1.0	0.5	0.0	0.9	0.0	0.0	0.0	0.0
Mean # of times	3.7	5.7	4.8	4.0	5.9	4.7	3.1	5.2	5.2	5.1	7.9	5.5

Frequency of Scouting - by Corn Acreage Category												
	%of Bt Growers Who Have Fields Scouted											
	Total Market			Small			Medium			Large		
Scouting Frequency	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	406	437	256	140	151	90	137	130	82	129	155	84
1 time	16.2	8.4	10.8	16.5	9.4	9.5	14.9	6.7	6.2	17.4	9.1	16.6
2 times	30.4	25.3	24.2	32.1	24.5	19.4	33.5	28.5	29.5	24.9	23.3	24.0
3 times	20.1	16.1	19.1	17.7	13.2	21.1	17.6	13.6	22.2	25.7	20.7	14.0
4 times	12.6	10.5	11.2	15.6	11.3	10.0	12.5	11.5	12.2	9.2	9.0	11.3
5 - 9 times	12.6	17.4	***7.7***	11.5	18.0	11.0	12.8	17.8	***6.2***	13.6	16.6	***5.8***
10+ times	7.7	21.3	***13.0***	6.1	23.1	16.3	8.1	20.3	12.2	9.1	20.4	***10.4***
Don't know	0.4	0.9	0.4	0.6	0.5	0.0	0.6	1.4	1.3	0.0	0.9	0.0
Mean # of times	3.7	5.7	4.8	3.6	6.1	5.2	3.7	5.7	4.5	4.0	5.4	4.8

METHOD: The above tables examine the frequency by which Bt corn fields were scouted. Bt corn growers who had their Bt corn fields scouted were asked how many times their Bt corn fields were scouted for insect damage during the growing season.

In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided.

Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

- continued

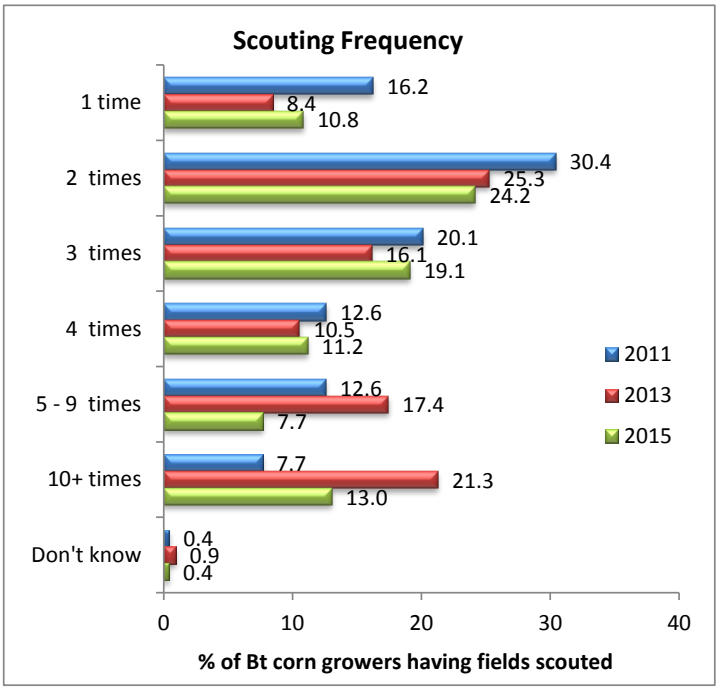
FREQUENCY OF BT CORN FIELD SCOUTING – continued …

SUMMARY OF FINDINGS:

- Overall Market
  - There was a wide range of responses to the number of times Bt corn growers had their fields scouted in 2015. For example 24.2% scouted their fields only twice; however, 13.0% said their fields were scouted 10+ times.
  - The average number of times Bt corn growers said their fields were scouted in 2015 was 4.8 times, down significantly from 2013.

- By Province
  - On average, growers in Manitoba scouted more often than growers in Ontario and Quebec.
  - The mean number of times fields were scouted declined from 2013 in Ontario and Manitoba and remained the same in Quebec.

- By Corn Acreage Category
  - The mean number of times fields were scouted was highest with small acreage corn growers.
  - The mean number of times fields were scouted declined from 2013 across all acreage categories.



6.4. METHOD USED FOR BT CORN FIELD SCOUTING

Scouting Method - by Province												
	%of Bt Growers Who Have Fields Scouted											
	Total Market			Ontario			Quebec			Manitoba		
Scouting Method	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	417	447	256	274	308	214	125	118	29	18	21	13
A random walk into the field	78.1	77.9	82.1	80.0	76.8	82.3	74.4	80.5	86.2	77.8	76.2	61.5
A set pattern across the field	14.2	14.6	15.3	14.5	16.6	16.1	13.6	10.2	10.3	16.7	14.3	15.4
Just on the edge of the field	7.3	8.9	7.9	6.0	8.7	8.7	9.6	9.3	3.4	11.1	9.5	7.7

Scouting Method - by Corn Acreage												
	%of Bt Growers Who Have Fields Scouted											
	Total Market			Small			Medium			Large		
Scouting Method	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	417	447	256	143	156	90	141	134	82	133	156	84
A random walk into the field	78.1	77.9	82.1	76.6	74.3	**87.1**	77.7	79.9	72.8	80.5	79.6	85.8
A set pattern across the field	14.2	14.6	15.3	15.8	13.4	10.6	11.1	13.8	**23.7**	15.9	16.7	12.0
Just on the edge of the field	7.3	8.9	7.9	8.1	12.7	8.6	5.7	11.3	10.4	8.1	3.0	4.9

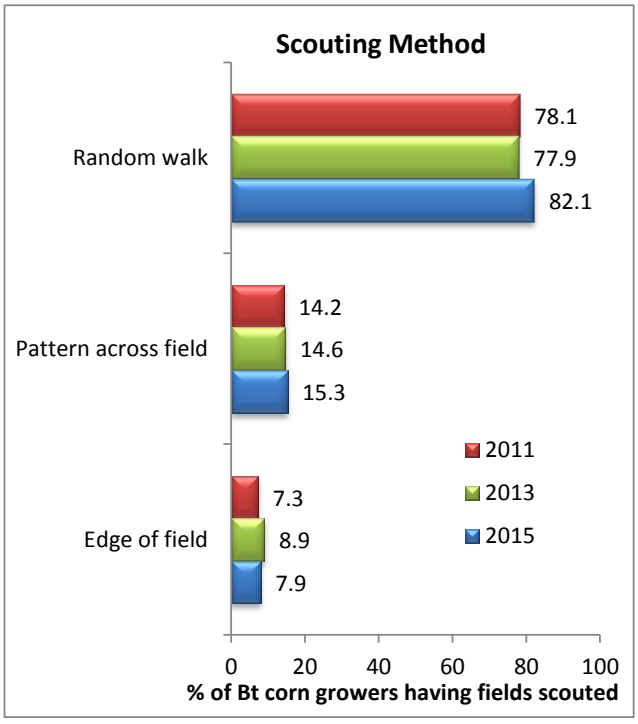
METHOD: The above tables examine the method used to scout Bt corn fields. Bt corn growers who had their Bt corn fields scouted were asked the method by which their Bt corn fields were normally scouted: a) Just on the edge of the field: b) a random walk into the field: or c) a set pattern across the field. These options were described and growers could give multiple answers including don't know.

In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided.

Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

SUMMARY OF FINDINGS:

- Overall Market
  - The most popular method for scouting Bt corn fields continues to be a random walk into the field with 82.1% of growers saying this method was used in 2015. The use of this method was similar to 2013.
  - The use of a set pattern across the field and at the edge of field was low and similar to 2013.
- By Province
  - A random walk into the field was the most common method for scouting Bt corn fields across all three provinces.
- By Corn Acreage Category
  - A random walk into the field was the most common method for scouting Bt corn fields across all three acreage size categories of corn grower.



6.5. METHOD OF RECORD KEEPING

Method of Record Keeping - by Province												
	%of Bt Growers Who Have Fields Scouted											
	Total Market			Ontario			Quebec			Manitoba		
Method	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	515	552	572	348	398	422	140	130	129	27	24	21
Written notes	68.0	69.8	71.1	71.1	73.0	***66.6***	61.4	61.5	**84.5**	59.3	66.7	52.4
Field maps	29.9	26.1	**37.3**	28.2	25.4	30.2	35.0	27.7	**54.3**	18.5	29.2	**52.4**
Computer records	9.9	11.9	**16.0**	9.6	10.7	11.3	10.7	15.4	**27.9**	11.1	8.3	19.0
GPS coordinates	7.6	7.9	10.3	8.8	9.0	9.4	4.3	4.6	**10.9**	14.8	12.5	28.6

Method of Record Keeping - by Corn Acreage												
	%of Bt Growers Who Have Fields Scouted											
	Total Market			Small			Medium			Large		
Method	2011	2013	2015	2011	2013	2015	2011	2013	2015	2011	2013	2015
Base	515	552	572	175	193	198	163	174	196	177	184	178
Written notes	68.0	69.8	71.1	68.2	67.1	64.5	65.4	68.0	75.4	70.2	74.3	73.7
Field maps	29.9	26.1	**37.3**	32.0	27.3	34.3	29.6	24.2	**39.6**	28.1	26.7	**38.1**
Computer records	9.9	11.9	**16.0**	5.0	7.6	11.7	10.3	12.4	14.1	14.9	16.1	22.8
GPS coordinates	7.6	7.9	10.3	3.1	4.2	5.4	5.9	5.7	8.0	14.2	14.2	18.1

METHOD: The above tables examine the method used to keep records of where Bt corn hybrids were planted. Bt corn growers who said they kept accurate records of where Bt corn hybrids were planted were asked how they kept those records: a) written notes: b) field maps: c) GPS coordinates: or d) computer records. These options were described and growers could give multiple answers.

In addition to the total market, splits by a) province (Ontario, Quebec, Manitoba) and b) corn acreage category (small, medium, large) are provided.

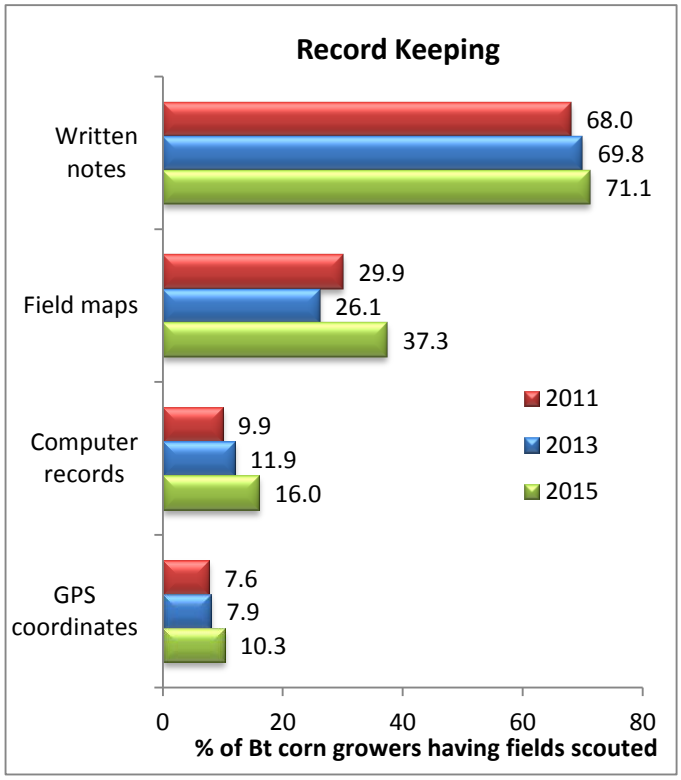
Statistically significant differences (P<0.1) between 2015 and 2013 values are highlighted.

- continued

METHOD OF RECORD KEEPING – continued …

SUMMARY OF FINDINGS:

- Overall Market
  - The most popular method for keeping records of where Bt corn hybrids were planted was via written notes with 71.1% of growers saying this was the method they used.
  - Field maps were the second most popular method used (37.3%) and increased from 2013.
  - 16% of Bt corn growers used computer records, up from 2013, and 10.3% used GPS coordinates to record where Bt corn was planted.



- By Province
  - Written notes were used most often in all three provinces, however, in Ontario this method was down from 2013.
  - GPS coordinates tended to be used more often in Manitoba, compared to Ontario and Quebec.

- By Corn Acreage Category
  - Written notes, followed by maps, were the most popular method of record keeping among all sizes of corn grower.
  - Computer methods and GPS coordinates tended to be used more often by large corn acreage growers, compared to small and medium size acreage categories.

APPENDIX: STUDY OBJECTIVES AND METHODOLOGY

PURPOSE & OBJECTIVES:

The purpose of this study is to assist the Canadian Corn Pest Coalition and its members in understanding Bt corn growers' awareness, compliance, and improvements needed for the continued implementation of the Bt Insect Resistance Management (IRM) requirements that are being promoted by the seed industry. This information will be used to comply with regulatory requirements and to assist the Coalition and individual seed companies in improving their communication on refuge requirements. The study is a continuation of the surveys conducted in previous years. The study objectives are to:

1. Provide quantitative data on the level of grower compliance with the Bt refuge requirements.
2. Provide quantitative data on the overall level of grower awareness of refuge requirements.
3. Understand Bt growers' difficulty in complying with the refuge requirements.
4. Determine growers' field scouting practices (who scouts, frequency and timing) and how field records are kept.
5. Determine the sources of information on Bt insect management requirements and how Bt corn growers rate their usefulness.
6. Categorize data by demographic profile (geography and corn acreage size).
7. Compare results where applicable to the 2011 and 2013 studies.

DATA COLLECTION: In-depth telephone interviews, averaging 15 minutes in length, were conducted with 646 corn growers during the period of August 5 to September 5, 2015 by iFusion Research. This interview collected corn acres, total Bt corn acres, Bt corn borer and Bt corn rootworm acres in total and by seed company, awareness and compliance with all the Bt refuge requirements, sources of information and planting, scouting and record keeping practices etc.

RESPONDENT SCREENING: Respondents were screened to ensure: a) they were the individuals responsible for making crop input purchase decisions on their farm: and b) they grew at least 50 acres of corn in 2015.

QUESTIONNAIRE PREPARATION & TESTING: The questionnaire for this study employed proven techniques used in previous studies and was approved and vetted by company representatives with the Canadian Corn Pest Coalition. The telephone questionnaires were pre-tested with farmers. Changes were identified and the final version of the telephone questionnaire was programmed in a CATI system. All interviewers were fully trained prior to initiation of the study. An incentive of $20 to complete the survey was provided.

SAMPLE SPECIFICATIONS AND COMPLETIONS: Data files containing the names, addresses and telephone numbers of farmers were compiled by iFusion Research. Quotas were established matching the population of corn growers in each Census Agricultural Region in Ontario and Quebec, in accordance with the 2011 Census of Agriculture. The table on the next page summarizes telephone completions.

DATA ANALYSIS: iFusion Research produced detailed tables, including frequency distributions and cross-tabulations.

QUOTA AND COMPLETIONS:

Prov	Census Ag Region	2011 Census Corn # of Farms	2011 Census Corn %of Farms	Survey Sample Corn Actual	Survey Sample BT Corn Target	Survey Sample BT Corn Actual	Survey Sample BT Corn %of Quota
Quebec	Total	**6,160**	**26.7%**	**142**	**140**	**132**	**94.3%**
Ontario	CAR 1	6,845	29.7%	227	200	216	107.7%
	CAR 2	5,763	25.0%	162	169	150	88.9%
	CAR 3	1,412	6.1%	40	41	36	87.1%
	CAR 4/5	2,164	9.4%	45	63	43	67.8%
	Total	**16,184**	**70.2%**	**474**	**430**	**445**	**103.5%**
Manitoba	**Total**	**713**	**3.1%**	**30**	**30**	**23**	**76.7%**
TOTAL		**23,057**	**100.0%**	**646**	**600**	**600**	**100.0%**

STUDY ACCURACY: Accuracy of responses for Bt corn growers in the total market are calculated in the following table, using a 90% confidence level and given a population of 23,057 corn farmers (2011 Census) and a study sample of 600 Bt corn growers. For example, a response of 20.0% of Bt corn growers is accurate to within +/-2.6% nine times out of ten.

Study Accuracy																							
% of Bt Corn growers	1	2	3	4	5	6	7	8	10	15	20	25	30	35	40	45	50	60	70	80	90	95	99
Response Accuracy (+/-)	0.7	0.9	1.1	1.3	1.4	1.6	1.7	1.8	2.0	2.3	2.6	2.8	3.0	3.1	3.2	3.3	3.3	3.2	3.0	2.6	2.0	1.4	0.7

STATISTICAL ANALYSIS: Throughout tables in the report, statistical analysis results are provided. Generally where 2011 and 2013 data are provided and compared to 2015 data, significant differences between total market proportions using a 90% confidence interval and normal distribution are highlighted. Where a proportion for 2015 is significantly higher than 2013, the 2015 proportion is highlighted in normal bold white font with a blue box (electronic copies) or dark gray (printed copies) box. Where a proportion is significantly lower it is highlighted with bold italics in a light orange box (electronic copies) or light gray (printed copies) box.