Perspectives on corn yield losses due to weeds in North America

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Introduction

- Weeds are one of the most significant threats to crop production in North America. Crop losses in yield and quality due to weed interference, as well as costs of controlling weeds, have a significant economic impact on crop production.
- The United States ranks 1st in the world with 35.5% of global corn production while Canada ranks 11th with 1.2% of corn production in 2011 (FAO Stat 2012).
- WSSA Weed Loss Committee has generated reports in 1984 (Chandler et al.) and 1992 (Bridges) that summarized crop losses due to weeds across the US and Canada.
- Chandler et al. (1984) reported an estimated 8 to 18% corn yield loss across US and 3 to 12% corn yield loss across Canada due to weeds.
- Bridges (1992) reported an estimated 1 to 15% corn yield loss due to weeds across the US even when Best Management Practices with herbicides were used and increased to 10 to 60% corn yield loss with BMPs but no herbicidal weed control.
- These data have been useful to highlight the continued need for weed science research.

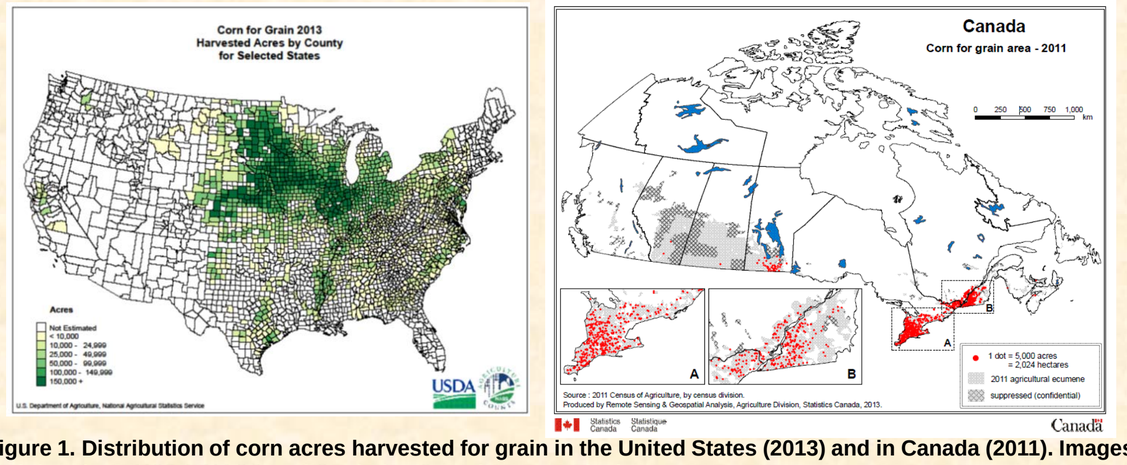

Figure 1. Distribution of corn acres harvested for grain in the United States (2013) and in Canada (2011). Images and data from USDA-NASS and Statistics Canada, respectively.

Objective

- To report on potential corn yield and economic losses due to weeds across the US and Canada over the past seven years (2007-2013).

Methods

- Requests for data were sent to research and/or extension weed science specialists in 2013 and 2014. Each specialist was asked to provide results of up to 10 individual studies conducted within a year during the period of 2007 to 2013 on weed control in corn. Data were also obtained from weed control research reports published online for several states and provinces.
- Information requested:
  - **Weedy yield** = average yield from the untreated weedy plot (yield using Best Management Practices (BMP) but no weed control), and
  - **Weed-free yield** = average yield from a herbicide control plot with > 95% control for each weed species (yield with BMP and excellent weed control)
- Yield loss (%) was determined for each individual study, then averaged within a year, and averaged across the seven years for each state or province:

$$YL\% = \frac{\text{weed-free yield} - \text{weedy yield}}{\text{weed-free yield}} * 100$$

- State- and province-level data for total corn acres harvested, average corn yield (bushels/acre), as well as total production (bushels) and yearly average commodity prices (US $/bushel) were obtained from USDA-NASS and Statistics Canada reports.
- Average commodity price for the period of 2007 to 2013 was US $4.94/bushel and used to determine potential loss in value due to weeds.

Results

Table 1. Potential average corn production and value losses due to weeds for each state or province that provided data for the period of 2007 to 2013. Harvested acres and yield data obtained from USDA-NASS and Statistics Canada.

Region State or province	Acres harvested	Average yield	Yield loss	Potential loss in production	Potential loss in value ($4.94/bu)
	(ac x 1000)	(bu / ac)	(%)	(bu x 1000)	(US $ x 1000)
Northeast					
Delaware	172	130.7	42.1	9,479	46,841
Lake States					
Michigan	2,214	142.9	55.8	176,420	871,766
Minnesota	7,669	163.1	52.6	658,064	3,251,777
Wisconsin	3,123	144.3	47.3	213,126	1,053,147
Eastern Canada					
Ontario	2,027	151.9	51.4	158,188	781,450
Corn Belt					
Illinois	12,229	160.7	50.7	996,129	4,922,303
Indiana	5,949	152.0	58.6	530,239	2,620,136
Iowa	13,364	166.1	39.9	886,566	4,380,904
Missouri	3,059	126.4	73.7	284,936	1,407,990
Ohio	3,393	154.3	60.2	314,979	1,556,446
Northern Plains					
North Dakota	2,484	117.7	51.3	150,020	741,311
South Dakota	4,841	130.1	48.0	302,347	1,494,027
Nebraska-irr	5,510	188.0	60.0	621,872	3,072,937
Nebraska-dry	3,590	123.1	44.8	197,962	978,214
Kansas-dry	2,462	89.1	46.3	101,567	501,886
Mountain					
Montana-irr	43	131.1	43.2	2,460	12,158

Table 2. Potential total corn losses in production (bushels) and value (US $) due to weeds for the United States and Canada based on 2012 Census Data from USDA-NASS and Statistics Canada.

Country	Acres in corn		Total production	Value ($4.94 / bu)	Potential loss in production (52% YL)	Potential loss in value
			(bu x 1000)	(US $ x 1000)	(bu x 1000)	(US $ x 1000)
United States	Dryland	74,593,976	10,333,410	51,047,045	5,373,373	26,544,463
	Irrigated	12,819,069				
Canada		3,543,735	200,242	989,195	104,125	514,383
Total		90,956,780	10,533,652	52,036,240	5,477,499	27,058,846

Summary

- Corn for grain is grown on more than 90 million acres in North America with a value of more than $ 52 billion US using current BMPs.
- On average, weeds cause 52% corn yield loss when using BMPs but no herbicidal weed control. More than ½ of corn production and value across North America would potentially be lost with weeds left uncontrolled.

References

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