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# Quality of Canadian non-food grade soybeans

## 2013

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## Summary

In 2013, the average oil content for Soybean, No.1 and No. 2 grades combined was 21.0% on a dry matter basis. The average was about 1% lower than last year's average of 21.9% but similar to the 5-year average (2008-2012) of 21.6%. The average protein content for Soybean, No.1 and No. 2 grades combined was 40.2%, which was higher than last year's average (39.3%) and higher than the 5-year average (39.4%).

Average oil and protein content for No. 1 and No. 2 grades combined varied between eastern and western regions. Manitoba had an oil content of 21.1% and a protein content of 39.7%, whereas Saskatchewan had an oil content of 20.7% and a protein content of 39.6. Ontario had an oil content of 21.1% and a protein content of 40.5%. Quebec had an oil content of 18.6% and a protein content of 41.3%

## Introduction

This harvest survey report is based on 318 non-food grade samples submitted to the Grain Research Laboratory. The number of samples is slightly more than the 298 samples submitted last year. The 2013 survey included 68 samples from Manitoba, 15 from Saskatchewan, 220 from Ontario, 11 from Quebec, 1 from New Brunswick, and 4 from Prince Edward Island. Of the samples submitted, 20% were graded as Soybean, No. 1 Canada; 78% were graded as Soybean No. 2 Canada; and 2% were graded as Soybean, No. 3 Canada.

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# Weather and production review

## Weather review

Soybeans are mainly grown in southern Ontario, southern Quebec and southern Manitoba.

The growing season in southern Ontario and southern Quebec was hot and dry in 2013. Seeding occurred early in Ontario and Quebec due to warm temperatures and dry soil conditions. Precipitation was average to below average, which aided in seeding. Total accumulated precipitation for the month of July ranged from 65 to 55 mm for Ontario and 109 to 118 mm for Quebec. A relatively dry fall aided in harvest.

The weather on the prairies played an important role in providing a good quality crop. April temperatures were 4 to 5 degrees lower than average, which delayed seeding for about 2 to 3 weeks when compared to last year. The majority of seeding was completed by late May to early June.

Cooler temperatures in midsummer helped to increase oil content in the developing seed. A warm September and the absence of frost allowed crops to fully mature.

Weather maps for the entire growing season can be found at:

<http://www4.agr.gc.ca/DW-GS/historical-historiques.jsp?lang=eng&jsEnabled=true>

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## Production and grade information

Soybean production in Canada increased from 4.9 million tonnes in 2012 to 5.1 million tonnes in 2013 (Table 1). In Ontario, production was 3.1 million tonnes, a decrease from 2012. Production was higher than in 2012 in both Quebec (847,000 tonnes) and Manitoba (1.1 million tonnes). (Table 2)

Compared to 2012, yields from harvested areas in eastern regions were lower; in western regions, they were higher. In Ontario, the yield was 3.0 tonnes/hectare, a decrease from last year's 3.2 tonnes/hectare. In Quebec, the harvested yield was 2.9 tonnes/hectare, a decrease from last year's 3.0 tonnes/hectare. The harvested yield for Manitoba in 2013 was 2.5 tonnes/hectare, an increase from last year's 2.4 tonnes/hectare.

Harvest survey samples submitted to the Canadian Grain Commission from Ontario, Quebec, Manitoba and Saskatchewan were graded by Canadian Grain Commission inspectors.

In the 2013 survey, 98% of the samples submitted were in the top 2 grades. More than half of these samples came from the eastern region. The remaining 2% of samples received were graded Soybean, No. 3 Canada and lower.

**Table 1 - Production of Canadian non-food grade soybeans**

Year	Seeded area hectares	Production tonnes	Yield tonnes/ha
2001	1,058,000	1,594,100	1.5
2002	974,700	2,220,100	2.3
2003	1,050,800	2,268,300	2.2
2004	1,225,900	3,041,500	2.6
2005	1,176,400	3,161,300	2.7
2006	1,213,500	3,465,500	2.9
2007	1,180,100	2,695,700	2.3
2008	1,202,400	3,335,900	2.8
2009	1,394,400	3,503,700	2.5
2010	1,483,000	4,345,300	2.9
2011	1,549,900	4,287,700	2.8
2012	1,680,400	4,929,600	2.8
2013	1,828,700	5,198,400	2.9

Source: Statistics Canada, CANSIM table 001-0010

**Table 2 - Seeded area and production for Eastern and Western Canadian Soybean**

	Seeded area		Production <sup>1</sup>		Average production
	2013	2012	2013	2012	2008-2013
	thousand hectares		thousand tonnes		thousand tonnes
Manitoba	424,900	323,700	1,068,200	770,200	541,800
Saskatchewan	68,800	ND	1,800	ND	68,800
<b>Western Canada</b>	<b>493,700</b>	<b>323,700</b>	<b>1,070,000</b>	<b>770,200</b>	<b>610,600</b>
Ontario	1,011,700	1,048,100	3,078,100	3,401,900	2,995,067
Quebec	15,500	1,700	847,000	843,000	4,443,000
PEI	24,300	20,800	61,500	51,400	252,300
New Brunswick	6,500	4,000	13,200	9,300	10,000
<b>Eastern Canada</b>	<b>1,058,000</b>	<b>1,074,600</b>	<b>3,999,800</b>	<b>4,305,600</b>	<b>7,700,367</b>

Source: Statistics Canada, CANSIM table 001-0010, CANSIM (database).

## Harvest survey samples

All samples were analyzed for oil and protein content using an Infratec 1241 Grain Analyzer near-infrared (NIR) spectrometer, calibrated and verified against the appropriate laboratory reference method. Grade composite samples were analyzed for fatty acid composition and free fatty acids. The reference procedures are listed under Oilseeds Methods <http://grainscanada.gc.ca/oilseeds-oleagineux/method-methode/omtm-mmao-eng.htm>.

Due to a low number of samples received from Saskatchewan (15), Quebec (11), New Brunswick (1) and Prince Edward Island (4), the data presented in this report for these areas might not truly reflect the quality of the crop for these areas.

**Table 3 – Quality data for harvest survey non-food grade soybeans****Soybean, No. 1 and No. 2 Canada grades combined data<sup>1</sup>**

Quality parameter	2013	2012	2011	2010	2008-2012
Oil content <sup>2</sup> ,%	21.0	21.9	22.0	21.4	21.6
Protein content <sup>3</sup> ,%	40.2	39.3	38.1	39.9	39.4

<sup>1</sup> Means for the combined grades

<sup>2</sup> Dry matter basis

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<sup>3</sup> N x 6.25, dry matter basis

## Uses for non-food grade soybeans

There are 2 major types of soybeans grown in Canada: those commonly referred to as oil (or “crush”) beans and food grade beans. This report deals with the “non-food grade” samples and could be considered those for the feed or crushing industry. A list of Canadian soybean varieties is provided in *List of Varieties which are Registered in Canada*, Variety Registration Office, Variety Section, Plant Health and Production Division, Canadian Food Inspection Agency (<http://www.inspection.gc.ca/english/plaveg/variet/soysoje.shtml>)

Oil beans are grown for producing oil and high-protein meal. Soybean oil is used in salad oil, shortening and margarine products. Defatted soybean meal is used as a protein supplement in livestock rations. Key quality factors for oil beans are oil content, protein content, and fatty acid composition. Oil and protein content give quantitative estimates of the beans as a source of oil, and of the defatted meal as a source of protein for animal feed. Fatty acid composition provides information about the nutritional, physical and chemical characteristics of the oil extracted from the beans.

## Oil and protein content

Oil and protein data are based on the means of Soybean, No. 1 and No. 2 Canada grades combined for all non-food grade samples received from Ontario, Quebec, New Brunswick, Prince Edward Island, Saskatchewan and Manitoba (Table 3). In addition, a comparison by all grades and provinces is provided in Table 5.

The average oil content was 21.0%, which was lower than the 2012 average of 21.9% and the 5-year average (2008-2012) of 21.6% (Tables 3 and 5). Individual producer samples ranged from 18.3% to 24.1% (Table 4).

The average protein content was 40.2%, which was higher than last year’s average of 39.3% and the 5-year average (2008-2012) of 39.4% (Tables 3 and 5). Individual producer samples ranged from 32.3% to 44.6% (Table 4).

As Table 5 shows, in Ontario, the average oil content was 21.1%, 0.8% lower than the average in 2012, while protein content increased to 40.5%. In Quebec, oil content decreased to 18.6%, while protein content increased to 41.3%. In Manitoba, the average oil content was 21.1%, 1.0% lower than the average in 2012. The average protein content for Manitoba was 39.7%, which is lower than the 2012 average of 38.1%.

Variations in the oil and protein content between eastern and western regions can be seen in the top 2 grades. While quality parameters can be strongly affected by environmental conditions, the variety of soybean planted, plus soil

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fertility, can also affect quality parameters. The inverse relationship between oil and protein content is illustrated in Figure 4 for both regions.

## Fatty acid composition

Table 6 shows fatty acid composition for No. 1 and 2 grade composites from eastern and western regions.

Ontario composites of the top 2 grades showed some differences in their fatty acid profiles. Soybean, No. 1 Canada had an alpha-linolenic value of 8.3% and an iodine value of 132 units. The alpha-linolenic value for Soybean, No. 2 Canada was 9.1%, and the iodine value was 134 units.

The 2013 Quebec Soybean, No. 2 Canada had an alpha-linolenic value of 11.9% and an iodine value of 143 units.

Manitoba composites of the top 2 grades showed slight differences in their fatty acid profiles. Soybean,, No. 1 Canada had an alpha-linolenic value of 8.2% and an iodine value of 133 units. The alpha-linolenic value for Soybean, No. 2 Canada was 8.95%, and the iodine value was 134 units.

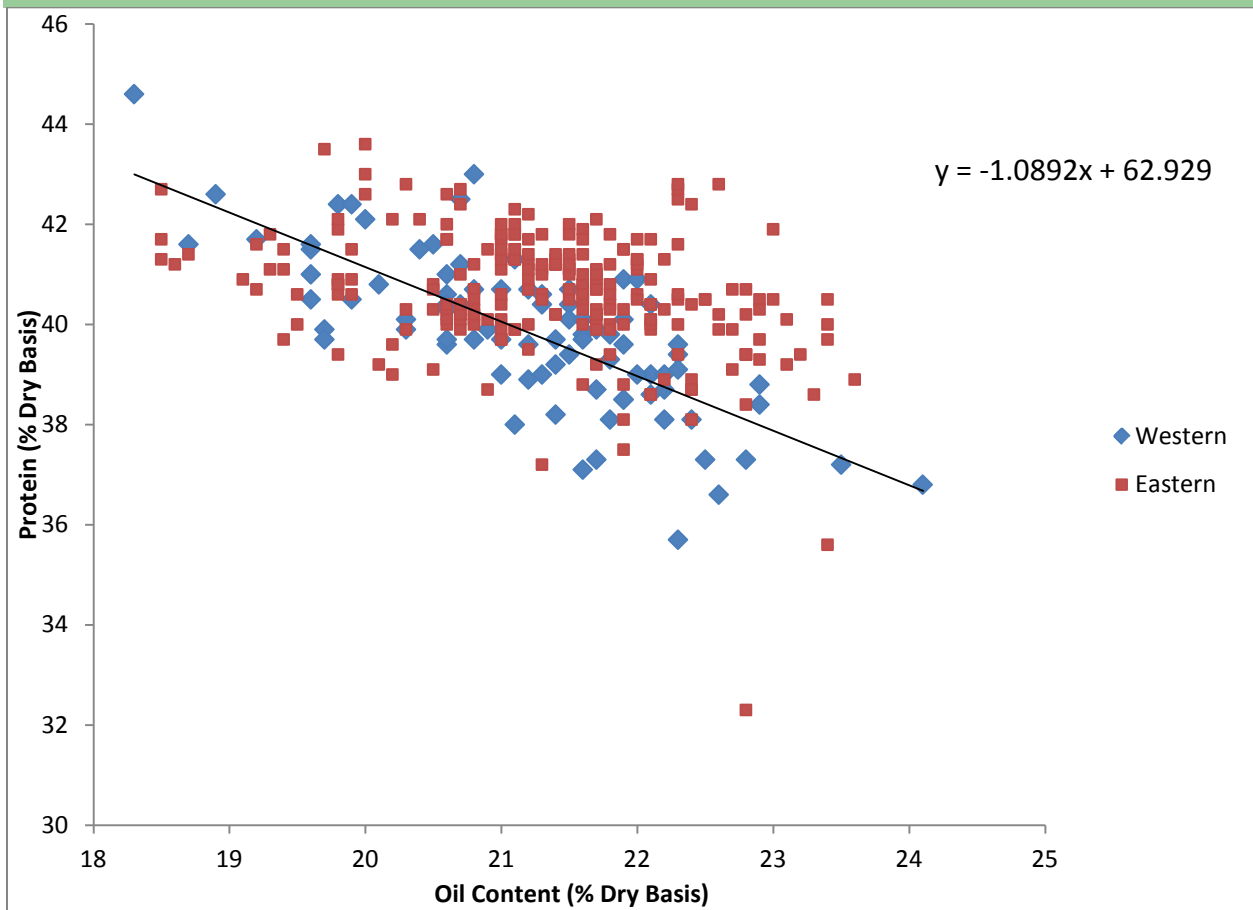
Variety selection, soil fertility and environmental growing conditions also contribute to the difference in the fatty acid composition between the eastern and western regions.

## Free fatty acid (FFA) content

Grade composites showed low free fatty acid levels, averaging 0.05% for Soybean, No. 1 Canada and 0.15% for Soybean, No. 2 Canada. (Table 6) Higher free fatty acid values are mainly due to seed damage, which results from exposure to moisture and oxygen, wet harvesting conditions and improper storage.



**Figure 1 – Relationship between oil and protein content for 2013**



**Table 4 – Oil and protein content of 2013 non-food grade soybean survey by province and grade**

Province	Number of samples	Oil content <sup>1</sup>			Protein content <sup>2</sup>		
		mean	min.	max.	mean	min.	max.
<b>Soybean, No. 1 Canada</b>							
Manitoba	3	21.6	20.6	22.6	37.7	36.6	41.0
Ontario	60	21.5	18.7	23.6	40.6	38.6	42.8
PEI	1	20.0	N/A	N/A	39.4	N/A	N/A
<b>All provinces</b>	<b>64</b>	<b>21.5</b>	<b>18.7</b>	<b>23.6</b>	<b>40.5</b>	<b>36.6</b>	<b>42.8</b>
<b>Soybean, No. 2 Canada</b>							
Manitoba	62	21.0	18.3	24.1	39.7	35.7	44.6
Saskatchewan	15	21.7	19.2	22.2	39.6	37.1	41.7
Ontario	159	21.0	18.6	23.4	40.4	32.3	43.6
Quebec	10	18.6	18.5	21.8	41.3	39.7	43.5
PEI	3	20.9	20.9	21.9	38.4	38.1	40.0
New Brunswick	1	22.4	N/A	N/A	38.4	N/A	N/A
<b>All provinces</b>	<b>250</b>	<b>20.9</b>	<b>18.3</b>	<b>24.1</b>	<b>40.2</b>	<b>32.3</b>	<b>44.6</b>
<b>Soybean, No. 3 Canada</b>							
Manitoba	3	20.7	19.9	22.3	40.2	39.1	42.4
Ontario	1	19.9	N/A	N/A	40.3	N/A	N/A
Quebec	1	21.0	N/A	N/A	43.2	N/A	N/A
<b>All provinces</b>	<b>5</b>	<b>20.4</b>	<b>19.9</b>	<b>22.3</b>	<b>40.4</b>	<b>39.1</b>	<b>42.4</b>
<b>Soybean, All Grades</b>							
Manitoba	68	21.1	18.3	24.6	39.7	35.7	44.6
Saskatchewan	15	20.7	19.2	22.2	39.6	37.1	41.7
Ontario	220	21.1	18.6	23.6	40.5	32.3	43.6
Quebec	11	18.8	18.5	21.8	41.4	39.7	43.5
PEI	4	20.8	20.9	21.9	40.0	38.1	40.0
New Brunswick	1	22.4	N/A	N/A	38.4	N/A	N/A
<b>All provinces<sup>3</sup></b>	<b>318</b>	<b>21.0</b>	<b>18.3</b>	<b>24.6</b>	<b>40.3</b>	<b>32.3</b>	<b>44.6</b>

**All provinces**<sup>1</sup> Dry matter basis<sup>2</sup> N x 6.25; dry matter basis<sup>3</sup> Weighted Averages

**Table 5 – Comparison of 2013 and 2012 non-food grade soybean data with 5-year means**

**Soybean, No. 1 and No. 2 Canada grades combined**

Year and region	Oil content <sup>1</sup> %	Protein content <sup>2</sup> %	Sum of oil and protein <sup>2</sup> %
<b>2013</b>			
<b>All Provinces</b>	<b>21.0</b>	<b>40.2</b>	<b>61.2</b>
Manitoba	21.1	39.7	60.7
Saskatchewan	20.7	39.6	60.3
Ontario	21.1	40.5	61.6
Quebec	18.6	41.3	59.8
PEI and New Brunswick	21.0	38.6	59.6
<b>2012</b>			
<b>All Provinces</b>	<b>21.9</b>	<b>39.3</b>	<b>61.2</b>
Manitoba	22.1	36.3	58.4
Saskatchewan	19.8	38.1	57.9
Ontario	21.9	40.0	61.9
Quebec	20.7	40.9	61.6
New Brunswick	21.3	39.5	60.8
<b>2008-2012 means</b>			
<b>All Provinces</b>	<b>21.6</b>	<b>39.4</b>	<b>61.0</b>
Manitoba	22.2	37.1	59.3
Saskatchewan	20.8	37.4	58.2
Ontario	21.9	41.6	63.5
Quebec	20.2	40.9	61.1

<sup>1</sup> Dry matter basis

<sup>2</sup> N x 6.25; dry matter basis

n/a No Soybean, No. 1 or No. 2 Canada samples in survey

**Table 6 – Fatty acid composition and FFA content for 2013 harvest survey soybean grade composites**

Province	Number of Samples	Fatty acid composition <sup>1</sup>					Free fatty acids	
		C16:0	C18:0	C18:1	C18:2	C18:3	Iodine value <sup>3</sup>	%
<b>Soybean, No. 1 Canada</b>								
Manitoba	3	10.2	4.3	21.9	53.5	8.2	133	0.05
Ontario	59	10.6	4.1	23.2	52.1	8.3	132	0.05
PEI	1	10.2	3.6	18.0	56.2	10.4	140	0.08
<b>All Provinces<sup>4</sup></b>	<b>63</b>	<b>10.5</b>	<b>4.1</b>	<b>23.0</b>	<b>52.3</b>	<b>8.3</b>	<b>132</b>	<b>0.05</b>
<b>Soybean, No. 2 Canada</b>								
Manitoba	61	10.5	4.1	21.9	52.8	8.9	133	0.03
Saskatchewan	15	10.6	4.6	21.3	51.9	9.8	133	0.06
Ontario	158	10.5	4.1	21.9	52.9	8.9	134	0.20
Quebec	11	10.1	3.3	16.5	56.5	11.9	143	0.24
PEI	3	9.8	3.4	17.8	56.9	10.5	141	0.08
New Brunswick	1	9.6	3.7	20.7	56.1	8.20	136	0.06
<b>All Provinces</b>	<b>249</b>	<b>10.5</b>	<b>4.1</b>	<b>21.6</b>	<b>53.1</b>	<b>9.1</b>	<b>134</b>	<b>0.15</b>

<sup>1</sup> Percentage of total fatty acids including palmitic (C16:0), stearic (C18:0), oleic (C18:1), linoleic (C18:2), and linolenic (C18:3); other minor fatty acids totaled 1.4% to 2.0%

<sup>2</sup> As designated on the sample envelope

<sup>3</sup> Calculated from the fatty acid composition

<sup>4</sup> Weighted Averages