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Agricultural Water Use in Canada

2012



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Agricultural Water Use in Canada

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Symbols

The following standard symbols are used in Statistics Canada publications:

- . not available for any reference period
- .. not available for a specific reference period
- ... not applicable
- 0 true zero or a value rounded to zero
- 0^s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
- p preliminary
- r revised
- x suppressed to meet the confidentiality requirements of the *Statistics Act*
- E use with caution
- F too unreliable to be published
- * significantly different from reference category ($p < 0.05$)

Other symbols

- 0 ... the estimate is calculated from a sample where all the responses are equal to zero, such that the coefficient of variation cannot be calculated

Note to readers

The 2012 survey estimates for both irrigation volume and area of land that received irrigation showed growth rates that varied widely across regions. Differences in weather patterns, crop types and farming practices can all lead to these variations. Readers are also advised that this is only the second iteration of the survey and that, given the length of the time series, comparisons from a time series perspective should be made with caution.

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Chris Mohl	methodology
Terri Blanchard	methodology

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Preface

The Agricultural Water Survey (AWS) is conducted to gather information on irrigation water use, irrigation methods and practices, and sources and quality of water used for agricultural purposes on Canadian farms.

This survey is part of the Canadian Environmental Sustainability Indicators (CESI) program. The data collected will be used in CESI's reporting activities and will be used by Agriculture and Agri-Food Canada to inform water use policy and in the development of programs for Canadian irrigators. Statistics Canada will also use the survey results to report on total water use, by sector, in Canada.

Highlights

- Approximately 1.7 billion cubic metres of water were used for irrigation, in 2012. This was more than double that used in 2010.
- The majority of water was used to irrigate field crops (61%) and forage crops (34%).
- Just over 7,300 farms, representing 79% of farms that were in scope for the survey, reported irrigating their crops in 2012.
- More than 590,000 hectares of land received irrigation in 2012. Field crops (346,530 ha) and forage crops (200,040 ha) were grown on the majority of land that received irrigation.
- In 2012, half of farms obtained at least some of their irrigation water from off-farm sources (50%). On-farm surface water was the second most common water source (36%).
- Close to 75% of the water used for irrigation came from off-farm sources, while 20% came from on-farm surface water and 5% came from on-farm underground sources.
- Provincial sources such as irrigation districts were the most common source of off-farm water. More than 90% of the off-farm water used for irrigation was obtained from provincial sources.
- Sprinkler irrigation systems were the most used irrigation system, followed by micro irrigation systems and surface irrigation.
- In 2012, 785 farms had to stop or forego irrigation because of a shortage of surface water and 340 farms suffered from a shortage of underground water.

Analysis

Irrigation volume

Approximately 1.7 billion cubic metres of water were used for irrigation, in 2012. Just over three quarters of this water was applied to crops in Alberta. Farms in British Columbia were responsible for the second largest amount of water used for irrigation (14%) (Table 1-1).

Nationally, the volume of water used for irrigation in 2012 was more than double that reported in 2010. Irrigation volumes increased across all provinces, with the exception of British Columbia, where irrigation volume remained almost the same. The greatest increases in irrigation volumes were in Alberta and Manitoba, where farmers reported increases of more than 150% in 2012 when compared to 2010. This is because 2012 was a relatively dry year in those provinces when compared to the excess rainfall and flooding they experienced in 2010.

Irrigation intensity¹

In 2012, the majority of irrigation water was used to irrigate field crops (61%) and forage crops (34%) (Table 1-3). The remaining 5% of irrigation water was applied to fruit crops (3%) and vegetable crops (2%).

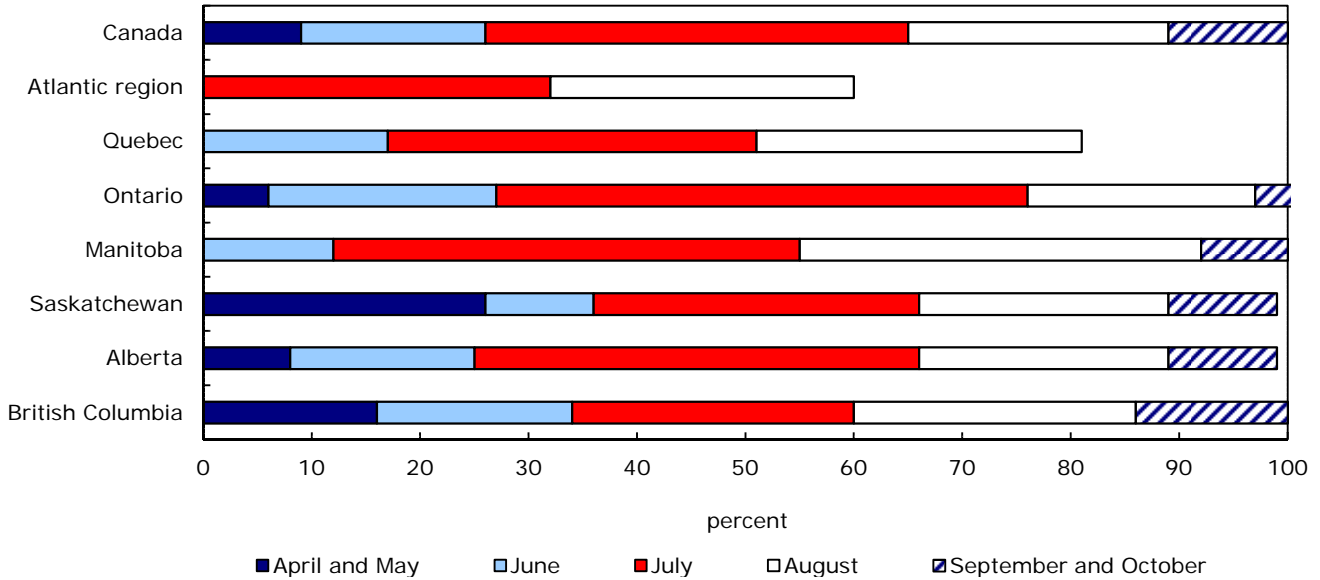
Field crops and forage crops had higher irrigation intensities than fruit and vegetable crops. Specifically, 2,998 cubic metres per hectare applied to field crops and 2,894 cubic metres per hectare applied to forage crops. Vegetable crops, in turn, required 1,328 cubic metres of water per hectare and fruit crops required 2,093 cubic metres per hectare (Table 2-1).

Timing of irrigation

Irrigation in 2012 peaked in July (Chart 1). Approximately 40% of water was applied in July compared to 24% in August, 17% in June, 11% in September and October, and 9% in April and May (Table 1-1). This irrigation profile was true for all provinces except British Columbia where irrigation volume peaked at 26% in July and 26% in August, compared to a July peak of 30% to 49% in the other provinces and regions. In addition, more than one quarter of irrigation water was used in Saskatchewan in April and May (Chart 1).

1. Irrigation intensity refers to the volume of water used for irrigation per unit area.

Chart 1
Monthly irrigation volume,¹ 2012 - Provinces and region



1. As a percentage of total irrigation volume.

Note: Percentages may not add up to 100 due to rounding and/or non-response. Data for the Atlantic region for June are not shown because they have a data quality code of F. Data for the Atlantic region and Quebec for April and May and September and October have been suppressed for confidentiality reasons.

Source: Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Area of land that received irrigation²

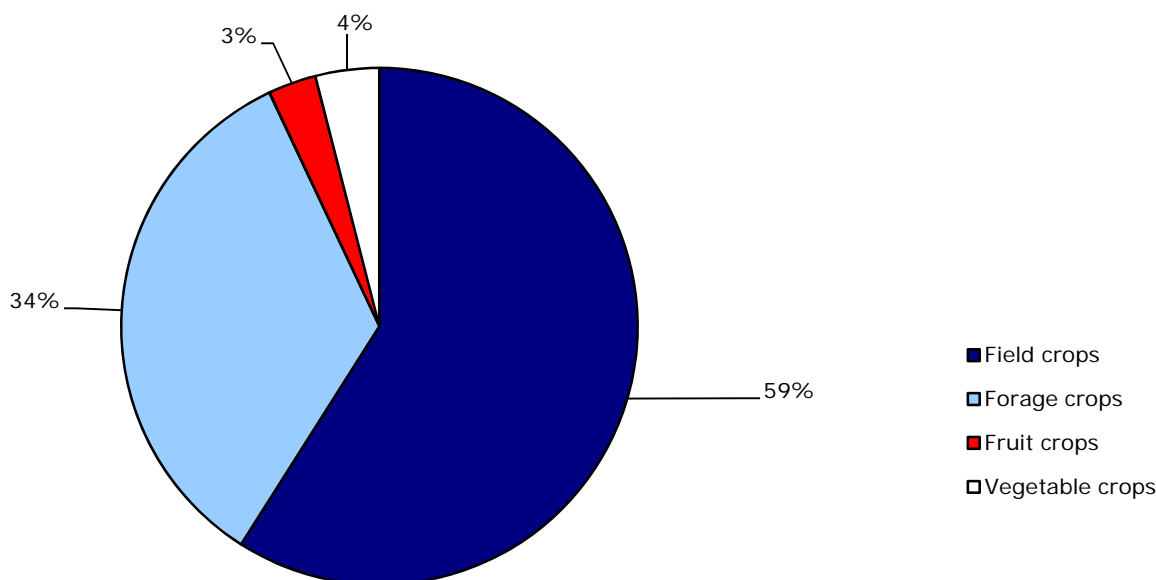
More than 590,000 hectares of land received irrigation in 2012. This represents a 12% increase, compared to 2010. Provincially, Alberta had the most farm land that received irrigation (420,940 ha) with approximately 70% of land that received irrigation situated in that province (Table 3-1).

Field crops (346,530 ha) and forage crops (200,040 ha) were grown on the majority of land that received irrigation (Table 3-1). Fruit crops (20,330 ha) and vegetable crops (24,150 ha) were also irrigated (Chart 2).

2. This section of the report refers to land area that received irrigation. Land area that had the capacity to be irrigated but did not receive irrigation is not included.

Chart 2

Percent of total area that received irrigation, by crop type, 2012 - Canada



Source: Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Number of farms that irrigated

Approximately 7,300 farms reported irrigating their crops in 2012 (79% of farms that were in scope for this survey) (Table 4-1). This is a 5% decrease, compared to 2010. This decrease can be partly attributed to attrition as the Census of Agriculture shows a 10% decrease in the overall number of farms between 2006 and 2011.

British Columbia had the largest number of farms that reported irrigation (2,950 farms) while Manitoba and the Atlantic region had the smallest (110 and 130 farms, respectively) (Table 4-1).

Forage crops were the most commonly irrigated, with 3,000 farms irrigating this crop type. Slightly less than 2,500 farms reported irrigating fruit crops and 2,365 farms reported irrigating field crops. Vegetable crops were the least irrigated crop, with 1,130 farms irrigating this crop type.

Drainage regions

By drainage region, more than three quarters of irrigation was applied in the South Saskatchewan drainage region. As Map 1 shows, the majority of the South Saskatchewan drainage region lies in Alberta, where the majority of irrigation took place, in 2012. The second largest volume of irrigation water was applied in the Fraser-Lower Mainland drainage region (9%) (Table 1-2).

Farm land in the South Saskatchewan drainage region received the most irrigation (approximately 440,000 ha). The majority of this land was devoted to field crops (292,500 ha) and forage crops (139,740 ha) (Table 3-2).

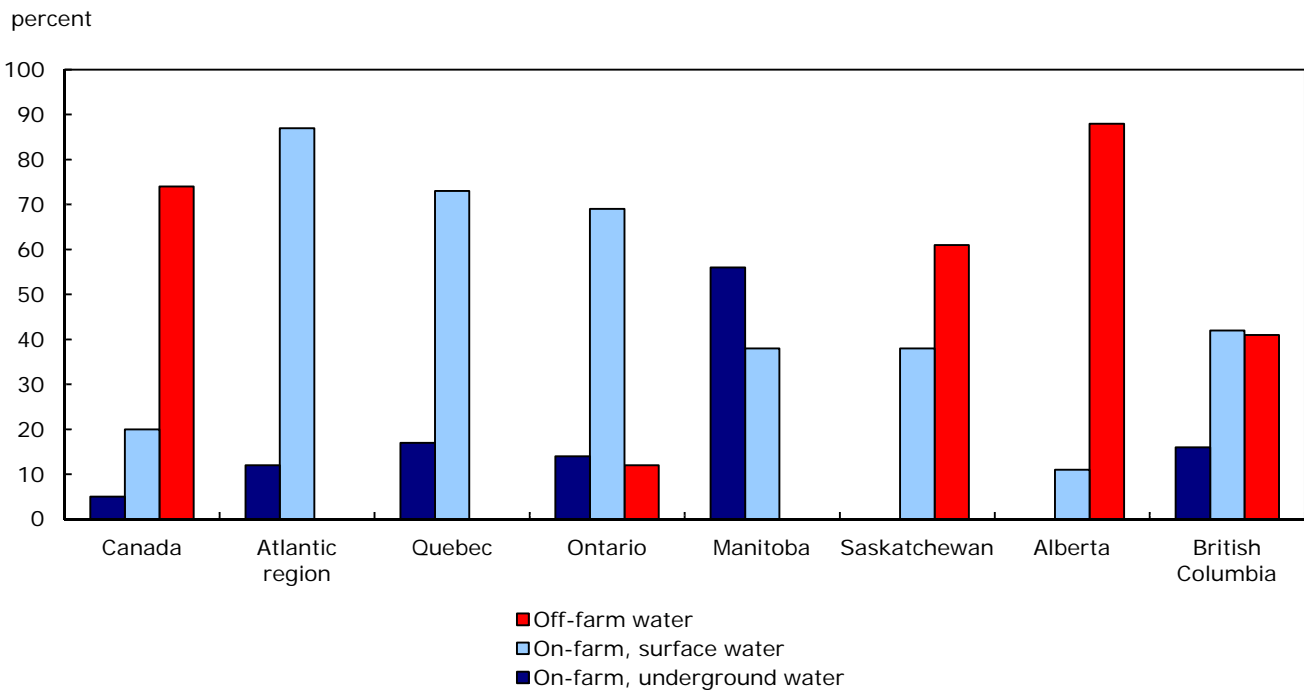
Farms that applied irrigation in 2012 were more evenly dispersed throughout the country. While the largest number of farms that irrigated was also found in the South Saskatchewan drainage region (30%), the Fraser-Lower Mainland and Okanagan-Similkameen drainage regions were home to 17% and 16% of farms that irrigated in 2012, respectively, and farms in the Great Lakes drainage region accounted for 13% of the farms that irrigated in 2012.

Irrigation water sources³

There are many sources of water used for irrigation. Farmers may utilize water sources located on their farms (on-farm water) such as rivers, ponds or dugouts (surface water), or wells (underground water). Farmers can also obtain water from off-farm sources, such as municipal water or water transported to the farm by canal system or vehicle (off-farm water).

Close to 75% of the water used for irrigation came from off-farm sources, while 20% came from on-farm surface water and 5% came from on-farm underground water sources (Table 6-1). Off-farm water was the predominant water source for Alberta and Saskatchewan, while the majority of irrigation water in Eastern Canada came from on-farm, surface water sources (Chart 3).

Chart 3
Proportion of total irrigation water volume, by source,^{1,2} 2012 - Provinces and region



1. Excludes "other" water sources.

2. On farm, underground water data for Saskatchewan and off-farm water data for the Atlantic region and Manitoba are not shown because they have a data quality code of F.

Note: Percentages may not add up to 100 due to rounding and/or non-response.

Source: Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

3. These estimates apply only to farms that irrigated in 2012.

In 2012, half of farms obtained at least some of their irrigation water from off-farm sources (50%). Of the farms using on-farm water, 36% of farms obtained some of their irrigation water from on-farm surface water sources while 20% of farms used on-farm underground water.⁴ Other water sources, such as rainwater, were used for irrigation by 60 farms (Table 7-1).

Off-farm water sources

Provincial sources such as irrigation districts were the most common source of off-farm water, with close to 3,000 farms obtaining their irrigation water this way (Table 8). More than 90% of the off-farm water used for irrigation, in 2012, was obtained from provincial sources (Table 9).

A smaller number of farms reported using treated wastewater (70 farms), tap water (215 farms), private sources (125 farms), and other sources (175 farms) of off-farm water (Table 8). Less than 1% of off-farm water was obtained from tap water and treated wastewater (Table 9).

A variety of reasons were given for using off-farm water but the most common reason was that there was not enough on-farm water available for irrigation (2,915 farms). A few farms (70) reported using off-farm water because of the poor quality of on-farm water and approximately 600 farms reported “other” as the reason for using off-farm water (Table 10).

Irrigation methods

There are three different categories of irrigation methods: sprinkler, micro and surface irrigation. Sprinkler systems distribute water onto crops in a high-velocity, high-volume spray. Micro irrigation systems deliver water onto the soil surface very close to the crop or below the soil. With surface irrigation, also known as flood irrigation, the water flows by gravity over land.

Sprinkler irrigation systems were the most used irrigation system, followed by micro irrigation systems and surface irrigation. In 2012, 5,615 farms used sprinkler irrigation systems while 1,795 used micro-irrigation systems and less than 1,000 farms used surface irrigation (Table 11-1).

More than 70% of sprinkler irrigation took place in the west, with Alberta (1,970 farms) and British Columbia (2,125 farms) accounting for the majority of this type of irrigation. British Columbian farms also accounted for approximately two-thirds of micro-irrigation (1,190 farms) while almost half the farms practising surface irrigation were in Alberta (445 farms) (Table 11-1).

The majority of farms using sprinkler irrigation used them on their forage crops (2,625 farms) and field crops (2,170 farms). Micro-irrigation systems were most commonly used for fruit crops, with 1,485 farms using this system. Surface irrigation was most commonly utilized for forage crops, with 610 farms using this irrigation method (Table 12).

4. There can be more than one water source per farm.

Irrigation practices

Energy or water conservation practices⁵

Irrigators used a variety of water or energy conservation practices, in 2012. Watering at night or in the morning was the most common practice (4,090 farms), followed by farms that used water or energy saving nozzles (3,275 farms) and farms that incorporated compost or other organic material into the soil⁶ (3,115 farms). Pressure reduction (2,905 farms) and leaving stubble on fields (2,575 farms) were also quite common. Wind breaks⁷ were less common, with 1,420 farms reporting their use. Just over 600 farms used other water or energy saving practices, and approximately 500 farms did not use any energy or water conservation practices (Table 13-1).

The uptake of the different energy or water conservation practices differed between provinces. Pressure reduction and using water or energy saving nozzles were most prevalent in Alberta and British Columbia as approximately 80% of farms utilizing these practices were located in these provinces. More than 40% of irrigating farms that incorporated compost or other organic material into soil or watered at night or in the morning were located in British Columbia. Just fewer than 40% of irrigating farms that used wind breaks were in Ontario (Table 13-1).

Not irrigating or stopping irrigation⁸

While no issues prevented irrigation for the majority of farms (6,860 farms), some farms did have to stop or forego irrigation in 2012 because of a shortage of surface water or underground water, poor water quality or other reasons (Table 14-1). In 2012, 785 farms had to stop or forego irrigation because of a shortage of surface water and 340 farms suffered from a shortage of underground water. Over 1,600 farms could not irrigate for some length of time because of poor water quality, an irrigation ban or other reasons.

Issues that prevented irrigation seemed to be most common in British Columbia where 40% or more of the farms that reported a shortage of surface water or underground water, poor water quality or other issues, were located (Table 14-1).

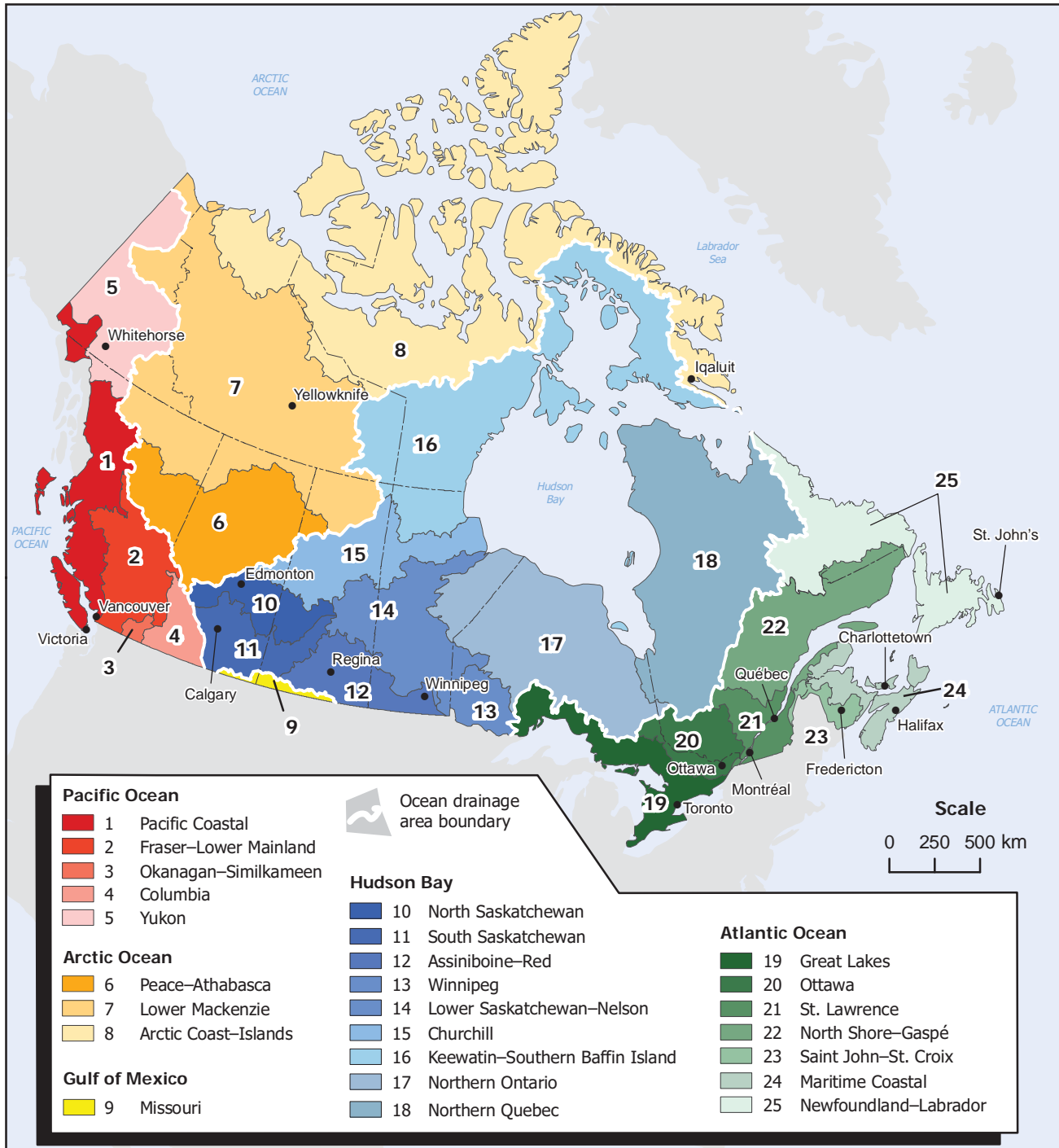
5. The 2012 estimates only include farms that irrigated in 2012. These data are not comparable to the 2010 data as the estimates in 2010 included farms that irrigated in 2010 and farms that did not irrigate in 2010 but had irrigated in the past.

6. Incorporating organic matter into soil can increase the moisture retention of soil.

7. Wind breaks are barriers, commonly trees or shrubs, that reduce or redirect wind and can reduce evaporation from soil.

8. The 2012 estimates include farms that either irrigated in 2012 or farms that did not irrigate in 2012 but had irrigated in the past.

Map 1
Ocean drainage areas and drainage regions



Source(s): Pearse, P.H., F. Bertrand and J.W. MacLaren, 1985, *Currents of Change: Final Report of the Inquiry on Federal Water Policy*, Environment Canada, Ottawa.
 Statistics Canada, Environment Accounts and Statistics Division, 2009, special tabulation.

Related products

Selected technical and analytical products from Statistics Canada

16-001-M2009007	The Water Yield for Canada As a Thirty-year Average (1971 to 2000): Concepts, Methodology and Initial Results
16-001-M2009008	Agricultural Water Use Survey 2007, Methodology Report
16-001-M2010014	Using a Trend-cycle Approach to Estimate Changes in Southern Canada's Water Yield from 1971 to 2004
16-201-X201000011295	Freshwater supply and demand in Canada

Selected CANSIM tables from Statistics Canada

153-0099	Farm irrigation status and irrigated crop area, by province
153-0100	Irrigation volume by month and by province

Selected surveys from Statistics Canada

5145	Agricultural Water Survey
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Statistical tables

Table 1-1
Irrigation volume by month, 2012 — Province or region

	April and May	June	July	August	September and October	Total
thousands of cubic metres						
Canada ¹	158,902	283,595	658,723	411,949	179,184	1,692,331
Atlantic region	x	F	1,386	1,216	x	4,300
Quebec	x	3,397	6,625	5,926	x	19,449
Ontario	2,191	7,948	18,810	8,017	1,443 ^E	38,409
Manitoba	267 ^E	7,178	26,427	22,887	5,035 ^E	61,793
Saskatchewan	14,075 ^E	5,595 ^E	16,335	12,507 ^E	5,455 ^E	53,966
Alberta	101,548	216,880	528,885	299,875	132,395	1,279,583
British Columbia	38,717	41,843	60,256	61,521	32,493	234,830

1. Excludes Yukon, the Northwest Territories and Nunavut.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 1-2
Irrigation volume by month, 2012 — Drainage region

	Drainage region code	April and May	June	July	August	September and October	Total
thousands of cubic metres							
Canada ¹		158,902	283,595	658,723	411,949	179,184	1,692,331
Pacific Coastal	1	753 ^E	1,571 ^E	2,842	2,951	1,874 ^E	9,991
Fraser–Lower Mainland	2	30,128 ^E	31,236	31,815	34,262	21,364	148,806
Okanagan–Similkameen	3	4,454	5,657	11,406	18,321 ^E	7,510	47,349
Columbia	4	F	3,379 ^E	F	5,986	1,744 ^E	28,685 ^E
Missouri	9	9,424 ^E	F	4,750 ^E	6,152 ^E	F	22,586
North Saskatchewan	10	338 ^E	x	x	x	420 ^E	x
South Saskatchewan	11	103,869	217,216	534,568	303,648	136,091	1,295,392
Assiniboine–Red	12	1,984 ^E	4,427 ^E	11,839	7,051	2,268 ^E	27,568
Winnipeg, Lower Saskatchewan–Nelson and Churchill	13, 14, 15	F	5,051	18,790	16,723	3,806 ^E	44,645
Great Lakes	19	2,131	7,788	18,069	7,468	1,441 ^E	36,896
Ottawa	20	F	x	x	x	F	x
St. Lawrence	21	1,567 ^E	3,220	5,989	5,326	1,746 ^E	17,826
North Shore–Gaspé, Saint John–St. Croix, Maritime Coastal and Newfoundland–Labrador	22, 23, 24, 25	536 ^E	890 ^E	1,864	1,744	617 ^E	5,650

1. Excludes Yukon (5), Peace–Athabasca (6), Lower Mackenzie (7), Arctic Coast–Islands (8), Keewatin–Southern Baffin Island (16), Northern Ontario (17) and Northern Quebec (18).

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 1-3
Irrigation volume by month, 2012 — Crop type

	April and May	June	July	August	September and October	Total
thousands of cubic metres						
All crops ¹	158,902	283,595	658,723	411,949	179,184	1,692,331
Field crops ²	78,715	146,958	469,416	234,261	109,378	1,038,728
Fruit	6,145	6,617	10,620	11,394	7,789	42,543
Vegetable	2,531	6,806	12,325	8,148	2,268	32,077
Forage crops ³	71,511	123,215	166,362	158,146	59,748	578,982

1. Excludes Yukon, the Northwest Territories and Nunavut.
2. Includes annual field crops and tame forages, including barley and potatoes.
3. Includes any cultivated grass or legume crop which has been (or will be) cut and dried principally for hay or ensilage. In 2010, forage crops were split into two categories: hay and improved pasture.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 2-1
Irrigation volume per hectare by crop type, 2012 — Province or region

	Field crops ¹	Fruit	Vegetable	Forage crops ²	All crops
cubic metres per hectare					
Canada ³	2,998	2,093	1,328	2,894	2,863
Atlantic region	F	3,341 ^E	1,220	...	1,427 ^E
Quebec	1,551	2,241	x	x	1,526
Ontario	1,162	1,380	1,599	613	1,326
Manitoba	2,923	x	x	x	2,778
Saskatchewan	1,326	x	x	2,090	1,581
Alberta	3,280	x	x	2,580	3,040
British Columbia	1,583	2,143	F	4,031	3,402

1. Includes annual field crops and tame forages, including barley and potatoes.
2. Includes any cultivated grass or legume crop which has been (or will be) cut and dried principally for hay or ensilage. In 2010, forage crops were split into two categories: hay and improved pasture.
3. Excludes Yukon, the Northwest Territories and Nunavut.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 2-2
Irrigation volume per hectare by crop type, 2012 — Drainage region

	Drainage region code	Field crops ¹	Fruit	Vegetable	Forage crops ²	All crops
cubic metres per hectare						
Canada³		2,998	2,093	1,328	2,894	2,863
Pacific Coastal	1	1,904	F	3,429	1,784	2,011
Fraser–Lower Mainland	2	1,229	786 ^E	F	3,930	3,149
Okanagan–Similkameen	3	x	3,413	x	5,963	4,373
Columbia	4	x	1,033	x	4,957 ^E	4,810 ^E
Missouri	9	2,131	1,942	1,988
North Saskatchewan	10	2,304	x	x	1,783	x
South Saskatchewan	11	3,181	...	1,147 ^E	2,579	2,969
Assiniboine–Red	12	1,795	1,008 ^E	F	2,198	1,787
Winnipeg, Lower Saskatchewan–Nelson and Churchill	13, 14, 15	3,808	x	x	x	3,779
Great Lakes	19	x	1,352	1,596	x	1,312
Ottawa	20	x	1,824 ^E	x	x	x
St. Lawrence	21	1,637	2,174 ^E	1,030	381	1,493
North Shore–Gaspé, Saint John–St. Croix, Maritime Coastal and Newfoundland–Labrador	22, 23, 24, 25	852 ^E	3,464 ^E	x	x	1,558 ^E

1. Includes annual field crops and tame forages, including barley and potatoes.

2. Includes any cultivated grass or legume crop which has been (or will be) cut and dried principally for hay or ensilage. In 2010, forage crops were split into two categories: hay and improved pasture.

3. Excludes Yukon (5), Peace–Athabasca (6), Lower Mackenzie (7), Arctic Coast–Islands (8), Keewatin–Southern Baffin Island (16), Northern Ontario (17) and Northern Quebec (18).

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 3-1
Total area that received irrigation¹ by crop type, 2012 — Province or region

	Field crops ²	Fruit	Vegetable	Forage crops ³	All crops
hectares					
Canada⁴	346,530	20,330	24,150	200,040	591,050
Atlantic region	F	660	360 ^E	0 ...	3,010 ^E
Quebec	2,940 ^E	3,750	x	x	12,750
Ontario	16,050	2,780	9,840	F	28,960
Manitoba	20,420	x	x	x	22,240
Saskatchewan	19,800 ^E	x	x	13,130	34,130
Alberta	280,570	x	x	137,330	420,940
British Columbia	4,760 ^E	13,070	2,540 ^E	48,660	69,020

1. Excludes land where irrigation was possible, but did not occur.

2. Includes annual field crops and tame forages, including barley and potatoes.

3. Includes any cultivated grass or legume crop which has been (or will be) cut and dried principally for hay or ensilage. In 2010, forage crops were split into two categories: hay and improved pasture.

4. Excludes Yukon, the Northwest Territories and Nunavut.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 3-2
Total area that received irrigation¹ by crop type, 2012 — Drainage region

	Drainage region code	Field crops ²	Fruit	Vegetable	Forage crops ³	All crops
hectares						
Canada⁴		346,530	20,330	24,150	200,040	591,050
Pacific Coastal	1	520 ^E	F	30 ^E	4,180	4,970
Fraser–Lower Mainland	2	3,710 ^E	6,440	F	34,810	47,260
Okanagan–Similkameen	3	x	6,260	x	3,930 ^E	10,830
Columbia	4	x	F	x	5,740	5,960
Missouri	9	2,770 ^E	0...	0...	8,590	11,360
North Saskatchewan	10	1,430 ^E	x	x	900 ^E	x
South Saskatchewan	11	292,500	0...	F	139,740	436,310
Assiniboine–Red	12	12,400	F	F	1,800 ^E	15,430
Winnipeg, Lower Saskatchewan–Nelson and Churchill	13, 14, 15	11,700	x	x	x	11,820
Great Lakes	19	x	2,680	9,800	x	28,110
Ottawa	20	x	120 ^E	x	x	x
St. Lawrence	21	2,400 ^E	3,570	5,960	F	11,940
North Shore–Gaspé, Saint John–St. Croix, Maritime Coastal and Newfoundland–Labrador	22, 23, 24, 25	2,370 ^E	820	x	x	3,630 ^E

1. Excludes land where irrigation was possible, but did not occur.

2. Includes annual field crops and tame forages, including barley and potatoes.

3. Includes any cultivated grass or legume crop which has been (or will be) cut and dried principally for hay or ensilage. In 2010, forage crops were split into two categories: hay and improved pasture.

4. Excludes Yukon (5), Peace–Athabasca (6), Lower Mackenzie (7), Arctic Coast–Islands (8), Keewatin–Southern Baffin Island (16), Northern Ontario (17) and Northern Quebec (18).

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 4-1
Number of farms by irrigation status, 2012 — Province or region

	Farms that usually irrigate ¹	
	Irrigated in 2012	Did not irrigate in 2012
number		
Canada²	7,310	1,895
Atlantic region	130	100 ^E
Quebec	580	150 ^E
Ontario	1,045	430
Manitoba	110	20 ^E
Saskatchewan	330	225
Alberta	2,165	445
British Columbia	2,950	530

1. Farms that reported having irrigated in 2012 or in the past.

2. Excludes Yukon, the Northwest Territories and Nunavut.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 4-2
Number of farms by irrigation status, 2012 — Drainage region

	Drainage region	Farms that usually irrigate ¹	
		Irrigated in 2012	Did not irrigate in 2012
		number	
Canada ²		7,310	1,895
Pacific Coastal	1	285	55 ^E
Fraser–Lower Mainland	2	1,245	400
Okanagan–Similkameen	3	1,205	F
Columbia	4	210	60 ^E
Missouri	9	135	F
North Saskatchewan	10	45	80
South Saskatchewan	11	2,235	495
Assiniboine–Red	12	140	85
Winnipeg, Lower Saskatchewan–Nelson and Churchill	13, 14, 15	50	20 ^E
Great Lakes	19	985	420
Ottawa	20	80	F
St. Lawrence	21	515	120 ^E
North Shore–Gaspé, Saint John–St. Croix, Maritime Coastal and Newfoundland–Labrador	22, 23, 24, 25	170	110

1. Farms that reported having irrigated in 2012 or in the past.

2. Excludes Yukon (5), Peace–Athabasca (6), Lower Mackenzie (7), Arctic Coast–Islands (8), Keewatin–Southern Baffin Island (16), Northern Ontario (17) and Northern Quebec (18).

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 5
Number of farms with land that received irrigation, 2012 — Crop type

	Farms with land that received irrigation
number	
Field crops ¹	2,365
Fruit	2,445
Vegetable	1,130
Forage crops ²	3,000

1. Includes annual field crops and tame forages, including barley and potatoes.

2. Includes any cultivated grass or legume crop which has been (or will be) cut and dried principally for hay or ensilage. In 2010, forage crops were split into two categories: hay and improved pasture.

Note(s): Excludes Yukon, the Northwest Territories and Nunavut. Figures may not add up to totals due to rounding. A farm may have more than one irrigated crop type.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 6-1
Percentage of irrigation water, by water source,¹ 2012 — Province or region

	On-farm, underground water	On-farm, surface water	Off-farm water
percent			
Canada ²	5	20	74
Atlantic region	12 ^E	87	F
Quebec	17 ^E	73	0 ...
Ontario	14 ^E	69	12 ^E
Manitoba	56	38	F
Saskatchewan	F	38 ^E	61
Alberta	0	11 ^E	88
British Columbia	16	42	41

1. Excludes "other" water sources.

2. Excludes Yukon, the Northwest Territories and Nunavut.

Note(s): Percentages may not add up to 100 due to rounding and/or non-response.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 6-2
Percentage of irrigation water, by water source,¹ 2012 — Drainage region

	Drainage region code	On-farm, underground water	On-farm, surface water	Off-farm water
percent				
Canada ²		5	20	74
Pacific Coastal	1	33	55	11 ^E
Fraser-Lower Mainland	2	5 ^E	50	45
Okanagan-Similkameen	3	44	8 ^E	46
Columbia	4	F	F	F
Missouri	9	0 ...	33 ^E	67
North Saskatchewan	10	F	67	33 ^E
South Saskatchewan	11	0 ...	11 ^E	87
Assiniboine-Red Winnipeg, Lower	12	F	67	F
Saskatchewan-Nelson, Churchill	13, 14, 15	73	23 ^E	F
Great Lakes	19	14 ^E	68	13 ^E
Ottawa	20	F	94	F
St.Lawrence	21	18 ^E	71	0 ...
North Shore-Gaspé, Saint John-St. Croix, Maritime Coastal, Newfoundland-Labrador	22, 23, 24, 25	11 ^E	88	F

1. Excludes "other" water sources.

2. Excludes Yukon (5), Peace-Athabasca (6), Lower Mackenzie (7), Arctic Coast-Islands (8), Keewatin-Southern Baffin Island (16), Northern Ontario (17) and Northern Quebec (18).

Note(s): Percentages may not add up to 100 due to rounding and/or non-response.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 7-1
Number of farms by irrigation water source, 2012 — Province or region

	On-farm, underground water	On-farm, surface water	Off-farm water	Other source
	number			
Canada ¹	1,440	2,620	3,670	60 ^E
Atlantic region	40 ^E	100	F	0...
Quebec	235	380	0...	F
Ontario	260	850	90 ^E	F
Manitoba	40	75	5 ^E	0...
Saskatchewan	F	140	185	F
Alberta	F	240	1,865	F
British Columbia	840	830	1,520	0...

1. Excludes Yukon, the Northwest Territories and Nunavut.

Note(s): Figures may not add up to totals due to rounding. A farm may use more than one source.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 7-2
Number of farms by irrigation water source, 2012 — Drainage region

	Drainage region code	On-farm, underground water	On-farm, surface water	Off-farm water	Other source
		number			
Canada ¹		1,440	2,620	3,670	60 ^E
Pacific Coastal	1	115	135	95 ^E	0...
Fraser–Lower Mainland	2	485	490	390	0...
Okanagan–Similkameen	3	185 ^E	125 ^E	930	0...
Columbia	4	45 ^E	80	105	0...
Missouri	9	0...	40 ^E	100	0...
North Saskatchewan	10	F	40	5 ^E	F
South Saskatchewan	11	0...	270	1,915	F
Assiniboine–Red	12	25 ^E	85	35 ^E	F
Winnipeg, Lower Saskatchewan–Nelson and Churchill	13, 14, 15	25	25	F	0...
Great Lakes	19	240	805	85 ^E	F
Ottawa	20	25 ^E	70	F	0...
St. Lawrence	21	220	330	0...	F
North Shore–Gaspé, Saint John–St. Croix, Maritime Coastal and Newfoundland–Labrador	22, 23, 24, 25	55 ^E	130	F	0...

1. Excludes Yukon (5), Peace–Athabasca (6), Lower Mackenzie (7), Arctic Coast–Islands (8), Keewatin–Southern Baffin Island (16), Northern Ontario (17) and Northern Quebec (18).

Note(s): Figures may not add up to totals due to rounding. A farm may use more than one source.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 8
Number of farms by off-farm irrigation water source, 2012 — Province or region

	Tap water (drinking water or municipal water)	Treated wastewater	Provincial sources	Private sources	Other source
	number				
Canada 1	215^E	70^E	2,990	125^E	175^E
Atlantic region	0...	0...	F	F	0...
Quebec	0...	0...	0...	F	0...
Ontario	50 ^E	0...	F	10 ^E	F
Manitoba	0...	0...	F	0...	F
Saskatchewan	F	F	160	0...	F
Alberta	0...	F	1,730	F	F
British Columbia	160 ^E	65 ^E	1,080	80 ^E	125 ^E

1. Excludes Yukon, the Northwest Territories and Nunavut.

Note(s): Figures may not add up to totals due to rounding. A farm may use more than one source.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 9
Percentage of off-farm water by irrigation water source, 2012 — Province or region

	Tap water (drinking water or municipal water)	Treated wastewater	Provincial sources	Private sources	Other source
	percent				
Canada 1	0^E	0^E	93	1^E	3^E
Atlantic region	0...	0...	100	0...	0...
Quebec
Ontario	F	0...	F	F	F
Manitoba	0...	0...	88	0...	F
Saskatchewan	0	F	95	0...	F
Alberta	0...	F	97	F	F
British Columbia	F	6 ^E	57	F	25 ^E

1. Excludes Yukon, the Northwest Territories and Nunavut.

Note(s): Percentages may not add up to 100 due to rounding and/or non-response. A farm may use more than one source.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 10
Number of farms by reason for using an off-farm irrigation water source, 2012 — Province or region

	No water or not enough water on the farm	Poor quality of on-farm water	Other reason
	number		
Canada 1	2,915	70^E	605
Atlantic region	F	0 ...	0 ...
Quebec	F	0 ...	F
Ontario	80 ^E	0 ...	F
Manitoba	F	0 ...	F
Saskatchewan	125	F	50 ^E
Alberta	1,505	60 ^E	295
British Columbia	1,190	F	235 ^E

1. Excludes Yukon, the Northwest Territories and Nunavut.

Note(s): Figures may not add up to totals due to rounding. A farm may report more than one reason.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 11-1
Number of farms by irrigation method, 2012 — Province or region

	Sprinkler ¹	Micro ²	Surface ³
	number		
Canada 4	5,615	1,795	925
Atlantic region	95	25 ^E	F
Quebec	285	300	65 ^E
Ontario	850	255	120 ^E
Manitoba	110	F	F
Saskatchewan	180	F	145
Alberta	1,970	F	445
British Columbia	2,125	1,190	145

1. Includes: hand move; solid or permanent set; side roll, wheel line, wheel move or wheel roll; traveller, volume gun, travelling gun, walker, overhead or circular; linear move; and centre pivot.

2. Includes: surface drip, sub-surface drip, micro-sprinkler, bubblers, microjet, and hand watering.

3. Includes: down rows, furrows, corrugations, border dyke, level basins, uncontrolled flooding, and back flooding.

4. Excludes Yukon, the Northwest Territories and Nunavut.

Note(s): Figures may not add up to totals due to rounding. A farm may have more than one irrigation method.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 11-2
Number of farms by irrigation method, 2012 — Drainage region

	Drainage region code	Sprinkler ¹	Micro ²	Surface ³
		number		
Canada ⁴		5,615	1,795	925
Pacific Coastal	1	235	90 ^E	F
Fraser–Lower Mainland	2	860	485	110 ^E
Okanagan–Similkameen	3	855	575	F
Columbia	4	175	40 ^E	25 ^E
Missouri	9	55	0 ...	85
North Saskatchewan	10	35	F	F
South Saskatchewan	11	2,005	0 ...	480
Assiniboine–Red	12	110	F	20 ^E
Winnipeg, Lower Saskatchewan–Nelson and Churchill	13, 14, 15	50	F	0 ...
Great Lakes	19	800	235	110 ^E
Ottawa	20	65	30 ^E	F
St. Lawrence	21	230	285	60 ^E
North Shore–Gaspé, Saint John–St. Croix, Maritime Coastal and Newfoundland–Labrador	22, 23, 24, 25	130	30 ^E	F

1. Includes: hand move; solid or permanent set; side roll, wheel line, wheel move or wheel roll; traveller, volume gun, travelling gun, walker, overhead or circular; linear move; and centre pivot.

2. Includes: surface drip, sub-surface drip, micro-sprinkler, bubblers, microjet, and hand watering.

3. Includes: down rows, furrows, corrugations, border dyke, level basins, uncontrolled flooding, and back flooding.

4. Excludes Yukon (5), Peace–Athabasca (6), Lower Mackenzie (7), Arctic Coast–Islands (8), Keewatin–Southern Baffin Island (16), Northern Ontario (17) and Northern Quebec (18).

Note(s): Figures may not add up to totals due to rounding. A farm may have more than one irrigation method.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 12
Number of farms by irrigation method, 2012 — Crop type

	Sprinkler ¹	Micro ²	Surface ³
		number	
All crops	5,615	1,795	925
Field crops ⁴	2170	105 ^E	215
Fruit	1,265	1,485	125 ^E
Vegetable	755	400	65 ^E
Forage crops ⁵	2,625	F	610

1. Includes: hand move; solid or permanent set; side roll, wheel line, wheel move or wheel roll; traveller, volume gun, travelling gun, walker, overhead or circular; linear move; and centre pivot.

2. Includes: surface drip, sub-surface drip, micro-sprinkler, bubblers, microjet, and hand watering.

3. Includes: down rows, furrows, corrugations, border dyke, level basins, uncontrolled flooding, and back flooding.

4. Includes annual field crops and tame forages, including barley and potatoes.

5. Includes any cultivated grass or legume crop which has been (or will be) cut and dried principally for hay or ensilage. In 2010, forage crops were split into two categories: hay and improved pasture.

Note(s): Excludes Yukon, the Northwest Territories and Nunavut. A farm may have more than one irrigated crop type or method per crop type.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 13-1
Number of farms by water and energy conservation practice, 2012 — Province or region

	Wind breaks	Leaving stubble on fields	Watering at night or in the morning	Pressure reduction	Water or energy saving nozzles	Incorporating compost or other organic matter into soil	Other methods or devices	No practices
	number							
Canada ¹	1,420	2,575	4,090	2,905	3,275	3,115	610	510
Atlantic region	35 ^E	20 ^E	115	40 ^E	40 ^E	65 ^E	F	F
Quebec	295	50 ^E	450	195	105	190	75 ^E	55 ^E
Ontario	545	395	910	220	285	580	130	F
Manitoba	40 ^E	65	75	50	45	45 ^E	10 ^E	F
Saskatchewan	40 ^E	180	80 ^E	95 ^E	105 ^E	80 ^E	30 ^E	70 ^E
Alberta	210	1,210	645	1,210	1,330	825	110 ^E	100 ^E
British Columbia	245 ^E	655	1,820	1,095	1,360	1,330	240 ^E	260

1. Excludes Yukon, the Northwest Territories and Nunavut.

Note(s): Figures may not add up to totals due to rounding. A farm may use more than one practice.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 13-2
Number of farms by water and energy conservation practice, 2012 — Drainage region

	Drainage region code	Wind breaks	Leaving stubble on fields	Watering at night or in the morning	Pressure reduction	Water or energy saving nozzles	Incorporating compost or other organic material into soil	Other methods or devices	No practices
		number							
Canada ¹		1,420	2,575	4,090	2,905	3,275	3,115	610	510
Pacific Coastal	1	50 ^E	35 ^E	195	95 ^E	55 ^E	175	F	40 ^E
Fraser–Lower Mainland	2	75 ^E	345	730	375	305	570	95 ^E	175 ^E
Okanagan–Similkameen	3	115 ^E	215 ^E	795	590	915	505	105 ^E	F
Columbia	4	F	60 ^E	90	40 ^E	85	75	F	45 ^E
Missouri	9	F	60	40 ^E	40 ^E	35 ^E	40 ^E	F	25 ^E
North Saskatchewan	10	15 ^E	25 ^E	35	15 ^E	25 ^E	15 ^E	F	F
South Saskatchewan	11	210	1,250	615	1,225	1,350	815	110 ^E	135 ^E
Assiniboine–Red	12	40 ^E	80	80	50	40 ^E	60	20 ^E	F
Winnipeg, Lower Saskatchewan–Nelson and Churchill	13, 14, 15	15 ^E	35	35	30	35	15 ^E	5 ^E	0...
Great Lakes	19	515	365	855	205	255	545	115	F
Ottawa	20	30 ^E	30 ^E	75	20 ^E	35 ^E	50 ^E	20 ^E	0...
St. Lawrence	21	270	45 ^E	400	175	90 ^E	160	60 ^E	50 ^E
North Shore–Gaspé, Saint John–St. Croix, Maritime Coastal and Newfoundland–Labrador	22, 23, 24, 25	60 ^E	30 ^E	145	55	60	90	25 ^E	F

1. Excludes Yukon (5), Peace–Athabasca (6), Lower Mackenzie (7), Arctic Coast–Islands (8), Keewatin–Southern Baffin Island (16), Northern Ontario (17) and Northern Quebec (18).

Note(s): Figures may not add up to totals due to rounding. A farm may use more than one practice.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 14-1
Number of farms that stopped irrigating or did not irrigate by reason, 2012 — Province or region

	Shortage of surface water	Shortage of underground water	Poor water quality / High cost / Irrigation ban	Other reasons	No issues prevented irrigation
	number				
Canada 1	785	340	545	1,125	6,860
Atlantic region	45 ^E	F	F	45 ^E	135
Quebec	120	80 ^E	50 ^E	50 ^E	490
Ontario	215	55 ^E	150 ^E	170 ^E	1,000
Manitoba	20 ^E	F	F	15 ^E	100
Saskatchewan	F	F	15 ^E	155 ^E	355
Alberta	60 ^E	0 ...	F	230	2,295
British Columbia	315	180 ^E	240	465	2,485

1. Excludes Yukon, the Northwest Territories and Nunavut.

Note(s): Figures may not add up to totals due to rounding. A farm may report more than one reason.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Table 14-2
Number of farms that stopped irrigating or did not irrigate by reason, 2012 — Drainage region

	Drainage region code	Shortage of surface water	Shortage of underground water	Poor water quality / High cost / Irrigation ban	Other reasons	No issues prevented irrigation
	number					
Canada 1		785	340	545	1,125	6,860
Pacific Coastal	1	35 ^E	40 ^E	F	35 ^E	230
Fraser–Lower Mainland	2	245	135 ^E	165 ^E	290	960
Okanagan–Similkameen	3	F	F	F	85 ^E	1,120
Columbia	4	F	0 ...	25 ^E	55 ^E	175
Missouri	9	15 ^E	0 ...	F	25 ^E	100
North Saskatchewan	10	F	F	F	45	75
South Saskatchewan	11	F	0 ...	F	290	2,360
Assiniboine–Red	12	15 ^E	F	F	45 ^E	165
Winnipeg, Lower Saskatchewan–Nelson and Churchill	13, 14, 15	F	F	F	F	55
Great Lakes	19	195	55 ^E	140 ^E	155 ^E	985
Ottawa	20	20 ^E	F	F	F	45
St. Lawrence	21	115 ^E	75 ^E	35 ^E	30 ^E	435
North Shore–Gaspé, Saint John–St. Croix, Maritime Coastal and Newfoundland–Labrador	22, 23, 24, 25	50 ^E	F	45 ^E	55 ^E	155

1. Excludes Yukon (5), Peace–Athabasca (6), Lower Mackenzie (7), Arctic Coast–Islands (8), Keewatin–Southern Baffin Island (16), Northern Ontario (17) and Northern Quebec (18).

Note(s): Figures may not add up to totals due to rounding. A farm may report more than one reason.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Agricultural Water Survey (survey number 5145).

Reference period

The information contained in this report reflects water use and irrigation methods and practices that took place during the 2012 growing season.

Survey frame and coverage

The target population for this survey is Canadian farm operations that irrigate. The survey frame was created using information collected as part of the 2011 Census of Agriculture.¹ The statistical unit was the agricultural operation. Any unit which reported sales of \$10,000 or more and reported either irrigating in 2010 or owning irrigation equipment on the 2011 Census was considered to be part of the initial survey frame.

A number of groups were removed from the initial survey frame.

- All institutional farms (e.g. government, university and prison farms), Indian reserve farms and community pastures.
- All units which reported greenhouse, sod, nursery, mushroom or Christmas tree operations on the 2011 Census of Agriculture.
- All units that belong to Statistics Canada's Large Agricultural Operations Statistics program. These very large and complex units have special collection agreements with Statistics Canada concerning the surveys for which they will provide data.
- All units for which the 2011 Census of Agriculture irrigation data was completely imputed.
- All units which reported only irrigation area in the "Other" irrigation category on the 2011 Census of Agriculture and did not report owning any irrigation equipment.
- All units in Drainage Regions (DR) 5, 6, 7, 8, 16, 17 and 18.

The remaining 12,055 units comprised the survey frame.

1. A copy of the Census of Agriculture questionnaire can be found at http://www.statcan.gc.ca/access_acces/alternative_alternatif.action?l=eng&loc=/ca-ra2011/201108/q11-eng.pdf.

Sample selection

A stratified sample design was used. Geographic strata were defined at the DR level or, when there were small populations within an individual DR, groups of DRs. This resulted in 13 geographic strata. Within each of these strata, the population was divided into four sub-strata based on their predicted water use for irrigation. This predicted value was derived from a model which used data from the 2006 and 2011 Censuses of Agriculture and the 2007 and 2010 Agricultural Water Surveys. Units were categorized into one of four sub-strata of zero, low, medium and high predicted water use. The thresholds for these sub-strata varied from one geographic stratum to the next.

The sample was allocated to meet predetermined coefficient of variation targets at the geographic stratum (DR group) level while at the same time not greatly exceeding a sample size of 2,000 units. The targets were not consistent from one DR group to the next. In those DR groups where greater irrigation was anticipated, the targets were lower than those used in other areas. The total sample size was 2,029 units.

In order to reduce the response burden on those farmers who had been selected for recent Statistics Canada surveys, a sample coordination method known as the microstratum approach was used. Within a geographic/size stratum, the units which had recently been least burdened by other Statistics Canada agriculture surveys were more likely to be selected for the AWS.

Data collection

The AWS was a voluntary survey. Respondents were mailed out a questionnaire and were asked to mail back their responses. A telephone follow-up took place for non-responding units.

An initial letter was sent to the selected units in the spring of 2012. This letter introduced the survey and informed the operator that its primary purpose was to collect information on water used during the 2012 growing season for irrigation purposes. It also asked the operator to keep track of the farm's water use for irrigation in order to report it later in the 2012 growing season.

The survey questionnaires were mailed out to the selected units in mid-October. Respondents were given 30 days to complete it and return it by mail. Those that did not respond within that time period were contacted by Statistics Canada interviewers. A Computer Assisted Telephone Interviewing (CATI) questionnaire allowed the operator to complete the survey over the telephone rather than having the respondent mail in the questionnaire.

Data entry, editing and imputation

The paper questionnaires were captured into an electronic format at Statistics Canada's Head Office. The responses from the CATI interviews were downloaded directly to this format. An initial set of edits was run against the data to identify inconsistencies in the data. Statistical methods were also used to identify units which appeared to have questionable reported values. When important inconsistencies were identified, Statistics Canada personnel attempted to contact the respondent by telephone for clarification and correction if necessary.

In cases where this follow-up was not successful or the inconsistencies were not important enough to warrant a follow-up, a combination of manual and automated editing and imputation took place. A set of edits and predetermined actions were used to impute a value when enough information was available to reasonably deduce the response of a missing or inconsistent field. If this information did not exist, then the action depended upon the field. For those fields related to total irrigated area or irrigation volume, the missing or inconsistent data was imputed in an automated manner using a nearest neighbour imputation approach. The imputation was done in such a way to minimize the number of changes to the original data. For all other fields, the response was set to the "don't know" value.

Estimation

Because the AWS was a sample survey, sampling weights were applied to individual respondents to represent the number of units in the population that they represent. The initial or design weights were calculated as the probability of the unit being selected for the sample. As with all surveys, there was non-response. An adjustment was made to the weights of the respondents to account for the non-responding units. In order to estimate a characteristic for the entire population, this final weight was multiplied by the response value and summed up over the entire population.

Data quality, sampling and non-sampling errors

The statistics contained in this publication are estimates derived from a random sample of Canadian farms and, as such, are subject to sampling and non-sampling errors. The quality of the estimates thus depends on the combined effect of these types of errors.

Sampling errors

These errors arise because observations are made only on a sample and not on the entire population. The sampling error depends on such factors as the size of the sample, the variability of the characteristic of interest in the population, the sampling design and the method of estimation. For example, for a given sample size, the sampling error will depend on the stratification procedure employed, allocation of the sample, choice of the sampling units and method of selection. In sample surveys, since inference is made about the entire population covered by the survey on the basis of data obtained from only a part of the population, the results are likely to be different than if a complete census was taken under the same general survey conditions. The most important feature of probability sampling is that the sampling error can be measured from the sample itself.

Typically the sampling error is measured by the expected variability of the estimate from the true value, expressed as a percentage of the estimate. This measure is expressed as the coefficient of variation (CV). Coefficients of variation of the final estimates were computed for the Agricultural Water Survey and are indicated on the statistical tables. The quality of the estimates was classified as follows:

A. Excellent	CV is 0.00% to 4.99%
B. Very good	CV is 5.00% to 9.99%
C. Good	CV is 10.00% to 14.99%
D. Acceptable	CV is 15.00% to 24.99%
E. Use caution	CV is 25.00% to 49.99%
F. Unreliable	CV is > 49.99% (data are suppressed)

Non-sampling errors

These errors are present whether a sample or a complete census of the population is taken. Non-sampling errors may be introduced at various stages of data collection (non-response, differences in the interpretation of questions, incorrect information from respondents) and data processing (such as coding, data entry, editing, weighting, tabulation, etc.). All efforts are undertaken to minimize non-sampling errors through extensive edits, quality control steps and data analysis, but some of these errors are outside the control of Statistics Canada.

The 2012 survey estimates for both irrigation volume and area of land that received irrigation showed growth rates that varied widely across regions. Differences in weather patterns, crop types and farming practices can all lead to these variations. Readers are also advised that this is only the second iteration of the survey and that, given the length of the time series, comparisons from a time series perspective should be made with caution.

Response rate

After performing the editing and imputation steps and excluding the out-of-scope units, the resulting response rate was 75.5%.

Data confidentiality

Data confidentiality is ensured under the *Statistics Act*, which prohibits the divulging of individual or aggregated data where individuals or businesses might be identified. In the case of the AWS, the confidentiality of estimates which use water volumes or irrigated areas are ensured by a process known as tabular data suppression. Individual cells in a published table which are at risk of providing identifiable information about a respondent are suppressed and replaced with an x. In some cases additional or secondary cells may need to be suppressed to maintain the confidentiality of the originally suppressed cell.

For estimates which do not use water volumes or irrigated areas (e.g., counts), a random rounding approach is used. Cell estimates are randomly rounded up or down to a multiple of five. This means that the equality of rounded values with rounded marginal totals may not be maintained.