



## CANADA – Census of Agriculture 2016 – Metadata review

### 1. Historical outline

The Constitution Act of 1867 determined that a census would be taken every 10 years starting in 1871. However, rapid expansion in Western Canada made a more frequent census necessary. Starting in 1896, a separate Census of Agriculture (CA) was taken every five years in Manitoba and, beginning in 1906, in Alberta and Saskatchewan. Since 1956, the five-year agricultural census was extended to the entire country and conducted in conjunction with the Census of Population (CP). The CA 2016, to which the metadata review and data presented here refer, was the 22nd agriculture census conducted in Canada.

### 2. Legal basis and organization

#### *Legal framework*

The Constitution Act of 1867 (formerly, the British North America Act) determined that a census would be taken every ten years, starting in 1871. The Statistics Act of 1971 stipulates that a CP and a CA shall be taken every five years, in years ending in one and six. The provisions of the Statistics Act on conducting the CA are: (i) Section 20; (ii) Subsection 21(1); and (iii) Subsection 21(2).

Statistics Canada is prohibited by law from releasing any information it collects that could identify any person, business, or organization, unless consent has been given by the respondent or as permitted by the Statistics Act. Various confidentiality rules are applied to all data that are released or published to prevent the publication or disclosure of any information deemed confidential. If necessary, data are suppressed to prevent direct or residual disclosure of identifiable data.

#### *Institutional framework and international collaboration*

Statistics Canada, a centralized statistical agency, responsible for conducting the CA and the CP. The development, testing, processing, data validation and preparation for data dissemination for the CA and the CP are mostly handled by different groups within Statistics Canada.

#### *Census staff*

No enumerators were directly involved in field data collection for CA, because remote data collection methods were used in the CA 2016: CAWI, Mail out/Mail-back and CATI (for more details please see Section 7 (Data collection methods)).

### 3. Reference date and period

**Reference day:** 10 May 2016 for inventory items, such as livestock, growing area of field crops, greenhouse products, market value of land and buildings, number of farm machinery and equipment, and written succession plan, etc.

#### **Reference period:**

- reference year 2016 (March 2016 to August 2016) for land tenure, area of crops, organic farming, maple taps, greenhouse product area, etc.
- the calendar year 2015 for farm labour, financial information, information on agricultural production methods and technologies, area with pesticide, fertilizers and manure, renewable energy production system, hatcheries, etc.

### 4. Enumeration period

Questionnaires were mailed at the end of April 2016 with an expected delivery date of 2 May 2016. Respondents were asked to complete and return their questionnaires on “census day” (10 May 2016). Non-response CATI follow-up took place from 6 June 2016 to 2 September 2016.

### 5. Scope of the census and definition of the statistical unit

The **census scope** covered agricultural activities (crop and livestock production).

The **statistical unit** was the agricultural operation, defined as “a farm, ranch or other agricultural operation that produces at least one agricultural product<sup>1</sup> intended for sale”. Operator is defined as a

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<sup>1</sup>The list of products intended for sale from an agricultural operation was provided in the census methodology.

person responsible for the management and/or financial decisions made in the production of agricultural commodities.

### ***Community-level data***

There were no community-level data collected along with the census.

## **6. Census coverage**

### ***Geographic coverage***

The CA 2016 covered the entire country.

### ***Cut-off threshold and other exclusions***

Only market-oriented agricultural operations were covered by the CA 2016 and no threshold was used.

## **7. Methodology**

### ***Methodological modality for conducting the census***

The classical approach was used in the CA 2016. The CA was conducted in conjunction with the CP. The two censuses were conducted concurrently and shared a common “census day”.

### ***Relation to other censuses***

The CA 2016 was conducted in conjunction with the CP, with the reference day for inventory items as of 10 May 2016. Although the CA and the CP were conducted at the same time, they do have separate questionnaires. However, sharing the data collection and communications activities for both censuses streamlines procedures and reduces costs considerably. Another important benefit is that information from the two questionnaires can be linked to create the agriculture-population linkage database. This unique database provides users with information pertaining to the socio-economic characteristics of the farm population.

### ***Frame***

The observed population for the CA 2016 was identified based on the data from Statistics Canada's Business Register that includes the establishments which responded to the CA 2011 or had reported to a recent Statistics Canada agriculture survey and confirmed agricultural activity. In addition, establishments that declared agricultural activities in their tax remittances or have reported a main business activity of agriculture to the Canada Revenue Agency were also eligible for the census. However, due to operational and budgetary constraints, only those establishments with strong signals of agricultural activity were included. During data collection, new potential farms identified through the CP questionnaire were also added to the observed population.

### ***Complete and/or sample enumeration methods***

The CA is a complete enumeration of all agricultural operations<sup>2</sup> in the country.

### ***Sample design***

No sampling was used.

### ***Data collection method(s)***

In the CA 2016, respondents had the option of responding online (CAWI), completing a paper questionnaire (Mail-out Mail-back), contacting the Census Help Line and providing the census information using CATI. Statistics Canada delivered (through Canada Post) an invitation letter to fill out a CA questionnaire on the internet to addresses where it was believed a farm operator lived. The addresses were identified from Statistics Canada's Business Register, which is populated from the previous census, other agriculture surveys, and tax data filings.

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<sup>2</sup>An operation is considered a census farm (agricultural operation) if it produces at least one of the following products intended for sale: crops (hay, field crops, tree fruits or nuts, berries or grapes, vegetables, seed); livestock (cattle, pigs, sheep, horses, game animals, other livestock); poultry (hens, chickens, turkeys, chicks, game birds, other poultry); animal products (milk or cream, eggs, wool, furs, meat); and other agricultural products (Christmas trees, sod, greenhouse or nursery products, mushrooms, honey or bees, maple syrup and its products).

On 2 May 2016, all known farm operations in Canada received an invitation letter to fill out their CA 2016 questionnaire on the internet using a Secure Access Code provided in the letter. If a paper questionnaire was preferred, the respondent could call the CA helpline to obtain the paper questionnaire by mail. Farm operators either completed and submitted an electronic form on the internet (using CAWI method) or mailed back the paper form directly to Statistics Canada in the National Capital Region. If it was determined that a questionnaire had not been received, or if data were missing, a follow-up was conducted by telephone (CATI method).

### **Questionnaire(s) and items covered**

A single questionnaire, available in both English and French,<sup>3</sup> was used for data collection in the CA 2016<sup>4</sup>. The CA 2016 questionnaire covered 19 out of 23 essential items recommended in the WCA 2020<sup>5</sup>.

## **8. Use of technology**

The CAWI and CATI methods were used for census data collection. Optical scanning was used for the data capture of paper questionnaires. Voice broadcast automated telephone calls were used to remind respondents to respond. An online database enables users to retrieve customized tables with census data at the national, province and county levels.

## **9. Data processing**

The CA and CP paper questionnaires were dealt with separately once they arrived at Statistics Canada's Data Operations Centre. They were sorted, electronically scanned and the data automatically captured using Intelligent Character Recognition (ICR) or Optical Mark Recognition (OMR). Any responses that were not recognized by the ICR/OMR process were sent to a Statistics Canada employee, who reviewed the questionnaire image and entered the response data into the system.

Questionnaires completed and submitted via the Internet were extracted directly by CA and processed directly into the CA databases.<sup>6</sup>

Once captured, the data were loaded onto an automated processing system that passed them through detailed edit, follow-up and imputation processes. The data were first subjected to a series of rigorous quality control and processing edits to identify and resolve problems related to inaccurate, missing or inconsistent data. A Statistics Canada employee then followed up on the problematic records that could not be resolved in edit, to clarify the missing or incomplete data. Finally, situations that could not be resolved through either edit or follow-up were handled with an imputation procedure that replaced each missing or inconsistent response either with a value consistent with the other data on the questionnaire or with a response obtained from a similar agricultural operation.

## **10. Quality assurance**

Data validation is an important piece of quality assurance in Statistics Canada, so it has a *directive for the validation of statistical outputs*.<sup>7</sup> In the guidelines for the validation of statistical outputs, validation was defined as 'the set of activities which ensured that weighted estimates and aggregate statistics were reliable, sound and defensible' and 'the processes used to identify and correct inconsistencies in both micro-data and macro-data through the use of diagnostic tools and subject matter expertise'. For CA, the data validation process was the first opportunity for CA analysts to review and analyse the

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<sup>3</sup> A special data collection process was developed to handle the increasingly complex structure of large integrated agricultural operations. Each operation's business structure was profiled to determine which of its components were to be enumerated and how many questionnaires were to be completed. The required number of questionnaires was sent to a contact within the operation. Once completed, they were posted back to the head office, where they were edited before being incorporated into the regular census processing flow.

<sup>4</sup>English CA 2016 questionnaire: [https://www23.statcan.gc.ca/imdb/p3Instr.pl?Function=getInstrumentList&Item\\_Id=235427&UL=1V](https://www23.statcan.gc.ca/imdb/p3Instr.pl?Function=getInstrumentList&Item_Id=235427&UL=1V)

<sup>5</sup> The following essential items were not covered: (i) 0407 Number of permanent crop trees in scattered plantings (for each tree crop); (ii) 0501 Type of livestock system; (iii) 0801 Household size by sex and age groups; and (iv) 1201 Presence of aquaculture on the holding.

<sup>6</sup> Telephone follow-up was used to contact respondents who had received questionnaires but did not return them. In addition, the data processing sequence includes several safeguards that can find 'missing' farms that were on the frame but had not returned a questionnaire.

<sup>7</sup> Statistics Canada directive for data validation: [http://icn-rci.statcan.ca/31/31b/31b\\_029-eng.html](http://icn-rci.statcan.ca/31/31b/31b_029-eng.html). This directive provides guidelines that apply to all Statistics Canada statistical programs that produce statistical outputs or data files.

reliability and validity of CA data post-collection and made edits to the data when necessary. CA disseminates data across numerous dimensions, requiring the validation of data down to the geographic CCS level. CA was obligated to ensure the reliability and accuracy of data at this level in order to meet the requirements of numerous custom data requests.

An example of a data validation process, CA reviewed and verified the complete and accurate information from every agricultural operation in Canada. This process also identified those 'missing' farms that were counted in 2011 but did not return a questionnaire in 2016 or, conversely, farms that did not exist in 2011 but have been identified on subsequent agriculture surveys since then.

A post-enumeration survey called "the coverage evaluation survey" (CES) was conducted from October to December 2016 to determine the level of CA 2016 net undercoverage for three important variables: farm count, land area and total sales. The CES gave an estimated under coverage for the CA 2016 of 4.9% percent for farm count, 1.5% for total farm area, and 0.2% for total sales. After closing the field data collection, a data validation and certification process was conducted<sup>8</sup>

## 11. Data and metadata archiving

Under the terms of the *Policy on Informing Users of Data Quality and Methodology*<sup>9</sup>, Statistics Canada has the responsibility to develop, maintain and disseminate statistical metadata for its surveys and statistical programs. The metadata includes information on the variables, classifications, data sources, methodology, data quality, questionnaires, questions and response choices. CA data tables and analytical publications on the Statistics Canada website are archived once the census cycle has completed its' full dissemination cycle. For example, the CA 2016 completed the dissemination cycle in the summer of 2019, so all previous CA 2011 products are archived according to the Statistics Canada *Web Archiving Directive*.

## 12. Data reconciliation

In addition to CA, the Agriculture Division at Statistics Canada conducts over 20 annual, semi-annual and monthly surveys on a regular basis. With each CA, new information about the structure of agriculture production and a new sample frame become available. The CA was used for updating the agriculture frame, calibrating survey methods and to align the current survey programs. Once the CA data were released, many of the survey program variables were reconciled and aligned with the census in a process called intercensal revisions (IR). The main objective of IR was to improve survey estimates using census data and to draw lessons for future surveys. The key steps of the IR process involved: (i) the identification of key variables and the calculation of differences between the survey and census data; (ii) diagnosis for each variable as to reason for discrepancy - CA data were used to perform matching, data confrontation and verification of survey data, while taking into account factors such as: seasonal variations; conjectural issues; special events like flooding, fires, and disease; and (iii) after the diagnosis, the last step was the correction of discrepancies.

The CA data were used to align survey estimates at the macro level. The revisions to survey estimates can be summarized by being either a wedge adjustment or a logarithmic adjustment depending on the characteristics of the data and commodity.<sup>10</sup>

The IR were conducted first on commodity variables and then subsequently on the financial accounts which would be impacted by revised commodity inventory levels and/or flows. CA estimates concerning receipts, expenses, capital assets and farm populations were also integrated into the farm financial

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<sup>8</sup> Preliminary census estimates are grouped into themes (that is, sets of variables are created according to commodity, land use, etc.), and small teams are assigned to scrutinize the values. Estimates are compared to previous census estimates, contemporary survey results, information from the taxation system, and published estimates from other sources such as provincial statistical offices, ministries of agricultural or agricultural associations. Analysts also consult regional and commodity experts to learn of any trends or events that may have influenced the data reported. The analysis is also performed by examining subsets of estimates, taking into account entries and exits of farms, by commodity and by geography. Where warranted, respondents were contacted again to confirm or clarify reported figures. Once the analysts had completed their evaluations, they presented the results to an expert review panel for final certification.

<sup>9</sup> Statistics Canada Directive on Documenting Statistical Metadata: <https://www.statcan.gc.ca/en/about/policy/info-user>

<sup>10</sup> Wedge adjustment: smooth the data along the trend lines. Logarithmic adjustment: involves ratios or percentage change. The percentage change indicated by the CA is kept and the survey estimates are adjusted to reflect the historical change.

accounts. Methods used in estimating non-survey series were also reviewed and updated based on changes to the agriculture production structure as revealed by CA. The revisions generally cover up to 5 years of data.

### 13. Dissemination of census results and microdata

The CA 2016 had three major data releases,<sup>11</sup> online and free of charge:

- basic counts and totals for all farm and farm operator variables were released on 10 May 2017;<sup>12</sup>
- selected historical farm and farm operator data (some series covering 1921–2016) were released on 11 December 2017; and
- selected data on the socio-economic characteristics of farm operators, farm families and the farm population, based on the agriculture-population linkage database were released on 27 November 2018.

The CA 2016 data are available at low levels of geography and are presented in various standard formats and through custom data tabulations. All published data are subjected to confidentiality restrictions to ensure that no respondent can be identified.

### 14. Data sources

**Statistics Canada.** 2017. 2016 Census of Agriculture. In: *Statistics Canada* [online]. Ottawa, Canada. <http://www.statcan.gc.ca/eng/ca2016>

### 15. Contact

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Website: <https://www.statcan.gc.ca/>

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<sup>11</sup> Data for these three releases are available online on the Statistics Canada website.

<sup>12</sup> These data are tabulated at the national, provincial and three subprovincial levels of geography: (i) census agricultural region; (ii) census division; and (iii) census consolidated subdivision.