ISO 19131 Agri-Environmental Indicator – Agricultural Greenhouse Gas Budget Data Series – Data Product Specifications

Revision: A

Data product specifications:

Agricultural Greenhouse Gas Budget

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Data product specifications:

Agri-Environmental Indicator – Agricultural Greenhouse Gas Budget Data Series

1. Overview

1.1. Informal description

1.2. Data product specification - metadata

This section provides metadata about the creation of this data product specification

Data product specification – title:	Agri-Environmental Indicator – Agricultural Greenhouse Gas Budget Data Series
Data product specification - reference date:	June 14, 2021
Data product specification - responsible party:	Agriculture and Agri-Food Canada, Science and Technology Branch
Data product specification – language:	English, French
Data product specification - topic category:	Environment

1.3. Terms and definitions

- Feature attribute
  characteristic of a feature

- Class
  description of a set of objects that share the same attributes, operations, methods, relationships, and semantics [UML Semantics]
  NOTE: A class does not always have an associated geometry (e.g. the metadata class).

- Feature
  abstraction of real world phenomena

- Object
  entity with a well-defined boundary and identity that encapsulates state and behaviour [UML Semantics]
  NOTE: An object is an instance of a class.

- Package
  grouping of a set of classes, relationships, and even other packages with a view to organizing the model into more abstract structures

1.4. Abbreviations

AAFC	Agriculture and Agri-Food Canada
AEI	Agri-Environmental Indicators
GHG	Greenhouse Gas
YYYY	Label to represent year in certain column names below including 1981, 1986, 1991, 1996, 2001, 2006, 2011, and 2016.

2. SPECIFICATION SCOPE

This data specification has only one scope, the general scope.

NOTE: The term ‘specification scope’ originates from the International Standard ISO19131. ‘Specification scope’ does not express the purpose for the creation of a data specification or the potential use of data, but identifies partitions of the data specification where specific requirements apply.

3. DATA PRODUCT IDENTIFICATION

3.1. Data series identification

Title	Agri-Environmental Indicator – Agricultural Greenhouse Gas Budget Data Series
Alternate Title	
Abstract	The Agri-Environmental Indicator Agricultural Greenhouse gas Budget datasets provide estimated net greenhouse gas emissions due to agricultural activities per hectare of Soil Landscapes of Canada agricultural areas. Products in this data series present results for predefined areas as defined by the Soil Landscapes of Canada (SLC v.3.2) data series, uniquely identified by SOIL_LANDSCAPE_ID values. Data is provided in two forms: semi-decadal results include only the publication years for the Census of Agriculture since 1981; and annual results include every year since 1981. Semi-decadal results form the backbone of trend analysis, whilst the annual results estimate results between Census of Agriculture years and forecasts beyond the most recent Census of Agriculture. Additionally, the annual results respect provincial boundaries which can be of use when analyzing results per province.
Purpose	These datasets provide net greenhouse gas emissions due to agricultural activities per hectare of agricultural land. They can be used to track trends in greenhouse gas emissions, which can be used for example to monitor progress in enhancing the efficiency of agricultural production.
Topic Category	Environment
Spatial Representation Type	Vector, csv, textTable
Spatial Resolution	1:1,000,000
Geographic Description	Bounding coordinates for Soil Landscapes of Canada polygons: North Bounding Coordinate: 59.18 West Bounding Coordinate: -128.88 East Bounding Coordinate: -52.37 South Bounding Coordinate: 41.67
Supplemental Information	
Constraints	Open Government License – Canada (https://open.canada.ca/en/open-government-licence-canada)
Keywords	Thesaurus: Government of Canada Core Subject Thesaurus (https://canada.multites.net/) Date: February 1, 2000 Keywords: Environment, Earth sciences Thesaurus: Other

	January 1, 2013 Keywords: Climate indicators
Scope identification	series

3.2. Data product identification

3.2.1. Agricultural Greenhouse Gas Budget - Annual

Title	Agricultural Greenhouse Gas Budget – Annual
Alternate Title	AEI_AIR_GHG_ANNUAL
Abstract	The Agri-Environmental Indicator Agricultural Greenhouse Gas Budget datasets provide estimated net greenhouse gas emissions due to agricultural activities per hectare of Soil Landscapes of Canada agricultural areas.
Purpose	This dataset provides annual net greenhouse gas emissions due to agricultural activities per hectare of agricultural land. It is used to track trends in greenhouse gas emissions, which can be used for example to monitor progress in enhancing the efficiency of agricultural production.
Topic Category	Environment
Spatial Representation Type	Csv, textTable, vector
Spatial Resolution	1:1,000,000
Geographic Description	Bounding coordinates for Soil Landscapes of Canada polygons: North Bounding Coordinate: 59.18 West Bounding Coordinate: -128.88 East Bounding Coordinate: -52.37 South Bounding Coordinate: 41.67
Supplemental Information	
Constraints	Open Government License – Canada (https://open.canada.ca/en/open-government-licence-canada)
Keywords	Thesaurus: Government of Canada Core Subject Thesaurus (https://canada.multites.net/) Date: February 1, 2000 Keywords: Environment, Earth sciences Thesaurus: Other January 1, 2013 Keywords: Climate indicators
Scope Identification	Dataset
Feature Attribute Names	SOIL_LANDSCAPE_ID, YEAR, PROVINCE, POLYGON_WEIGHT, PROV_PCT, GHG_VAL, GHG_CLASS, GHG_CLASS_EN, GHG_CLASS_FR

3.2.2. Agricultural Greenhouse Gas Budget

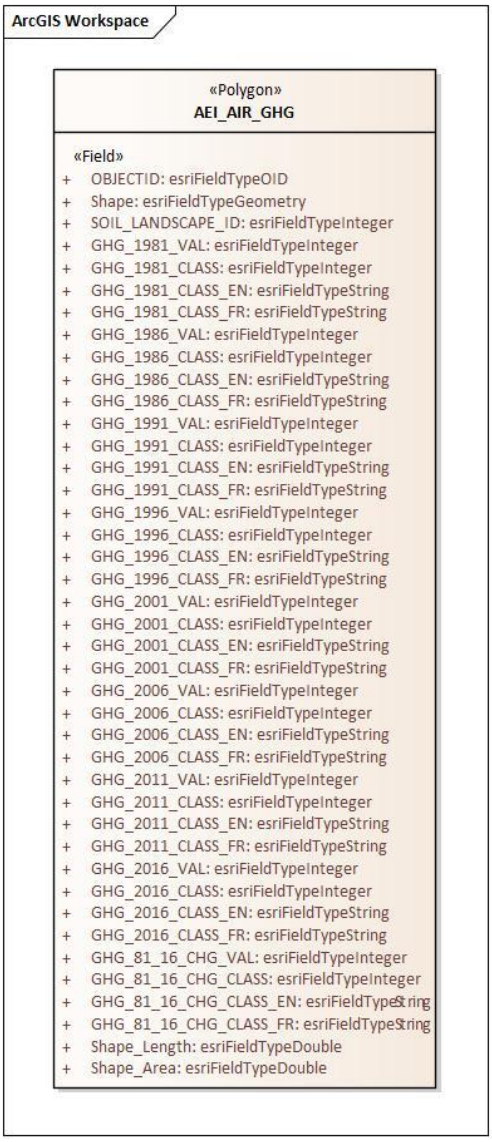
Title	Agricultural Greenhouse Gas Budget

Alternate Title	AEI_AIR_GHG
Abstract	The Agri-Environmental Indicator Agricultural Greenhouse Gas Budget datasets provide estimated net greenhouse gas emissions due to agricultural activities per hectare of Soil Landscapes of Canada agricultural areas.
Purpose	This dataset provides semi-decadal net greenhouse gas emissions due to agricultural activities per hectare of agricultural land. It is used to track trends in greenhouse gas emissions, which can be used for example to monitor progress in enhancing the efficiency of agricultural production.
Topic Category	Environment
Spatial Representation Type	Vector, textTable, csv
Spatial Resolution	1:1,000,000
Geographic Description	Bounding coordinates for Soil Landscapes of Canada polygons: North Bounding Coordinate: 59.18 West Bounding Coordinate: -128.88 East Bounding Coordinate: -52.37 South Bounding Coordinate: 41.67
Supplemental Information	
Constraints	Open Government License – Canada (https://open.canada.ca/en/open-government-licence-canada)
Keywords	Thesaurus: Government of Canada Core Subject Thesaurus (https://canada.multites.net/) Date: February 1, 2000 Keywords: Environment, Earth sciences Thesaurus: Other January 1, 2013 Keywords: Climate indicators
Scope Identification	Dataset
Feature Attribute Names	SOIL_LANDSCAPE_ID, GHG_1981_VAL, GHG_1981_CLASS, GHG_1981_CLASS_EN, GHG_1981 _CLASS_FR, GHG_1986_VAL, GHG_1986_CLASS, GHG_1986_CLASS_EN, GHG_1986 _CLASS_FR, GHG_1991_VAL, GHG_1991_CLASS, GHG_1991_CLASS_EN, GHG_1991_CLASS_FR, GHG_1996_VAL, GHG_1996_CLASS, GHG_1996_CLASS_EN, GHG_1996_CLASS_FR, GHG_2001_VAL, GHG_2001_CLASS, GHG_2001_CLASS_EN, GHG_2001_CLASS_FR, GHG_2006_VAL, GHG_2006_CLASS, GHG_2006_CLASS_EN, GHG_2006_CLASS_FR, GHG_2011_VAL, GHG_2011_CLASS, GHG_2011_CLASS_EN, GHG_2011_CLASS_FR, GHG_2016_VAL, GHG_2016_CLASS, GHG_2016_CLASS_EN, GHG_2016_CLASS_FR, GHG_81_16_CHG_VAL, GHG_81_16_CHG_CLASS,

	GHG_81_16_CHG_CLASS_EN, GHG_81_16_CHG_CLASS_FR

4. DATA CONTENT AND STRUCTURE

4.1. Feature-based application schema



4.2. Feature catalogue – Agri-Environmental Indicator – Agricultural Greenhouse Gas Budget Data Series

Title	Agri-Environmental Indicator – Agricultural Greenhouse Gas Budget Data Series
Scope	Applies to the Agri-Environmental Indicator – Agricultural Greenhouse Gas Budget Data Series
Version Number	*1*
Version Date	*June 14, 2021*
Producer	Agriculture and Agri-food Canada, Science and Technology Branch

System-generated attributes (for example, OBJECTID, Shape, Shape Length and Area) are not defined in the feature catalog.

4.2.1. Feature attributes

4.2.1.1. Soil Landscape ID

Name	Soil Landscape ID (SOIL_LANDSCAPE_ID)		
Definition	Soil Landscape of Canada Polygon Identifier		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Integer		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.2. Year

Name	Year (YEAR)		
Definition	Year of Data		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Integer		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.3. Province

Name	Province (PROVINCE)		
Definition	The name of the province that data is found within		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Character		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.4. Polygon Weight

Name	Polygon Weight (POLYGON_WEIGHT)		
Definition	The weighting given this record (polygon) compared with the other records (polygons) when aggregating the data to coarser map units, for example to EcoRegion or EcoDistrict scales.		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Integer		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.5. Province Percent

Name	Province Percent (PROV_PCT)
Definition	The percentage weighting given the portion of the Soil Landscape of Canada polygon (identified by the SOIL_LANDSCAPE_ID) that falls in the identified province. If a Soil Landscape of Canada polygon is split by a provincial boundary, this value will be less than 100.
Aliases	
Producer	Agriculture and Agri-Food Canada
Value Data Type	Integer
Value Domain Type	0 (not enumerated)
Value Domain	

	Feature Attribute Value		
	Label	Code	Definition

4.2.1.6. Agricultural Greenhouse Gas Emissions

Name	Agricultural Greenhouse Gas Emissions (GHG_VAL)		
Definition	The calculated value of net greenhouse gas emissions, measured in kg CO_2e/ha		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Integer		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.7. Agricultural Greenhouse Gas Emissions Classification

Name	Agricultural Greenhouse Gas Emissions Classification (GHG_CLASS)		
Definition	A classification that describes the level of agricultural greenhouse gas emissions based on the GHG_VAL.		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Integer		
Value Domain Type	1 (enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition
	Very Low	1	*VAL < 750*
	Low	2	*750 ≤ VAL < 1500*
	Moderate	3	*1500 ≤ VAL < 2250*
	High	4	*2250 ≤ VAL < 3000*
	Very High	5	*VAL ≥ 3000*
	Not Assessed		Area not evaluated

4.2.1.8. Agricultural Greenhouse Gas Emissions Classification - English

Name	Agricultural Greenhouse Gas Emissions Classification - English (GHG_CLASS_EN)
Definition	Textual Description of the Class in English
Aliases	

Producer	Agriculture and Agri-Food Canada		
Value Data Type	Character		
Value Domain Type	1 (enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition
	Very Low	1	*VAL < 750*
	Low	2	*750 ≤ VAL < 1500*
	Moderate	3	*1500 ≤ VAL < 2250*
	High	4	*2250 ≤ VAL < 3000*
	Very High	5	*VAL ≥ 3000*
	Not Assessed		Area not evaluated

4.2.1.9. Agricultural Greenhouse Gas Emissions Classification - French

Name	Agricultural Greenhouse Gas Emissions Classification - French (GHG_CLASS_FR)		
Definition	Textual Description of the Class in French		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Character		
Value Domain Type	1 (enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition
	Très faible	1	*VAL < 750*
	Faible	2	*750 ≤ VAL < 1500*
	Moyen	3	*1500 ≤ VAL < 2250*
	Élevé	4	*2250 ≤ VAL < 3000*
	Très élevé	5	*VAL ≥ 3000*
	Elément non évalue		*Area not evaluated*

4.2.1.10. Agricultural Greenhouse Gas Emissions YYYY

Name	Agricultural Greenhouse Gas Emissions YYYY (GHG_YYYY_VAL)
Definition	The calculated value of net greenhouse gas emissions, measured in kg CO_2e/ha in a given year (YYYY), for example, where YYYY = 1981, this column is labeled GHG_1981_VAL.
Aliases	
Producer	Agriculture and Agri-Food Canada
Value Data Type	Integer
Value Domain Type	0 (not enumerated)

Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.11. Agricultural Greenhouse Gas Emissions YYYY Classification

Name	Agricultural Greenhouse Gas Emissions YYYY Classification (GHG_YYYY_CLASS)		
Definition	The calculated value of net greenhouse gas emissions, measured in kg CO_2e/ha GHG_YYYY_VAL column value; For example, where YYYY = 1981, this column is labeled GHG_1981_CLASS, and is based on the GHG_1981_VAL		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Integer		
Value Domain Type	1 (enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition
	Very Low	1	*VAL < 750*
	Low	2	*750 ≤ VAL < 1500*
	Moderate	3	*1500 ≤ VAL < 2250*
	High	4	*2250 ≤ VAL < 3000*
	Very High	5	*VAL ≥ 3000*
	Not Assessed		Area not evaluated

4.2.1.12. Agricultural Greenhouse Gas Emissions YYYY Classification - English

Name	Agricultural Greenhouse Gas Emissions YYYY Classification - English (GHG_YYYY_CLASS_EN)		
Definition	Textual Description of the Class in English; where YYYY is equal to census of agriculture years since 1981. For example, where YYYY = 1981, this column is labeled GHG_1981_CLASS_EN		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Character		
Value Domain Type	1 (enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition
	Very Low	1	*VAL < 750*
	Low	2	*750 ≤ VAL < 1500*

	Moderate	3	*1500 ≤ VAL < 2250*
	High	4	*2250 ≤ VAL < 3000*
	Very High	5	*VAL ≥ 3000*
	Not Assessed		Area not evaluated

4.2.1.13. Agricultural Greenhouse Gas Emissions YYYY Classification - French

Name	Agricultural Greenhouse Gas Emissions YYYY Classification - French (GHG_YYYY_CLASS_FR)		
Definition	Textual Description of the Class in French; where YYYY is equal to census of agriculture years since 1981. For example, where YYYY = 1981, this column is labeled GHG_1981_CLASS_FR		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Character		
Value Domain Type	1 (enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition
	Très faible	1	*VAL < 750*
	Faible	2	*750 ≤ VAL < 1500*
	Moyen	3	*1500 ≤ VAL < 2250*
	Élevé	4	*2250 ≤ VAL < 3000*
	Très élevé	5	*VAL ≥ 3000*
	Elément non évalue		*Area not evaluated*

4.2.1.14. Change in Agricultural Greenhouse Gas Emissions 1981 - 2016

Name	Change in Agricultural Greenhouse Gas Emissions 1981 - 2016 (GHG_81_16_CHG_VAL)		
Definition	The difference identified by the VAL in 2016 minus the VAL in 1981.		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Integer		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.15. Change in Agricultural Greenhouse Gas Emissions 1981 - 2016 Classification

Name	Change in Agricultural Greenhouse Gas Emissions 1981 – 2016 Classification (GHG_81_16_CHG_CLASS)		
Definition	A classification that describes the difference identified by the CLASS in 2016 minus the CLASS in 1981		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Integer		
Value Domain Type	1 (enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition
	Large Decrease	1	*VAL < -450*
	Moderate Decrease	2	*-450 ≤ VAL < -150*
	Little to no change	3	*-150 ≤ VAL < 150*
	Moderate Increase	4	*150 ≤ VAL < 450*
	Large Increase	5	*VAL ≥ 450*
	Not Assessed		Area not evaluated

4.2.1.16. Change in Agricultural Greenhouse Gas Emissions 1981 - 2016 Classification - English

Name	Change in Agricultural Greenhouse Gas Emissions 1981 – 2016 Classification - English (GHG_81_16_CHG_CLASS_EN)		
Definition	Textual Description of the Class in English		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Character		
Value Domain Type	1 (enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition
	Large Decrease	1	*VAL < -450*
	Moderate Decrease	2	*-450 ≤ VAL < -150*
	Little to no change	3	*-150 ≤ VAL < 150*
	Moderate Increase	4	*150 ≤ VAL < 450*
	Large Increase	5	*VAL ≥ 450*
	Not Assessed		Area not evaluated

4.2.1.17. Change in Agricultural Greenhouse Gas Emissions 1981 – 2016 Classification - French

Name	Change in Agricultural Greenhouse Gas Emissions 1981 – 2016 Classification - French (GHG_81_16_CHG_CLASS_FR)		
Definition	Textual Description of the Class in French		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Character		
Value Domain Type	1 (enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition
	Diminution importante	1	*VAL < -450*
	Diminution moyenne	2	*-450 ≤ VAL < -150*
	Peu ou pas de changement	3	*-150 ≤ VAL < 150*
	Augmentation moyenne	4	*150 ≤ VAL < 450*
	Augmentation importante	5	*VAL ≥ 450*
	Elément non évalue		Area not evaluated

5. REFERENCE SYSTEMS

5.1. Spatial reference system

Horizontal coordinate reference system: WGS84

Map projection: Web Mercator Auxiliary Sphere; EPSG:3857; Version 8.1.4

5.2. Temporal reference system

Gregorian calendar

6. DATA QUALITY

6.1. Completeness

The spatial scope of this data includes the agricultural land within the provinces of Canada. Agricultural land includes cropland, whether cropped or fallow, and pasture land, whether improved or unimproved.

6.2. Logical consistency

All polygons are classified into one of six risk classes based on the risk value derived by the model. Class values range from 1 to 5 inclusive. For identifying change in risk, class values range from 5 to 1; where class value represents the number of risk classes the polygon has changed. For instance, a polygon with a “1” change in risk class value, should be interpreted as a polygon that is seeing a large

decrease between the years in question (e.g. 1981 to 2016). Class descriptions, in English and French, are consistently provided based on the class value.

6.3. Positional accuracy

The positional accuracy of this data is dependent on the positional accuracy of the Soil Landscape of Canada (v3.2) polygons. SLC v3.2 provides soil information at a scale of 1:1 million for the major agricultural regions of Canada. The SLC v3.2 polygons are aligned to the Atlas of Canada 1:1,000,000 scale National Frameworks data.

6.4. Temporal accuracy

The model that derived this data depends directly on the Census of Agriculture. Thus each of the columns denoting a year pertain to the corresponding year the Census of Agriculture from Statistics Canada (i.e. 1981, 1986, 1991, 1996, 2001, 2006, 2011, 2016).

Where data is provided by year as defined by the "YEAR" column, years consistent with the Census of Agriculture will be based directly on the Census of Agriculture data. Where years are between Census of Agriculture years, the data is interpolated, whilst where years are more recent than the latest Census of Agriculture, the data is extrapolated by the model. For this reason, when a dataset is published on a given Census of Agriculture year, the previously extrapolated years will be interpolated and thus will differ from previous publications.

6.5. Thematic accuracy

This data was calculated using mathematical models and formulas that integrate information on soil, climate and landscape. These models are the product of evidence-based science, incorporating authoritative data sources and have been developed over several decades; and continue to develop as new science and data become available.

6.6. Lineage statement

Lineage Statement	The agri-environmental indicator data was calculated using mathematical models or formulas that integrate information on soil, climate and landscape. This information was mainly derived from Soil Landscapes of Canada and information on crops, land use, land management and livestock from the Census of Agriculture and other custom data sets from provincial agencies, the private sector, and remote sensing agencies.
Scope	Data Series

7. DATA CAPTURE

The agri-environmental indicator data was mainly derived from:

- Soil Landscapes of Canada (SLC) v3.2, from the Soil Landscapes of Canada Working Group, 2007 (information on soil, climate and landscape) https://open.canada.ca/data/en/dataset/5ad5e20c-f2bb-497d-a2a2-440eec6e10cd
- Census of Agriculture, from Statistics Canada (information on crops, landuse, land management and livestock)
- Annual Crop Inventory

Other custom data sets come from provincial agencies, private sector and remote sensing agencies, among others. Some factors used in the calculation of data were compiled and developed by the program researchers. Summarized results from the Census of Agriculture, special surveys such as the Farm Environmental Management Survey (Statistics Canada, 2007) or combinations of these two sources were also used to complement the information provided by agri-environmental indicator data. The agri-environmental indicator data was collected at various temporal and geographical scales and interpreted and integrated into a common geospatial framework. The areas used for most of the primary agriculture indicator model calculations are polygons of the SLC map series.

Indicator	**Unit of Measurement**
Greenhouse Gas Budget	kg CO_2e/ha

8. DATA MAINTENANCE

Updates to the data series are tied to the release of new census data, which occurs every 5 years, for the census product. The annual dataset is tied to the release of a new annual crop inventory.

9. PORTRAYAL

Not applicable.

10. DATA PRODUCT DELIVERY

File Geodatabase
format name: Esri Geodatabase (File-based) format version: 10.4
specification: A collection of various types of GIS datasets held in a file system folder. (http://arcgis.com) languages: eng character set: utf8

geoJson

format name:	Geographic Javascript Object Notation
specification:	https://tools.ietf.org/html/rfc7946
languages:	eng
character set:	utf8

CSV

format name:	*Comma Separated Values*
specification:	
languages:	*eng*
character set:	*utf8*

11. METADATA

The metadata requirements follow the Government of Canada's Treasury Board Standard on Geospatial Data (ISO 19115).