

Data Quality Statement

1991 AGRICULTURE ECUMENE

1.0 Purpose of the Ecumene

The 1991 Agriculture Ecumene was designed primarily to meet the mapping needs of the 1991 Census of Agriculture. While there were specific needs for the census publication "Canadian Agriculture at a Glance" and ongoing mapping in the Crop Condition Assessment Program, the ecumene can be used for a variety of thematic maps.

1.1 Definition of Ecumene

An agricultural ecumene represents the agricultural land base of Canada. In general, ecumenes are used by cartographers to limit the display of choropleth or dot symbols based on data on whole geostatistical units to those portions that actually exhibit the relevant land use. This provides a more realistic representation of the data and avoids the misinterpretation that can result from data symbolization over large regions that are not actually devoted to the land use in question. An agriculture ecumene, therefore, ought to show where agricultural land use occurs.

Ecumenes are often highly generalized representations of the land usage and are likely to include some areas not actually used that way, and exclude other minor regions that are. The delineation of an ecumene should be appropriate to the scale of maps to be produced.

2.0 Purpose of the Data Quality Statement

The data quality statement provides information to allow users to evaluate the quality of the product for their particular use. Geography products are assessed in relation to relevant aspects of spatial data quality and every product is accompanied by a data quality statement.

2.1 Lineage

2.1.1 Sources

The basis for building the 1991 Agriculture ecumene was the 1991 Census Digital Boundary Files. These contain census enumeration areas (EAs) as the smallest units rather than Census subdivisions (CSDs) which were used for the 1986 Agriculture Ecumene.

The data used to determine the ecumene came from the 1991 Census of Agriculture.

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Other sources of information were used to identify ecumene pockets within large EAs and parcels of known non-agricultural land within the ecumene. These included remotely sensed data and atlases including the Canada Gazetteer Atlas and the National Atlas of Canada.

2.1.2 Method of Derivation

- **Coverage**

The ecumene includes all provinces but excludes the Yukon Territory and the Northwest Territories. The methods of delineating the ecumene varied on a regional basis.

- **Automated Delineation**

The ecumene was derived separately for each Consolidated Census Subdivision (CCS). A CCS is a grouping of small CSDs within a Census Division (CD) with a land area greater than 25 square kilometres. A CSD with a population greater than 100,000 usually forms its own CCS.

1. An index of value of agricultural intensity was calculated for each EA using the ratio of the sum of improved and unimproved agricultural lands to the total EA land area.
2. EAs were ranked by descending index value within the CCS.
3. The ranked EAs were selected for inclusion in the CCS ecumene until the cumulative area exceeded the total CCS area of agricultural lands (improved and unimproved) by a specified percentage. For example, the cutoff value for the Prairie provinces was 130%.

The algorithm was computed using SAS and the results were incorporated in an Arc-Info coverage for mapping. Polygons in the final ecumene Arc-Info coverage are coded with a simple 'in' or 'out' attribute to permit unambiguous mapping of the topology of the ecumene.

- **Other Approaches Used**

Calculate the ratio of agricultural land on Census Farms to total EA area for each EA and use it as the index of agricultural intensity. This approach focuses on the intensity of agricultural in each EA and appropriate cutoffs can be applied as in the automated method.

Determine the value of gross farm receipts for each EA and use it as the indicator of agricultural intensity. Minimum cutoff values can be used to eliminate EAs with very low levels of agricultural activity. This approach will

ensure that agricultural operations with significant output on relatively little land use are included in the ecumene.

- **Digitizing Generalized Limits**

Generalization is used to improve the cartographic appearance of the ecumene while maintaining as far as possible the accuracy of representation. Where these generalized ecumene boundaries did not follow existing digital EA boundaries, they were digitized from hand-drafted positions.

- **Quality Assurance**

Quality assurance of the ecumene involved visual inspection of a map having ecumene areas shaded. All three approaches mentioned above were calculated and displayed for subject matter expert evaluation in making an appropriate choice for each province.

- **Comparison of the 1991 and 1986 Ecumenes**

The following table shows the changes to the ecumene and the relationship between the ecumene and total farm area for Canada and the Provinces. The improvements for the provinces of Newfoundland and Prince Edward Island are particularly noteworthy.

	Ecumene Change (%)	Ratio of Total Farm Area to Ecumene Area (%)	
		1986	1991
Canada	98	79	81
Newfoundland	55	10	23
Prince Edward Island	43	46	102
Nova Scotia	75	25	32
New Brunswick	54	23	39
Quebec	110	53	45
Ontario	100	60	58
Manitoba	95	88	93
Saskatchewan	96	91	95
Alberta	100	93	94
British Columbia	112	55	48

2.2 **Attribute Accuracy**

Ecumene accuracy depends on the precision of the units used to build the ecumene. The availability of the 1991 Census EA Digital Boundary File made it possible to delineate much more precisely than in the past, when CSDs were the initial building blocks. It reduced the amount of manual intervention to arrive at a cartographically acceptable ecumene.

The accuracy of the 1991 Agriculture Ecumene can be shown to be considerably better than those produced from the 1981 and 1986 Censuses. A more detailed discussion is provided by Werschler in Delineation of the Canadian Agricultural Ecumene for 1991.

2.3 **Positional Accuracy**

Beyond normal error rates in digitizing at scale of about 1:2,000,000, the generalization procedures involved handdrawn limits being placed taking account of various supplementary land use information and subject matter expertise. Where required for cartographic reasons, ecumene pockets were enlarged to make them visible.

The subjectivity of these procedures improved the appearance of the ecumene at the cost of decreased positional accuracy.

2.4 **Logical Consistency**

The definition of the ecumene necessarily means that some areas which are non-agricultural are included and other areas of agricultural land are excluded. The delineation seeks to minimize these deviations.

Some of the differences between the 1991 ecumene and the 1986 ecumene arise because of the better spatial resolution used in the 1991 delineation.

2.5 **Completeness**

Ideally, ecumene pockets should be defined in each CCS which had agricultural production in the 1991 Census. In the current ecumene, representation at the Census Division (CD) has been controlled. CDs where the agricultural data cannot be published for confidentiality reasons have been excluded. Small ecumene pockets have been enlarged to make them visible on maps.

2.6 **Limitations on Use**

This ecumene has been designed for displaying all of Canada on the same map at a relatively small scale. The ecumene would not be suitable for mapping smaller areas at larger scales.

Reference:

Timothy J. Werschler, **Delineation of the Canadian Agricultural Ecumene for 1991**, Working Paper, Agriculture Division, Statistics Canada, September 1993