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The loss of dependable agricultural land in Canada

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Highlights

- ◆ By 2001, about one-half of Canada's urbanized land was located on dependable agricultural land.
- ◆ Between 1951 and 2001, the supply of dependable agricultural land declined by 4 percent, while the demand for cultivated land increased by 20 percent.

Introduction

Many successful and growing cities started as small agricultural trading centres. Part of their original comparative advantage was their proximity to productive and fertile agricultural land. Now their continuing expansion is consuming this high-quality agricultural land. In addition to the expansion of urban areas, highways, utility corridors and other infrastructure also consume high-quality agricultural land. Because of the limited availability of good farm land, its loss may have implications for long-term agricultural sustainability.

This bulletin examines the trends in agricultural and non-agricultural land use across Canada from 1951 to 2001. The analysis updates the earlier reports by Hofmann (2001) and Statistics Canada (2001). Moreover, the data presented here are based on a new methodology which has resulted

in new and more accurate estimates of land use (see Appendix 1).

This bulletin focuses on two main trends in land use. First, on the demand side, we assess the trends in cultivated land. Cultivated land includes land of varying quality, both dependable agricultural land and marginal agricultural land. Second, we assess the availability of good farm land. This is estimated by subtracting the area of dependable agricultural land occupied for urban and other non-agricultural uses from the total area of dependable land. Related to this, we also examine the trends in urban land use in Canada.



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Agricultural land use: trends in cultivated land

The demand for cultivated land, which includes cropland, summerfallow and tame or seeded pasture (for definitions, see Appendix 1), increased from 1951 to 1981 but the growth slowed in the last two decades. Overall, between 1951 and 1976, cultivated land increased by 14 percent but the increase from 1976 to 2001 was less than 6 percent (Figure 1).

Although total demand for cultivated land leveled off beginning in 1981, there has been a shift in the use of cultivated land. Cropland area grew steadily throughout the study time period. By 2001, almost 80 percent of all cultivated land was cropland. Cropland also accounted for the largest increase in area, growing from 25.2 million to 36.4 million hectares during the 1951 to 2001 period, an increase of 45 percent.

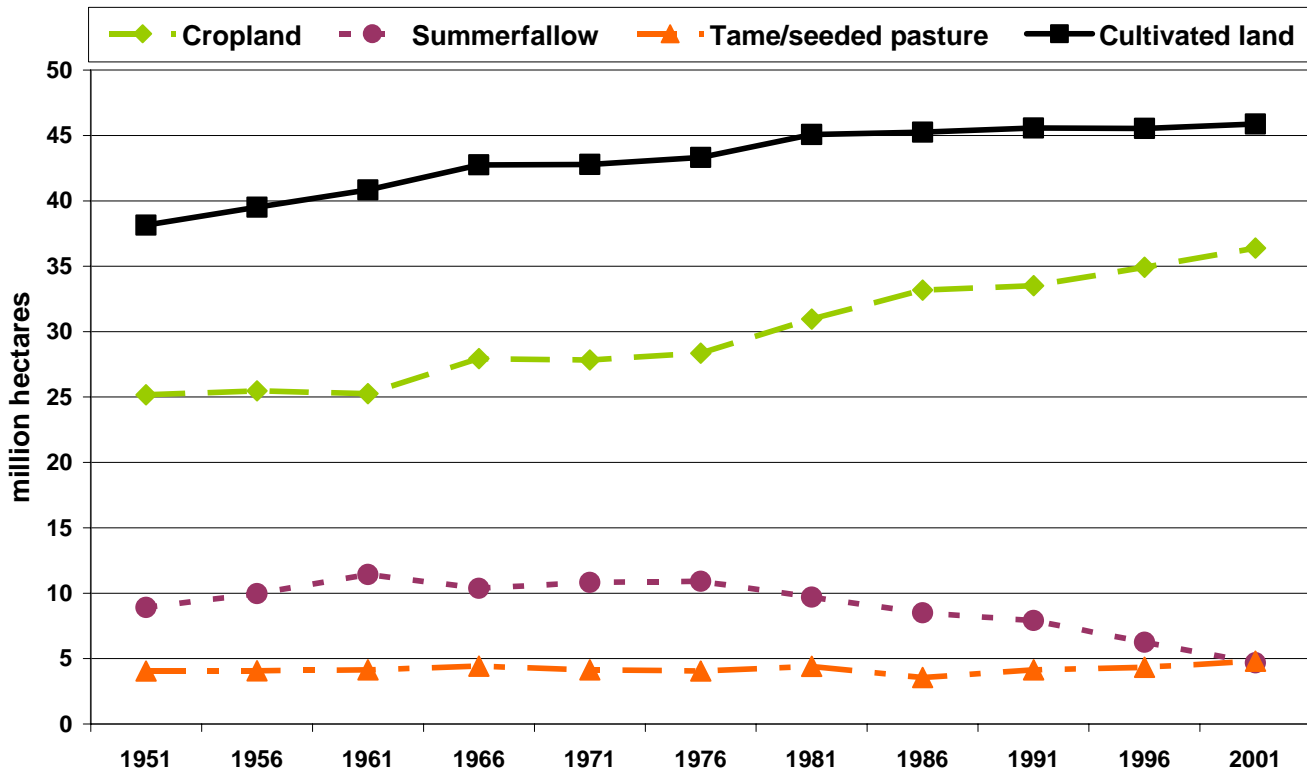
Summerfallow, on the other hand, declined by 48 percent from 1951 to 2001. However, this

decline was not consistent; there were small bursts of growth in the early 1960s and 1970s. The consistent decline in summerfallow area commenced only in 1976. In 1951, summerfallow comprised 23 percent of cultivated land; by 2001 this area had dropped to 10 percent of the total.

In 2001, tame and seeded pasture (also known as improved pasture) comprised about 10 percent of cultivated land. Overall, tame and seeded pasture remained relatively constant, hovering around 4 million hectares over the period.

Figure 1

Cultivated land continues to increase in Canada



Source: Statistics Canada, Census of Agriculture, 1951 to 2001.

The availability of dependable agricultural land has declined due to urbanization and other non-agricultural uses

Despite Canada’s size, dependable agricultural land (Appendix 1) is a scarce resource in this country (Table 1). Only about 5 percent of Canada’s land is free from severe constraints to crop production. Limitations such as climate and soil quality reduce the amount of land that can be used dependably for agricultural activities. “Dependable” agricultural land is defined as land designated as Class 1, Class 2 and Class 3 by the *Canada Land Inventory* (McCuaig and Manning, 1982). These classes

include all land areas that are not hampered by constraints for crop production. It is, in other words, our endowment of good farmland.

Dependable agricultural land is also more scarce in some parts of the country than other parts. Although Quebec is the largest province, only 5 percent of all dependable agricultural land is found in this province (Table 1). Three-quarters of Canada’s dependable agricultural land is concentrated in three provinces: Saskatchewan; Alberta; and Ontario (Table 1). Due to its relatively small area, less than 1 percent of Canada’s dependable land is found in Prince Edward Island. However, over 75 percent of the total area of the island is covered by dependable agricultural land.

Table 1
Canada Land Inventory: Dependable agricultural land by province

Province	Class 1	Class 2	Class 3	Dependable	Portion of
				agricultural land	total
			square kilometres		percent
Newfoundland and Labrador	67	67	0.0
Prince Edward Island	...	2,626	1,422	4,048	0.8
Nova Scotia	...	1,700	10,219	11,920	2.4
New Brunswick	...	2,056	13,823	15,879	3.2
Quebec	223	10,713	13,625	24,560	5.0
Ontario	27,635	23,335	25,567	76,537	15.5
Manitoba	2,111	29,617	24,499	56,228	11.4
Saskatchewan	12,282	73,341	104,482	190,105	38.6
Alberta	6,719	38,704	61,039	106,462	21.6
British Columbia	78	1,574	5,270	6,922	1.4
Canada	49,048	183,667	260,012	492,727	100.0

Notes:

... not applicable

Figures may not add up to totals due to rounding.

Sources:

Government of Canada, Canada Land Inventory.

Statistics Canada, Environment Accounts and Statistics Division.

Urbanization in Canada

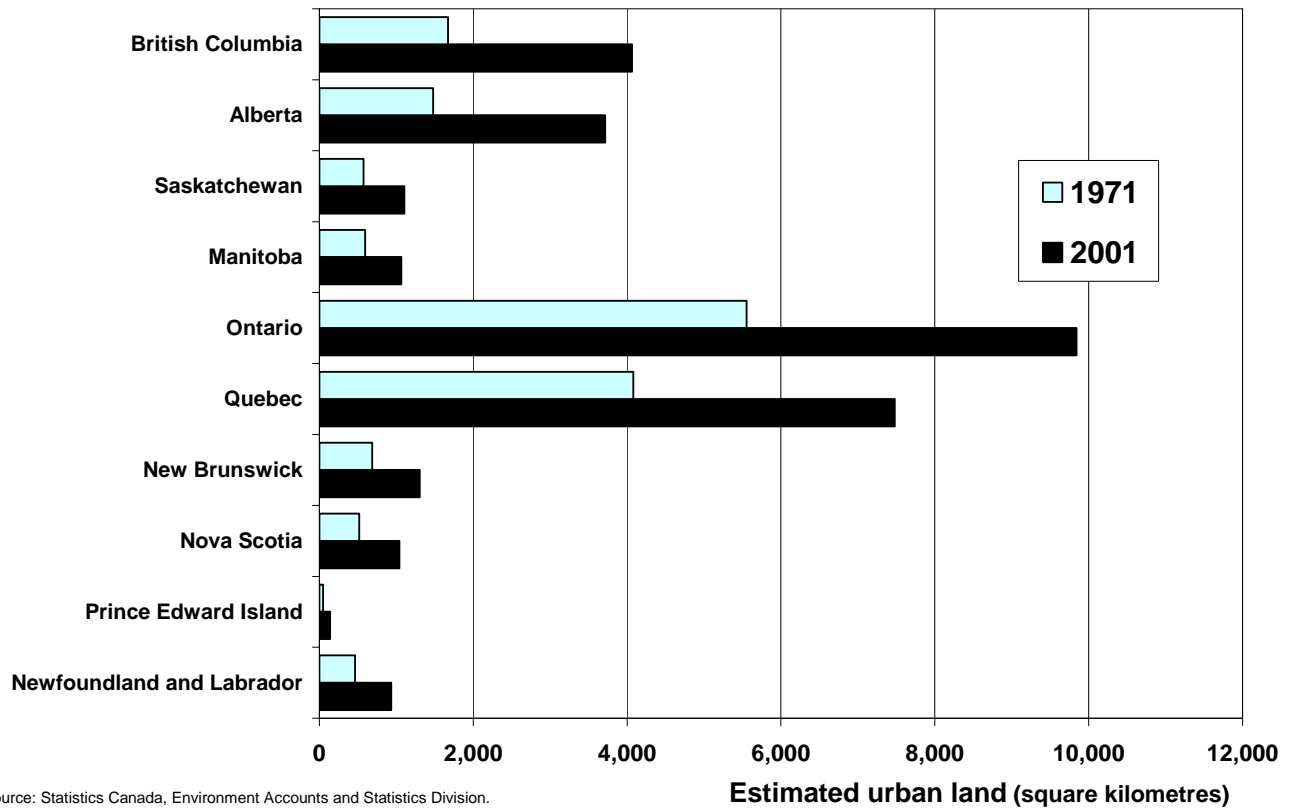
Urbanization in Canada is concentrated in a relatively small area. Canada's urban landscape is dominated by four major regions where half of the Canadian population resides: Ontario's extended Golden Horseshoe; Montreal and the adjacent region; British Columbia's Lower Mainland and southern Vancouver Island; and the Calgary-Edmonton corridor (Statistics Canada, 2002a).

Largely as a result of the Golden Horseshoe area, Ontario has the highest concentration of urban land (as defined in Appendix 1) in Canada. In 2001, approximately one in every three square kilometres of urban land was found in Ontario. Overall, Ontario had the largest urban land area with 9,800 square

kilometres (Figure 2), an area slightly smaller than the urban land found in all three Prairie Provinces and British Columbia combined. In 2001, Quebec had the second largest area of urban land, almost 7,500 square kilometres, followed by British Columbia with approximately 4,100 square kilometres.

The total area of urban land in Canada has increased significantly in recent decades. Between 1971 and 2001, urbanization consumed about 15,200 square kilometres of surrounding land. This area, almost three times the size of Prince Edward Island, represented an increase of 96 percent in urban land over the period. Ontario's urban land alone grew by 4,300 square kilometres, a growth of almost 80 percent during the period (Figure 2).

Figure 2 **One third of Canada's urban land (9,800 square kilometres) is in Ontario**



Source: Statistics Canada, Environment Accounts and Statistics Division.

Growth in urban land can be attributed to changes in population and housing preferences. In 2001, over 80 percent of the total Canadian population was urban (Appendix 1). Over the 1971 to 2001 period, the number of urban dwellers increased from 16 million to 24 million, a jump of about 50 percent. This increase in urban population, combined with the entry of the “baby boom” generation into the housing market in the 1970s and 1980s, significantly expanded the demand for new homes.

The preferences in location, type of home and lifestyle also changed and accelerated the expansion of urban centres. Before the introduction of automobiles, employment in urban areas was concentrated in the central core of towns and houses were located on small lots often within walking distance to work,

shopping and other amenities. By the mid-1900s this trend began to change, largely because of the use of automobiles and the development of related infrastructure. Urban dwellers started to live away from the central core and to rely on their automobiles for many daily activities.

By 2003, there were over 18.9 million motorized, on-road vehicles¹ registered in Canada. Between 1999 and 2003 alone, there was an increase of over 1 million vehicle registrations (Statistics Canada, 2003). A new urban form has emerged, shaped by car-oriented planning, (Environment Canada, 1996) that has led to what is commonly referred to as “urban sprawl”.

1. On-road vehicles include light vehicles, heavy vehicles (trucks), buses, motorcycles and mopeds.

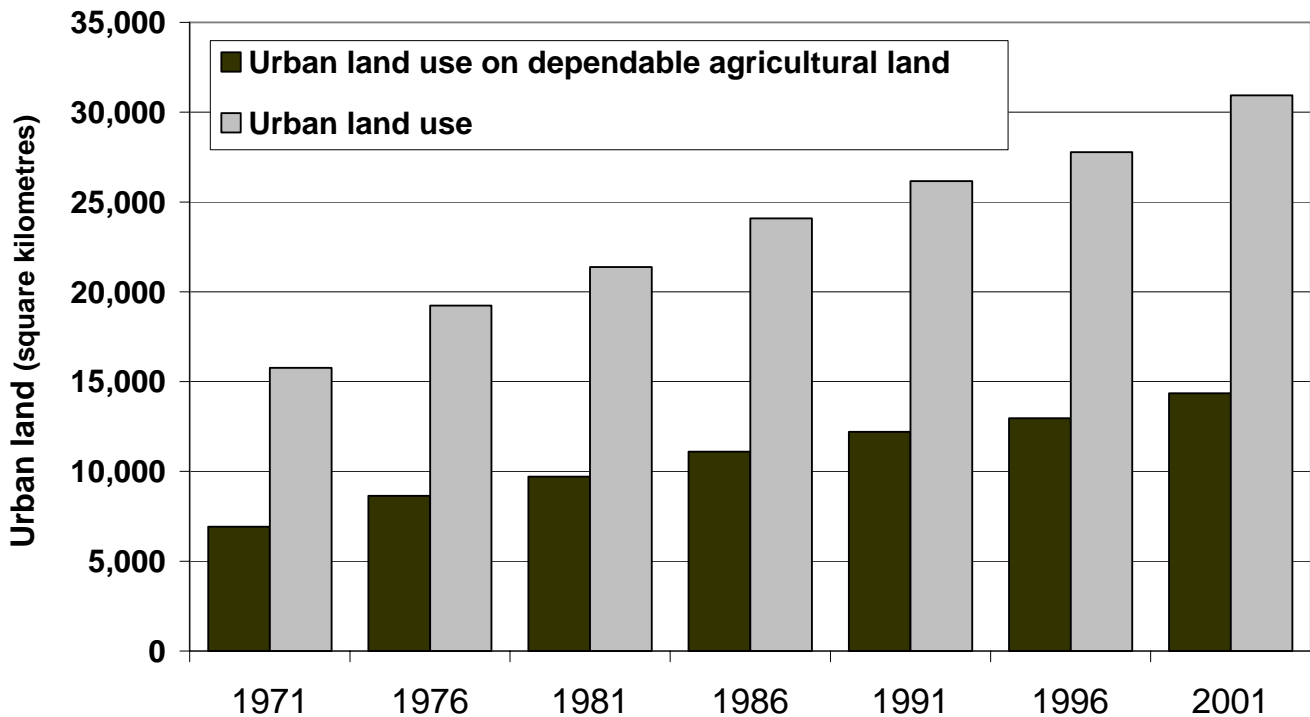
Urban consumption of dependable agricultural land

In 2001, there were about 14,300 square kilometres of urban land occupying dependable agricultural land. This was more than double the 1971 level of approximately 6,900 square kilometres (Figure 3).

Approximately 46 percent of the urban land in Canada was situated on dependable agricultural land in 2001. This was greater than the 1971 share when 44 percent of urban land was situated on dependable agricultural land.

Figure 3

Urban uses cover 14,300 square kilometres of dependable agricultural land



Source: Statistics Canada, Environment Accounts and Statistics Division.

The loss of any dependable agricultural land is a concern given the limited amount of this non-renewable resource. As of 2001, urban land in Canada occupied approximately 3 percent of all dependable agricultural land². More importantly, it occupied 7.5 percent of our very

best agricultural land that was classified as Class 1 in the *Canada Land Inventory*.³

The provinces of Ontario, Manitoba, Saskatchewan and Alberta are home to 99 percent of Canada’s Class 1 agricultural land. More than 56 percent of this land is concentrated in Ontario alone and most of this in the heavily urbanized southern part of the province. One of the results of urbanization in Ontario has, therefore, been the loss of a

2. This figure does not include the amount of dependable agricultural land occupied by large urban areas prior to the development of the *Canada Land Inventory*.

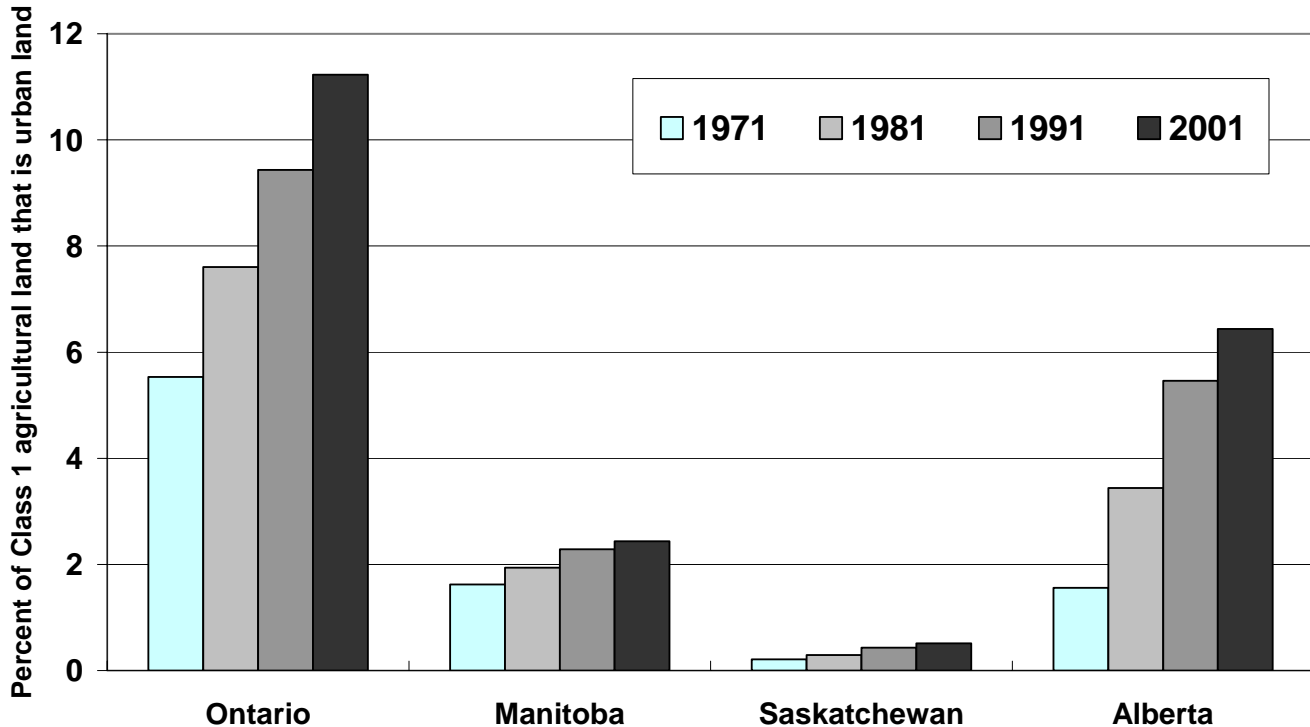
3. Class 1 land is Canada’s only land with no significant constraints to crop production.

substantial portion of the province's Class 1 agricultural land. As of 2001, over 11 percent of the province's best agricultural land was being used for urban purposes (Figure 4). Once

consumed, this land is, for all intents and purposes, permanently lost from agriculture.

Figure 4

In 2001, 11 percent of Ontario's Class 1 agricultural land was occupied by urban land



Source: Statistics Canada, Environment Accounts and Statistics Division.

Outside of Ontario, the other provinces with significant areas of Class 1 agricultural land have also experienced losses due to urbanization. The most important of these have occurred in Alberta and Manitoba; Saskatchewan still retains most of its Class 1 land (Figure 4).

Although the losses of agricultural land to urban uses may appear to be small, particularly in some regions, this measure does not take into account two important issues. First of all, in some regions, urbanization of agricultural land affects specialty crops that have a limited ability to flourish in Canada. These crops can make important contributions to local economies (e.g., the fruit belts in Ontario's

Niagara region and in British Columbia's Okanagan region). In such cases, the loss of each square kilometre can be significant.

Secondly, cities also lead to changes in the use of land beyond their boundaries. For instance, golf courses, gravel pits and recreational areas are often located on agricultural land adjacent to urban areas. Thus, the effects of urban areas extend beyond their physical boundaries (Environment Canada, 1996).

Other uses of dependable agricultural land

As noted above, by 2001, approximately 14,300 square kilometres of urban land, or almost half of the total, was situated on what was previously dependable agricultural land. When

urban land is combined with that used for small rural settlements (those with populations under 1,000), farmsteads and rural housing lots (Appendix 1), over 23,200 square kilometres of dependable land had been lost to possible agricultural use by 2001 (Table 2). Overall, urban and rural built-up areas were the cause of 57 percent of the total area of dependable land converted to non-agricultural uses. Another

11,700 square kilometres, or 29 percent of the total, were lost to transportation and utility uses. A further 8 percent was lost to protected areas and campgrounds. Unlike land lost to urban and rural built-up uses, however, losses to protected areas and parkland are not considered permanent.

Table 2
Estimated area of non-agricultural uses of
dependable agricultural land, Canada, 1951-2001

Year	Urban and rural built-up ¹	Transportation and utilities ²	Protected areas and campgrounds	Other ³	Total
square kilometres					
1951	11,400	7,400	1,000	200	20,000
1961	12,600	7,400	1,100	300	21,400
1971	14,300	8,200	1,300	500	24,300
1981	18,000	9,800	1,500	1,100	30,400
1991	21,100	10,600	2,100	1,700	35,500
2001	23,200	11,700	3,400	2,100	40,400

Notes:

Figures are rounded to the nearest 100.

1. Includes inventoried human settlements with populations above 1000, settlements with a population under 1000, and rural farmsteads/housing lots.

2. Includes roads, railways, airports and utility transmission lines.

3. Includes lumberyards, sewage treatment facilities, dumps, Federal Real Property, cemeteries, pits, quarries, autowreckers and golf courses.

Source: Statistics Canada, Environment Accounts and Statistics Division.

Use versus availability of dependable agricultural land

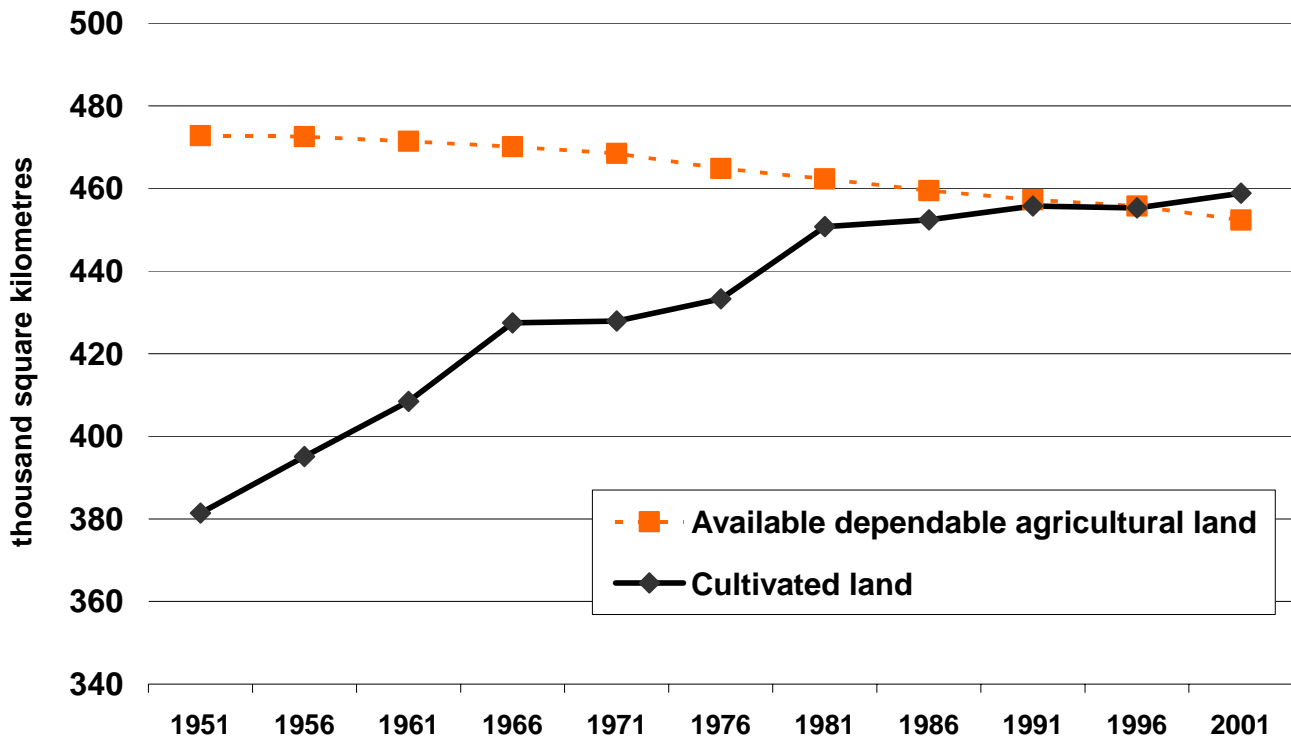
A sustainable agricultural system would, ideally, be one in which the area of land under cultivation did not persistently exceed the area of available dependable agricultural land. When the limit of dependable land is exceeded, increased cultivation must rely upon marginal land. This lower-quality land is often unsuitable for stable, long-term agricultural production. It is, by definition, affected by severe constraints for crop production (e.g., poor soil texture,

inadequate drainage and adverse slope). Production on marginal land may also be more environmentally harmful, as it is often susceptible to soil damage resulting in erosion, and requires greater inputs of fertilizers, pesticides and water to achieve a given yield.

Between 1951 and 2001, the amount of cultivated land in Canada increased by 20 percent while the supply of available dependable agricultural land actually declined by 4 percent as a result of urbanization and other non-agricultural land uses (Figure 5). Sometime during the 1990s, the area under cultivation exceeded the supply of dependable agricultural land (Figure 5).

Figure 5

**Supply and demand:
Available dependable agricultural land and cultivated Land**



Source: Statistics Canada, Environment Accounts and Statistics Division.

Conclusion

Although the estimated area in some land groups has changed due to an improved methodology, our calculations confirm the strong growth in the conversion of dependable agricultural land to urban purposes, as reported in the earlier reports (Hofmann (2001) and Statistics Canada (2001)).

Canada’s supply of dependable agricultural land has diminished over time largely due to losses to urban land. In 2001, almost half of the urban land in Canada was located on land that had been converted from dependable agricultural land. As a result, cultivation has been forced onto land with agronomic constraints, which is a less sustainable practice for the long-term.

The pressure on dependable agricultural land due to urbanization may be expected to continue. Thus, we may expect an on-going tension between the agricultural use and the non-agricultural use of dependable agricultural land.

Appendix 1

Methodology, definitions and data sources

Cultivated land

The area of cultivated land, comprising cropland, summerfallow⁴ and tame or seeded pasture⁵, is available every five years from the *Census of Agriculture*. Estimates for non-census years are made by assuming a simple linear trend in area of cultivated land between census years.

Dependable agricultural land

The total area of dependable agricultural land in Canada is defined as land classified by the *Canada Land Inventory* to agricultural land classes 1 through 3, at a scale of 1:250,000. These classes include all land areas that are not hampered by severe constraints for crop production. The area of available dependable land is estimated by subtracting the area of dependable land occupied for urban and other non-agricultural uses from the total area of dependable land in the country.

Urban and other non-agricultural land uses

Land area for urban and other non-agricultural uses are estimated for each census year. Estimates for non-census years are made by assuming a simple linear trend in area between census years. Auxiliary data were used to fill in for census years where area data was not available.

Estimates of urban land are calculated by using Census Enumeration Area (EA) digital boundary files and Census Enumeration Area (EA) representative points. EA digital boundary files are digital maps outlining the EA boundaries and are available beginning in 1991. Prior to 1991, only EA representative points (e.g., centroids representing the centre of the EA) were available in digital format. Those EA

representative points with urban populations⁶ were used to generate digital maps for all EAs in a geographic information system.

To estimate the portion of urban land that now occupies dependable agricultural land in each year, the digital maps representing urban land are overlaid with digital maps from the *Canada Land Inventory* showing the extent of dependable agricultural land in Canada. The intersection of the two represents the area of urban built-up land that has consumed dependable agricultural land.

Several data sources were used to estimate and model non-agricultural land use of dependable agricultural land.

- The area for small rural settlements with populations of less than 1,000 is derived from Statistic Canada census block data and historical Census of Population statistics.
- Digital maps from the National Topographic Database (NTDB) combined with auxiliary historical data from a variety of sources are used to estimate land area covered by airports, dumps, auto wreckers, cemeteries, roadways, railroads, pits, quarries, waste management sites, lumber yards, golf courses, and utility transmission sites. The variety of auxiliary data sources included Statistics Canada railway statistics, Transportation Canada road statistics and historical NTDB map sheets.
- The area of parks and other protected areas are obtained from the World Wildlife Fund Canada protected areas database.

4. Summerfallow refers to land that is not cropped for a year in order to store moisture and / or to control weeds.

5. Tame or seeded pasture is grazeable land that has been improved from its natural state by seeding, draining, irrigating, fertilizing or weed control.

6. "Urban" population refers to the population in census urban areas (i.e., centres of 1,000 or more with a population density of 400 or more inhabitants per square kilometre).

- Farmstead and rural housing lot data are calculated using Census of Agriculture farm number statistics and farmstead area coefficients from the United States Department of Agriculture.
- Federal real property area estimates were derived from the Federal Real Property Database (Department of Public Works) and Statistics Canada data concerning federal capital expenditures.
- This publication includes an increased number of variables and more detailed research relating to the amount of dependable agricultural land lost to non-agricultural conversions. This includes specific research relating to airports, dumps, auto wreckers, cemeteries, roadways, railroads, pits, quarries, waste management sites, lumber yards, golf courses, farmsteads, small rural settlements and utility transmission sites.
- The geographic information system methodologies for generating the Enumeration Areas based on representative points has been refined.

Previous Research

Similar research was outlined in Hofmann (2001) and Statistics Canada (2001). Although the trends in this publication are similar to the above-mentioned publications, several significant changes in the methodology have influenced the data.

- In the calculations by Hofmann (2001) and Statistics Canada (2001), *Canada Land Inventory* data at a scale of 1:1 million were used. For the estimates in this publication, recently released data at a scale of 1:250,000 were compiled from <http://www.geogratis.ca/CLI/frames.html> (accessed April 5, 2004). This change in scale has improved the accuracy of the estimates and has resulted in an upward revision in the amount of dependable agricultural land in Canada.
- In Hofmann (2001) and Statistics Canada (2001) “Land under cultivation” referred to crops and summerfallow. In this publication, the term “cultivated land” comprises cropland, summerfallow and also tame or seeded pasture.

Reliability

The reliability of data found within this article varies. The cultivated land data from the Census of Agriculture are very reliable (Class 1)⁷. The estimates of urban land, dependable land and dependable land consumed by non-agricultural uses (including urban) are considered acceptable (Class 3).

For greater detail and an outline of data limitations, please contact the authors.

7. Data are given one of the following ratings: Class 1 (very reliable), Class 2 (reliable) and Class 3 (acceptable). Please refer to Statistics Canada (2001) for further details.

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Nancy Hofmann is a senior analyst, and Giuseppe Filoso and Mike Schofield are Geographic Information specialists in the Environment Accounts and Statistics Division of Statistics Canada. The data in this bulletin were prepared using a variety of indicators related to the *Canadian System of Environment and Resource Accounts* (CSERA) being developed by the Environment Accounts and Statistics Division. CSERA has been developed with the specific objective of organizing physical and monetary statistics related to the environment using classifications, concepts and methods that are compatible with the *Canadian System of National Accounts*. The latter is the source of many of Statistics Canada's most important economic statistics. Compatibility between these two systems ensures that the environmental statistics can be directly integrated with those of the Canadian System of National Accounts. Any questions related to this paper or the work of the Environment Accounts and Statistics Division can be directed to environ@statcan.ca.

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